

# Towards a Sustainable Blue Economy in Djerba

Djerba scale, Tunisia





## Analysis of Threats and Enabling Factors for Sustainable Tourism at Pilot Scale

# Towards a Sustainable Blue Economy in Djerba

Djerba scale, Tunisia



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## OVERVIEW

The present document was produced within the framework of **Co-Evolve4BG** project “*Co-evolution of coastal human activities & Med natural systems for sustainable tourism & Blue Growth in the Mediterranean*” in relation to Threats and Enabling Factors for maritime and coastal tourism development on a national scale” Co-funded by ENI CBC Med Program (Grant Agreement A\_B.4.4\_0075).

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## Abstract

This report focuses on the ‘Sustainable Blue Economy’, in Djerba taking into consideration the state of the art of the blue sectors and the environmental status. The main challenges for the Sustainable Blue Economy in Djerba are illustrated and some recommendations and strategic action plans are suggested for a sustainable blue economy in Djerba.

The document has been broken into 6 chapters. The first chapter is going to highlight the Blue Economy Concept and give a brief description of the study area. Chapter two will illustrate the blue economy sectors state of the art and the environmental status. Chapter three is going to highlight the government’s initiative to promote the Sustainable Blue Economy in Djerba. The next chapter will demonstrate the Sustainable Blue Economy main Challenges in Djerba. Chapter five will suggest some recommendations and strategic action plans. The report will end with the last chapter that will provide a conclusion.

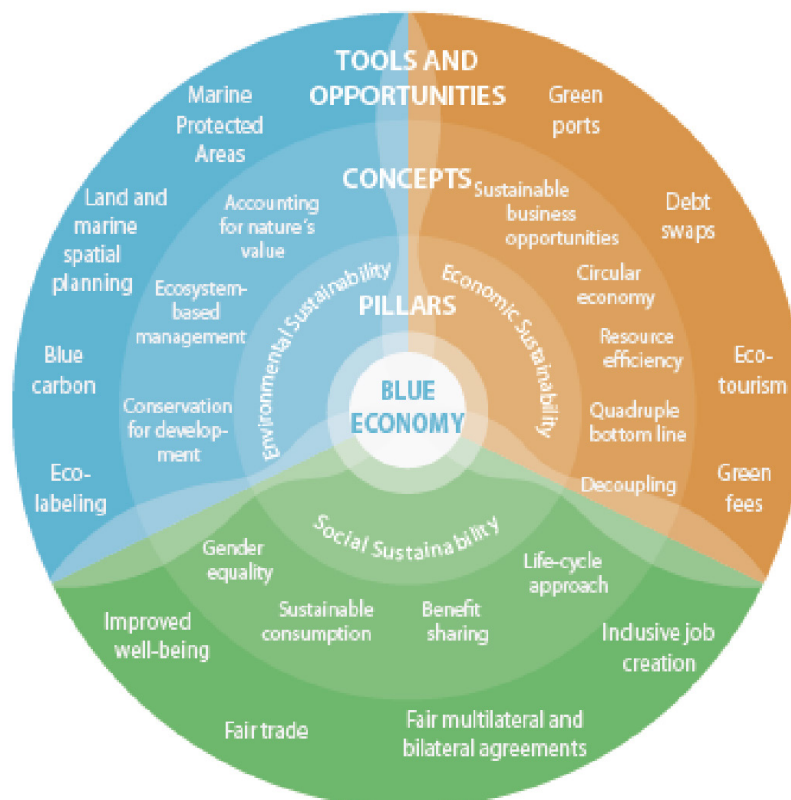
## I. Introduction

The aim of this report is to provide an overview of the sustainable blue economy in Djerba Island. In fact, this concept is tightly related to the creation of job opportunities in Djerba's communities while ensuring the island remains healthy through promotion of the island's sustainable development. While traditional sectors, such as seaside tourism, fishing and maritime transport occupy the economic scene forefront of many emerging sectors such as tidal energy. In fact, the island is threatened both by sea level rise and the protection of the coastline. Its resilience capacities improvement can cope with the climate change impact. The lack of governance, coordination and robotics can hinder the implementation of a sustainable blue economy strategy in Djerba. Thus, there is a need for a holistic approach in Djerba.

Sustainable Blue Economy conception perceives marine space as an environmental and socio-economic system in which there are a set of competing human objectives that need to be addressed in a holistic approach. On 17 May 2021, the European Commission revealed a communication aimed to integrate ocean policy into Europe's new economic policy to confirm that the 'Blue Economy' plays a pivotal role in the implementation of the European Green Deal (EGD). They have admitted that a dualism between environmental protection and economy is ineffective. Hence, there is an urgent need for a pattern shift from 'Blue Growth' to a 'Sustainable Blue Economy'.

After the Rio+20 conferences, Sustainable Blue Economy is seen as an ambitious framework for ocean management that needs to involve stakeholders, to be managed in a goal-oriented approach, and to account for the institutions under which stakeholders make choices.

To fulfill this transition, economic activities at sea and in coastal areas must reduce their cumulative impacts on the marine environment. Furthermore, the value chains must transform themselves to contribute to climate neutrality, zero pollution, circular economy and waste prevention, marine biodiversity, coastal resilience, and responsible food systems. Indeed, the main objective of the Sustainable Blue Economy strategy is to promote smart, sustainable, and inclusive growth and employment opportunities in the maritime economy. The tools, the concept and pillars of the Blue Economy are illustrated in Fig.1.



**Figure 1.**Tools, concept, and pillars of a Sustainable Blue Economy (Spring, 2021)

## II. Study Area

### II.1 General Description

Djerba Island is in the Southeast of Tunisia in the Gulf of Gabès (Fig.2). It is known worldwide as a privileged tourist destination for its climatic, geographical, and social aspects. The sunny Mediterranean climate, developed tourist infrastructure, peace and social cohesion with religious minorities, and the traditional urban aspect, are all assets that have contributed to this attractive territorial image.

From an administrative point of view, Djerba Island is made up of three delegations: Houmet Essouk, Midoun and Ajim. It covers a total area of 51,400 ha. In 2017, the annual amount of rainfall recorded was 281mm, the second lowest rainfall in the governorate after Ben Guerdene. For the same year, the average temperature was 13.7°C with maximum average peaks in August of 29°C and minimum of 11.9°C in January.

Demographically speaking, the island is inhabited by 180,626 citizens with two equivalent delegations which are Houmet Essouk and Midoun with a population of more than 72,000 inhabitants each and the third, Ajim is much less populated with 24,856 inhabitants. Between 2004 and 2014, the population of the island has evolved by an average of 29% with very contrasting levels first in Midoun then Houmet Essouk and finally Ajim. By 2035, the population of the island could reach 197,000 inhabitants.

### II.2 Key Stakeholders

The mapping of stakeholders acting in the management and use of the island distinguishes a governance system with a multitude of actors which faces coordination and consultation problems at the level of the three municipalities.

- Public sector stakeholders: A governorate, a regional council, 3 Municipalities, 3 delegations, APAL, ONTT, AFT, ONTH, CITET, ANPE, OTEDD, ONAS, ANGED, STEG, SONEDE, ODS, ONPC, APIP, INP, MARHP....
- Private sector stakeholders: Tunisian Hospitality Federation (FTH), Tunisian Federation of Travel Agencies (FTAV) and tourist entertainers (diving and Quad rent).
- Civil society stakeholders: Association for the Safeguarding of the Djerba Island, Tunisian Initiative Association, Friends of the Birds, Association of Architects of Djerba (AAJ), Association Djerba Solidarity & Development, Djerba Association for Science and Technology (ADST), Association for the protection and improvement of the Djerba environment and Djerba Association for Sustainable Development.
- International donor stakeholders: United Nations Development Program (UNDP), WWF, and the European Union.

## III. State of The Art

### III.1. General Description

The main traditional blue sectors in Djerba are fisheries & aquaculture, maritime transport, maritime and coastal tourism. The main emerging sector is the desalination sector. There is one desalination plant in Djerba. Yet, the marine renewable energy, robotics and maritime surveillance are not developed and there is a scarcity of data. While, as to the biotechnology sector, it has a great potential but unfortunately it is not well developed on the island, and it needs more investment and research.

According to the following figure the touristic area is mainly in the north-east of the island. All the diving sites and hotels are in the north-east of the island (Fig.2). There is one Marina in Houmet Essouk near the port. In Djerba, there are three fisheries ports but the port of Aghir, located in the east of the Island, is no longer functional. The port's infrastructure needs to be ameliorated. The maritime transportation between al Jorf and Ajim is held by ferries which are under the supervision of the ministry of housing and infrastructure.

Djerba is a biodiversity hotspot, according to the Regional Activity Centre for Specially Protected areas (RAC-SPA), Tunisia has 41 sites designated as Wetland of International Importance (Ramsar site), and 4 of them are in Djerba.

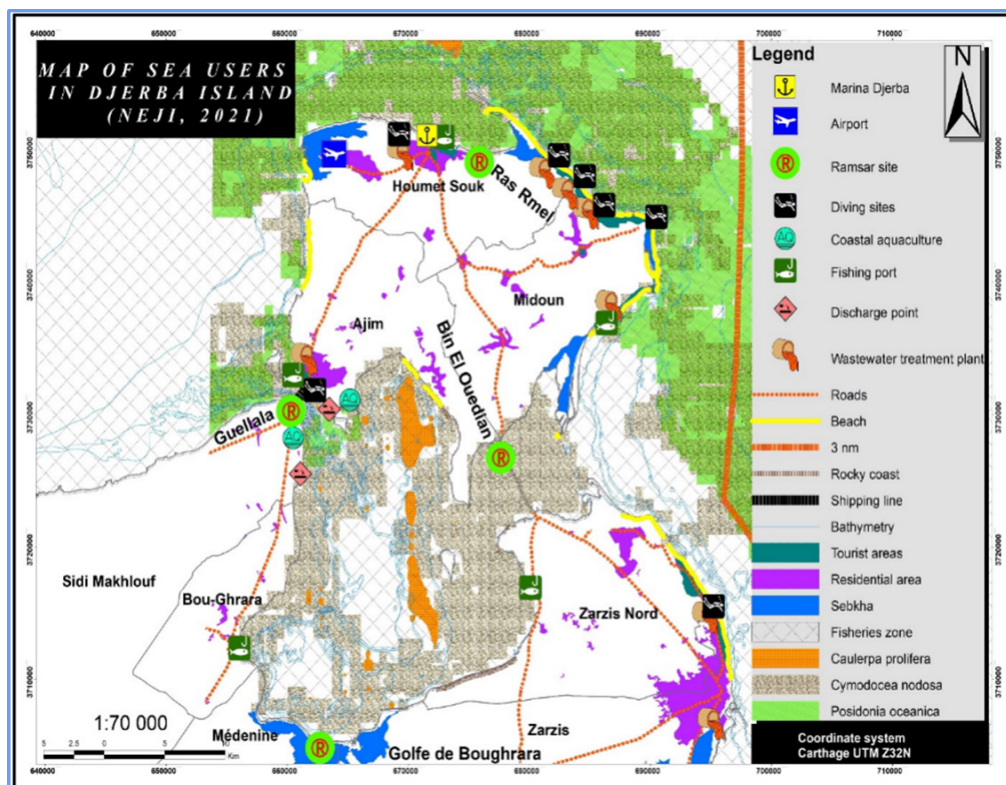


Figure 2. Sea users in Djerba

## III.2. Fisheries & Aquaculture

### III.2.1. Fisheries

From an economic point of view, the local fishermen depend largely on the marine activity which finances 92% of their income. Fishing is provided by 3318 fishermen the majority of whom work on board coastal fishing units. There are about 150 women clam collectors carrying out a fishing activity on foot on the coasts of the island. Fish production on Djerba Island reached 3,774 tons in 2019.

The annual production of blue crab in 2020 reached 3100 tons for the governorate of Medenine. Houmet Essouk alone provided 46% of production. Ajim contributed as well to this production with about 10%. The fishing sector, highly dependent on climatic factors. Thereby, leading to the new invasive species emergence: the blue crab. Thanks to state intervention and through the development strategy for this new sector. The fishermen succeeded in transforming this threat into opportunity. Several processing and export factories have thus been set up in Djerba.

### III.2.2. Aquaculture

There are two coastal aquacultures, one in Ajim and the other in Jorf. The extent of the continental shelf and the blooms repetitive phenomena are principal causes of the fish farming failure in Djerba. Different other projects are still in progress:

- Aquaculture project in floating cages at 5 nautical miles from the port of Ajim in a depth of 9-10m.
- Shrimp project Vanameii aquaculture by French company.
- Spirulina aquaculture at Sedwikech in 2021 by a Tunisian woman investor.
- Project of freshwater fish in Medenine.

### III.2.3. Tourism

The international tourism development in the 1960s disrupted the indigenous people's economy that was based on agriculture, trade, fishing, and crafts. The sector directly employs approximately 15,000 people. Besides, Djerba-Zarzis international airport as well as its road infrastructure contributes to making it an important tourist center and a generator of economic growth for the south of Tunisia. Today, Djerba offers a diverse variety of tourist products including golf courses, casinos, museums, thalassotherapy centers and amusement parks. The marina of Houmet Essouk also allows the pleasure boats anchorage, thus causing a conflict with fishermen whose boats are docked in the space shared with Marina. There is no form of wastewater or solid waste treatment for these hotel units. All waste from the hotel sector is stored on site at the edge of the beach, near the Roman lane and archaeological site. This threatens the cultural, human, and ecological heritage of Djerba.



### III.2.4. Maritime Transport

The island is very close to the mainland by two outposts: one to the west of Jorf on the mainland at Ajim, and the other to the east of Zarziss on the mainland at El Kantra. Djerba increasingly sees itself as a peninsula rather than an island. However, the main tourist flows arrive in Djerba by plane. The existing ferry system is characterized by recurrent malfunctions and breakdowns, which hamper its performance. The long queues are becoming increasingly restrictive during busy periods (summer period, school holidays, festivals, etc.). In fact, both the increase in the number and the modernization of ferries and transshipment facilities are insufficient to limit congestion. Hence, more governmental efforts are needed. In fact, a study is underway to build a 2.45km bridge to link Ajim and Jorf which is an unsustainable solution that will affect the marine environment.

### III.2.5. Biodiversity and Environmental Status

From an environmental point of view, the marine environment of Djerba Island is characterized by a flora that consists essentially of the *Posidonia oceanica* biocenosis. Several macroalgae species such as *Cystozeira shiffneri*, *C. mediterranea*, *C. sauvageana* and *Phymatolithon calcareum* are present in the area. The fauna of Djerba consists of various fish species such as *Pomatoschistus tortonesei*, *Sciaena umbra*, *Fistularia commersonii*, *Kyphosus sectator*, *Parexocoetus mento*, *Pisodonophis semicinctus*, *Sphyræna chrysotaenia*, *Helicolenus dactylopterus*, *Conger conger*, *Merluccius merluccius*, *Muraena helena* and *Diplodus annularis*. Crab species such as *Maja squinado* have been reported in this zone. In addition, decapod shrimp are represented by the native species *Penaeus kerathurus* and the two non-native species *Metapenaeus monoceros* and *Trachysalambria palaestiniensis*.

Djerba Island is surrounded by a set of water purification and treatment stations (Fig.2). The situation in the two wastewater treatment plants of Djerba (Ajim and Aghir) is near the fishing areas and RAMSAR sites which raises the question of their possible impact on the marine environment and local biodiversity. In addition, the waste discharges from phosphate companies in the Gulf of Gabès has worsened the situation.



## IV. Initiatives to promote sustainable Blue Economy

### IV.1. Introduction

Tunisia is in line with its commitments to the implementation of the 2030 Agenda for Sustainable Development. Indeed, Tunisia presents its second Voluntary National Report 2021 and reaffirms its determination to implement the SDGs despite the context of COVID 19 pandemic that made the implementation more difficult. In fact, it started in Tunisia with the first post-revolution development plan adoption (2016-2020) and around 80% of the SDG targets were in alignment with this plan.

The Tunisian State, part of the international community, has ratified most of the conventions related to the exploitation, exploration, management and protection of the environment, maritime resources, and biodiversity. Thereby, strengthening its legislative and regulatory framework (United Nations Convention on the Law of the Sea, Convention on Biological Diversity, The International Convention for the Prevention of Pollution from Ships, United Nations Framework Convention on Climate Change...).

In Djerba there are some initiatives for a Sustainable Blue Economy, for instance; the BLUE HOPE project, which is the most important project in this region, and it takes into consideration the 3 spheres of a sustainable blue economy which are the social, environmental and economic sphere in Djerba. Other governmental and non-governmental organization's initiatives have suggested programs and plans that are not as inclusive and smart as the Blue Hope project, for instance, ecolabelling in the tourism sector and the Blue Crab valorization. Most importantly the initiatives are illustrated in the following tables.

### IV.2. Government Initiatives

#### IV.2.1. Fisheries & Aquaculture

**Table 1.** Initiatives for Fisheries and Aquaculture

Sector	Plan/Project/Program	Objectives	Description
<b>Fisheries &amp; Aquaculture</b>	FAO's "Blue Hope in the Mediterranean" Project	Develop an investment plan geared towards the blue economy and support the implementation of ecosystem-based management (EBM) in southern Tunisia	About 3,500 fishermen will directly benefit from the project

## IV.2.2. Maritime and Coastal Tourism

Table 2. Initiatives for Maritime and Coastal Tourism

Sector	Plan/project/program	Objective	Description
<b>Maritime and Coastal Tourism</b>	Eco-labelling: 1. Tunisian Eco-label 2. Green Key 3. Blue Flag	Represent a significant competitive advantage to be exploited as a tool for marketing	Radisson Resort & Thalasso is the only establishment certified according to the standard of the Green Key.  Magic Life in Djerba is certified according to the standards of Blue Flag.  Yadis hotel Djerba and Radisson SAS Resort & Thalasso are in the process of being certified.

## IV.2.3. Valorization and Commercialization of Invasive Blue Crab

Table 3. Initiatives for Blue Crab Valorization

Sector	Plan/ Program /Project	Objective	Description
<b>Valorization of Blue Crab</b>	Exploitation and valorization of Blue Crab fishing in the region of Ajim in Djerba project supported by Tunisian authorities and FAO	Create a local product specific to the locality of Ajim  Ensure women's access to training in handling and extracting crab meat	Invasive Blue Crab is turned into lucrative business

## IV.2.4. Renewable Energy

Table 4. Initiatives for Renewable Energy

Sector	Plan/Program/project	Objective	Description
<b>Renewable Energy</b>	Feasibility study of "Eco-solar Village Djerba-Zarziss" project.  Alliance of municipalities for energy transition (ACTE program).	Create more skilled job opportunities to contain unemployment.  Urban transport plans development.  Development of a common strategy between the 3 municipalities energy transition.	Produce renewable energy and desalinate seawater to develop organic farming.  Provide investment opportunities to generate sustainable income and provide an economic ripple effect for the entire region.

## IV.2.5. Social Equity and Sustainable Development

**Table 5.** Initiative for Social equity

Sector	Plan/Project/Program	Objective	Description
<b>Social Equity and Sustainable Development</b>	Gendering and sustainable marine products project	Confronting the economic and social repercussions of the Corona pandemic which befell the category of women who collect marine grains by being on the beaches from November to the end of May in the Djerba region, Houmet Essouk	Enable this vulnerable group to have a point of sale from the producer to the consumer, as well as a platform for electronic promotion of their products. thereby, ensuring a fair trade and cutting off the way for intermediaries who exploit these women efforts in an indecent way

## IV.2.6. Patrimonial Protection

**Table 6.** Initiative for Patrimonial Protection

Sector	Project/Plan/Program	Objective	Description
<b>Patrimonial Protection</b>	Youth digital project	Serves to engage and bring together young people, help them develop their skills, reveal their potential and encourage their commitment and participation in the development of the island	Supports the initiative to register the island as a UNESCO world Heritage Site

## IV.2.7. Water Resources

**Table 7.** Initiative for Water resources

Sector	Project/Plan/Program	Objective	Description
<b>Water resources</b>	Desalination plant in Djerba	Help Tunisia meet growing municipal demands	The 50,000 m <sup>3</sup> /day development on the island of Djerba is expandable to 75,000 m <sup>3</sup> /day and is expected to meet the potable water needs of the island's residents until 2035

## IV.2.8. Water Resources

**Table 8.** Initiative for Ecosystem Protection

Sector	Project/plan/Program	Objective	Description
<b>Ecosystem and plastic waste management</b>	Djerba without single-use plastic products	Combat plastic pollution	For the year 2020 alone, the Directorate of Environmental Health and Protection under the Tunisian Ministry of Health has excluded 23 beaches from bathing because of plastic pollution

## IV.2.9. Climate Change

**Table 9.** Initiatives for Climate Change

Sector	Project/Plan/Program	Objective	Description
<b>Climate change</b>	<ul style="list-style-type: none"> <li>- The master plan for the development of the sensitive area of Djerba.</li> <li>- APAL participates in the prioritization of actions for local development in Djerba</li> </ul>	<ul style="list-style-type: none"> <li>- Start the elaboration of a sustainable development pact and a climate plan. these should encompass the projects envisaged to deal with the repercussions of climate change at the island level.</li> <li>- Support Tunisia in promoting innovative strategies, technologies, and financing options to respond to the risks of climate change in coastal areas with pilot actions at Djerba island</li> </ul>	This study showed that 3,500 hectares in Djerba island will be submerged by the sea by 2100, in addition to maritime erosion which should extend over 24 km and an increase in the salinity of the waters of sea, which requires an additional effort to combat these phenomena and improve the mechanisms of adaptation to climate change

## IV.2.10. Maritime Transport

**Table 10.** Initiative for Maritime Transport

Sector	Project /Plan/Program	Objective	Description
<b>Maritime Transport</b>	2 new lines connecting Sfax to Djerba and Gabès to Djerba were launched.	Spare travelers the trip to Djerba by land or waiting for the ferry for hours	This sector is under the supervision of the ministry of equipment and housing, it must be under the supervision of OMMP

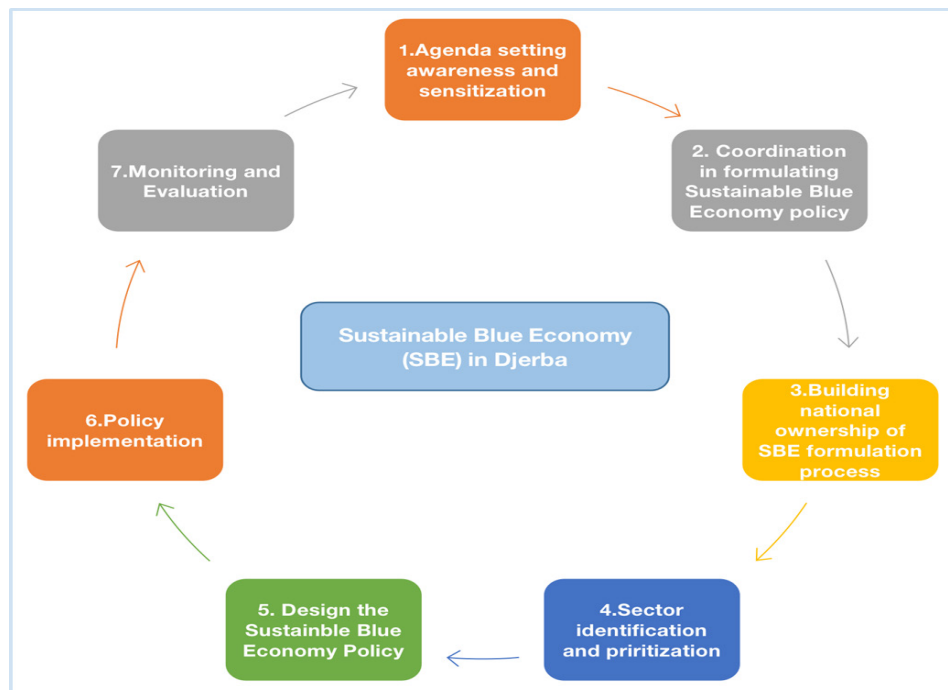
## V. Challenges for a sustainable Blue Economy

The main challenges for achieving a Sustainable Blue Economy in Djerba refer to critical environmental, social, and economic issues that need to be addressed by the Sustainable Blue Economy. In general, the Main challenges are the following:

- Solid waste management (marine litter)
- Climate change (Sea level rise, beach erosion)
- Marine and continental biodiversity loss
- Unsustainable Tourism
- Water resources scarcity
- Pollution and eutrophication
- Lack of governance, coordination, and inadequate legislation
- Demographic pressure
- Urban pressure on agricultural land and on the landscape agrarian of the Island
- Overexploitation and illegal fishing practices
- Heritage issue between wealth and the need for protection and conservation
- Managing the urban space reserved for the coastal tourism
- The crafts sector decline
- Poor port infrastructure
- Conflict between Fisheries and Tourism
- Maritime Transport congestion
- Energy (High cost of supply)
- Unemployment high rates (18.20 % in Midoun) and social inequity.

## VI. Recommendations

In this section, necessary recommendations are introduced to achieve an integrated maritime policy and to ensure a desirable transition towards a sustainable blue economy including the sustainable development. These recommendations draw on the successful comparative experiences of countries that have made significant progress in the blue economy. Sequencing and steps for the blue economy policy development process in Djerba are illustrated in Fig.4. The two pivotal maritime activities in Djerba are Fisheries and Tourism. Marine Spatial Planning (MSP) is essential for implementing a Sustainable Blue Economy. All steps are mentioned in Fig.5. Integrated Coastal Zone Management which coordinates policies, activities and investments impacting coastal and maritime resources are critical to capturing the opportunities of the Sustainable Blue Economy in Djerba.



**Figure 3.** Sustainable Blue Economy Policy Development Process



**Figure 4.** MSP Process in Djerba

## VI.1. Recommendation 1: Integrated Coastal Zone Management (ICZM)

For the Barcelona Protocol, the Coastal Management Plan is a crucial step in the implementation of the ICZM strategy at the local level. Djerba Coastal Development Program will serve as a support for Coastal Management, and it will implement the Barcelona concrete application principles convention and more particularly the Integrated Coastal Zone Management.

### VI.1.1. In terms of Environment

Djerba Island is one of the most threatened coastal ecosystems in Tunisia. Threats must be considered in the island's coastal development planning processes. The island had problems with:



- Coastal submersion risk due to erosion and sea level rise.
- Maritime desertification and a threat to agricultural land from the groundwater salinization effects.
- The natural and energy resources overexploitation.
- Certain port areas Siltation and agricultural land silting (port of Aghir and agricultural areas).

Thus, and given the amplifying effects of climate change, the main problems that the coastal action plan should consider and tackle at the level of the island in general and the coastal zone in particular, concern mainly:

- Pollution, the risk of land salinization and submersion.
- The intense phenomenon of coastal erosion which mainly affects the mudflats and the lowest sabkhas (RasErRaml, LellaHadria and Bin El Ouediane).

These impacts are obvious through the 18 km of beaches that are affected by erosion; a disastrous imbalance on the biodiversity; a displacement of the coastline and a negative impact on tourism. Furthermore, the expectations of the coastal development plan in Djerba should also concern the effective solution of waste management and discharge problems from tourist and para-tourist units. Hence, there is an urgent need to:

- Collaborate and coordinate missions between the municipalities and the Ministry in charge of the environment.
- Raise awareness and communication between the administration and citizens.
- Implement a clear work plan and a waste management method which is missing the effectiveness and efficiency.
- Implement an agreement and coordination between the three municipalities of the island, regarding this aspect.
- Ensure the commitment of those involved in the island's tourism sector and guarantee large numbers of adherence to the effective waste management principle, starting from the sorting of waste.

### **VI.1.2. In Terms of Regional Planning**

As far as land use planning is concerned, the expectations from a strategic plan mainly concern the integration management of the island territories. It can be realized by ensuring a development that considers all the territorial coastal areas components and those of the island interior. It can as well ensure that the problems due to Land-Sea interaction are solved. The development of tourist areas and hotel

units' construction will generate environmental degradation (coastal degradation, water pollution and marine erosion), the disfigurement and gradual disappearance of the typical architectural status of the island (identity of Djerba). Around the towns of Houmet Essouk and Midoun, there is a strong anarchic urbanization behind the tourist area. This urbanization mode, with the rapid growth in tourism, has deprived agriculture, especially traditional agriculture, of its two resources: water and land. Indeed, the rural landscape which gives a notable identity to the island has degraded. Thus, there is a need for:

- An approved land development master plan that considers the approval procedures complexity.
- Adequate legislation because the legal and regulatory framework that governs land use planning and town planning does not make it possible to respond to the specificities linked to the geographical characteristics of the island.
- Coordination structure responsible for territorial planning and management for the whole island planning.
- Rationality in the development of tourist areas and urban areas. Indeed, the mass tourism rapid development and its concentration along a coastline relatively limited has generated negative urban impacts on the Djerbian territory.

### VI.1.3. In Terms of Renewable Energy

Regarding the improvement of the renewable energies' potential, the expectations from a coastal action plan mainly concern the solutions that will overcome the issue of the rapid growth in energy consumption electricity from the Djerba Island, which is increasing by 11 to 12% per year. In addition, the high energy cost used by the production sectors and in particular the tourist establishments, consists in an important financial weight which requires an opening on the alternative of the development of renewable energies given the great potential of solar energy and wind turbines. Thus, there is an urgent need for:

- Efforts in terms of energy management and investment in renewable energy.
- Investment in renewable energies that would be an opportunity for investors, private and public authorities.
- Floating Solar PV to supply the Island with power. It will reduce the problem of lack of land even if it is costly.
- Tidal installation: under the Roman road Djerba-Zarzis or under the Ajim-Jorf Bridge while trying to minimize the marine environmental impact.

These energies represent a source of future earnings for companies and local authorities with high energy consumption and in particular large tourist establishments. This opportunity would also be a good breakthrough for the transition energy that protects the environment and guarantees sustainable development. Indeed, it will allow the reduction of conventional energy consumption with its harmful environmental effects: the emission of greenhouse gasses and natural resources depletion (Fig.6).



**Figure 5.** Floating solar panels and tidal energy

#### **VI.1.4. In Terms of Economic Development**

The expectations of a Strategic Coastal Action Plan mainly concern economic governance establishment that meets the integrated management that ensures:

- The economic fabric diversification.
- Improved employability, the island territories integrated development implemented to bridge the imbalances between the zones of the coast and those of the interior of the island.
- The integrated approach and the plan development design of the Island within the framework of “an integrated local plan between delegations”.
- A strong relationship between sectors and areas and to develop transversal sectoral tools and territorial management.
- Held suitable training for the productive sectors of the area.
- Foster the financing project capacity.
- Implement a coherent and strategic vision for this funding as part of a territory project for the Island Integrated Development.
- Enhance the economic actors’ supervision, quality control and the economic vision driven by the national and international market.
- Develop an island label of the Island product for products and territories.
- Diversify the tourism products as 80% of tourism is seaside tourism.
- Ensures the integration of the tourism sector as a catalyst for other sectors of the economy; Pesca-tourism.

- Eco-tourism in wetlands (Flamingo Island, Lella Hadhria...).
- Build other marina in Midoun region and facilitate the administrative procedure for nautical tourism.
- Enhance the components of beach leisure and cultures based on the territories.
- Develop equipment and services that are inefficient therefore unfavorable to investment.
- Develop the transport network in relation to the mainland.
- The network inside the island must meet transport standards in the tourist areas.
- Change the ferry's supervision from Public Works, Housing and Infrastructure Ministry to Merchant Navy and Ports Office (OMMP).
- Encourage the privatization of maritime transport sector in Djerba.
- Invest more in maritime robotics.
- Knowledge and data sharing (For instance: EMODNET, COPERNICUS platforms).

### **VI.1.5. In Terms of the Governance System**

For coordination between the three Municipalities, it is obvious that they must work together to pool their efforts and ensure coordination which will be the major lever for the development of the island. In addition, it is important to define a single coordination framework for the entire territory of the island with its 3 municipalities. This can be guaranteed neither at the level of council, nor at the level of the councils of the governorate of Medenine, which are inefficient. Moreover, they do not allow an understanding of the lack of technical supervision at the level of local governments.

Like the whole of the national territory, the absence of strategic planning at the local level is partly explained by the weakness of the municipalities and regional administrations supervision level. Thus, it is important to improve the technical supervision at the level of municipalities and local administrations on the island.

## **VI.2. Recommendation 2: Sustainable Development of the Fishery Products Value Chain**

### **VI.2.1. measures for a sustainable development for fisheries sector**

Some measures for a sustainable development for fisheries sector are highly recommended:

- Certain fishing areas restriction,
- Certain fishing gear prohibition (temporary or permanent),
- Vessel Monitoring system and Global position system,
- Introduction of fishing periods or minimum catch sizes for certain species,
- Introduction of new fishing gear or selective fishing gear.

## VI.2.2. Measures to ensure ecosystem protection

Some measures should be taken to ensure ecosystem protection are illustrated below:

- Destructive fishing techniques reduction (trawling).
- Increase in fish production and catches by small-scale fishermen.
- Capacity building of producer organizations (fishermen's groups) to co-manage artificial reef sites and monitor the implementation.
- Establishment of Marine and Coastal Protected Areas and include Lalla Hadria as a Ramsar Site.
- Identification of sensitive marine areas where artificial reefs could be established to limit the impact of destructive fishing techniques and restore fisheries resources.
- Monitoring of the impact of artificial reefs on fauna and flora.

## VI.2.3. Development of Ajim and Houmet Essouk Fishing ports

The main suggestion to develop Djerba's port infrastructure are the following:

- Redevelopment of the slipway in Ajim Port.
- Paving of the shipyard in Ajim Port.
- Maintenance of Ajim port barrier.
- Environmental, technical, and economic feasibility study to develop ports and fishing shelters in consultation with the stakeholders (Local Authorities, municipalities, APIP).
- Renovation of pedestrian sidewalks at the Ajim port.
- Installation of a sewage pumping station.
- Enlargement of the entrance of Houmet Essouk port.
- Renewal of the water and sanitation network in Houmet Essouk.
- Construction of a refrigeration unit, enlargement of the quays.
- Extension of the Port of Houmet Essouk to resolve the conflict with the marina.
- Improvement of storage, marketing infrastructure, services and other port services including access to ice.
- Development of fishing sites and shelters in Saguia and Guellala.
- Improve access to Borj Jilij landing sites and wharfs.
- Foster the partnership with fishermen's organizations, the private sector and APIP.

## VI.2.4. Valorization of Fishing Techniques and Fish Products in Djerba

The main recommendations for fish products valorization are the following:

- Creation of a "bank of palm trees", which are raw materials used in the construction of fixed fisheries, with possibly a value chain in the source area (Djerba).
- Technical and financial support of small-scale fishermen and distributors for the application of the requirements of the quality label for fisheries products.

### **VI.2.5. Capacity Building and Promotion of Professional Small-Scale Fisheries Organizations**

The main suggestions are illustrated below:

- Diagnose professional groups of small-scale fishermen to identify ways to strengthen these organizations or social enterprises to ensure their sustainability and financial autonomy.
- Implementation of the capacity building training and programs.
- Study with regulatory and practical recommendations to ensure the Small to Medium Enterprises Construction sustainability.
- Improvement of equipment storage shelters for instance; lightweight construction in accordance with APAL requirements.

### **VI.3. Recommendation 3: Diversification of Income for Small-Scale Fisheries and Their Families**

The main recommendations are:

- Diversify income and activities: Small-scale agriculture, small-scale livestock, crafts, ecotourism, Pesca-tourism.
- Study of the small-scale fishermen livelihoods and members of their families and promising opportunities analysis to diversify and increase their income outside of fishing activities.
- Technical support for sub-projects carried out by individuals or groups of fishermen for the improvement of fish production (introduction of selective fishing gear), value chains, conservation, and development of fish products (production ice and small local processing).
- Technical support includes short training for small-scale fishermen and members of their families (young people and women) on promising activities and project incubation, setting up sub-projects and simplified business plans.
- Facilitation of access to existing funding mechanisms (subsidy of credits from different sources, complementary targeted cost-sharing grants as needed).
- Financial support for the promoters of projects and micro-enterprises of small-scale fishermen and their families to diversify their sources of income, within the framework of a partnership with micro-finance institutions.

### **VI.4. Recommendation 4: Petition for the Authorization of Ecotourism Activities**

The main recommendations are the following:

- Identification of the various local, national, and international actors (local and national, international NGOs, deputies of the region, municipalities of the island and research or support institutions such as INSTM) that can serve as support for pesca tourism lobbying.

- Realization of communication events and promotion of ecotourism in Djerba.
- Study and proposal, with other interested stakeholders, of a law concerning pesca tourism.

## **VI.5. Recommendation 5: Protection and Restoration of the Marine and Coastal Environment**

### **VI.5.1. Identification of Pollution Sources and Implementation of a Corresponding Action Plan**

The main recommendations are below:

- Identification and analysis of the effects of the various sources of pollution directly affecting the coasts or the sea (slaughterhouses, water treatment plants, solid waste collection centers and water desalination plant).
- Planning and implementation of necessary development, upgrading or replacement actions in consultation with the parties concerned (Ministry of the Environment and Local Affairs, municipalities, APAL, local authority, ANPE and ANGED).

### **VI.5.2. Communication and Promotion of Sustainable Fishing and Protection of the Marine Environment**

- The main recommendations are:
- Awareness campaigns with target groups (fishermen's groups, local communities, women, and youth associations).
- Building the capacities of civil society organizations working on the protection of the marine environment and the coast's protection, biodiversity, and the blue economy by identifying the needs of these actors.
- Communication: production of advocacy tools for the public (for decision-makers, educators, journalists, and children) to communicate on actions to promote sustainable fishing and preservation of fishery resources.

### **VI.5.3. Better Consideration of Climate Change Impacts**

The main recommendations are:

- Support the climate changes effects.
- Risk analysis of the region's vulnerability to climate change and proposal of an action plan.
- Study for the evaluation of the current and prospective direct and indirect effects of climate change on the Djerba Island.
- Identification of measures for adaptation and improvement of the resilience of the ecosystem.



#### **VI.5.4. Improvement of Water Circulation at the Spit of Ras Rmal**

The main recommendations are:

- Restoration and Protection techniques for Ras Rmal split.
- Government's Funds to improve it.

#### **VI.5.5. Coordination, Monitoring and Communication**

The main recommendations are:

- Development and implementation of a communication plan.
- Disseminating the lessons learned and its innovative aspects to promote emulation on the Djerba Island and in Tunisia.

### **VI.6. Recommendation 6: Strategic Actions Plan for a Sustainable Maritime and Coastal Tourism**

According to the key stakeholders in Djerba, the key questions for establishing a sustainable maritime and Coastal Tourism in Djerba are the following:

- How can convince developers as a core system on the necessity of adopting a sustainable development strategy in the tourism sector in Djerba?
- How can the local population be sensitized in terms of their involvement in any process of sustainable development?
- How to support the poorest people in this process?
- What initiatives and successful strategies should be implemented?
- What new regulations need to be enacted to introduce the culture of sustainable development in the tourism sector, to reduce the fisheries and tourism conflict and solid waste from the tourism sector?
- How can a public-private partnership be built?

To achieve tourism at a time sustainable and responsible, the following strategic recommendations are suggested:

- Developing visions, at a national scale and in the medium and long term, classifying and ranking the tourism sector at the national economy (in Tunisia) and taking better account of global challenges ahead. They will include climate change (Sea level rise and erosion) and preserving the island biodiversity (Posidonia, Ramsar sites and marine mammals) and reducing conflict with fisheries sector using Maritime Spatial Planning (MSP) as a tool.
- A potential collaboration between tourism and fisheries; pescatourism is possible.
- Using the strategic foresight tools to better organize the sector development by involving all the stakeholders' contributions especially the private sector and civil society.
- Sharing analysis and approaches to sustainable tourism development in the context of regular meetings involving the various responsible bodies.

- Establishing mechanisms to provide reliable, complete, and comparable information between the actors at a national level.
- Strengthening foresight studies on tourism to anticipate future developments.
- Developing an economic analysis to assess the impact of tourism on the environment.
- Defining and clarifying the indicators of sustainable tourism.
- Enhancing eco-tourism in wetlands park.
- Improving infrastructure and implementing new information technology.
- Avoiding hotel management to all-inclusive system.
- Enhancing eco-labelling.

## VII. Conclusions

As a conclusion, it is obvious that despite the main challenges raised by this report, Djerba participatory diagnosis proved to be a combination of the consequent real potential, with which the island is endowed in the blue sectors like Tourism and Fisheries, and the critical threshold rupture of global balances in the island. Taking into consideration both the stakeholders mapping and identification confirm that the island transversality management reinforces the island territoriality. Indeed, its sustainable management cannot be administratively fragmented. Hence, co-management then becomes the center of a positive pragmatism for a functional strategic action and a sustainable blue economy.

To succeed in implementing a sustainable blue economy strategy, it is imperative to replace the current institutional framework which lacks a coherent articulation for an effective implementation of the island's comprehensive integrated management action plans. In its article 16 (Instrument for the integrated management of Monitoring and Observation Mechanism and Network), the Protocol invites parties to participate on the appropriate scientific and administrative level, to the Mediterranean coastal zones network, thereby promoting the scientific experiences exchange, data, and good practices.

In addition, the strategic action plan scope for a sustainable blue economy must be defined according to the challenges identified in the previous chapter and prioritized at the end of a fully endogenous participatory process. The issue is about not risking compromising the stakeholder's community's goodwill and their adherence to the sustainable blue economy and sustainable development objectives. In fact, they are acquired through a well committed participatory process in advance. Yet, more specific questions related to the adoption of the Coastal management plan adoption and the ICZM Protocol full implementation as well as MSP at the island level are still unknown. They must be tackled with local and regional levels, while relying on the following fundamentals:

- The requirement for the institutional structures coherence and legal frameworks for the governance of the island's Integrated coastal zone management (ICZM).
- The practice of ICZM should not be seen as an environmental activity, but it must involve the institutions and actors responsible for the social and economic pillars of sustainability.
- The need for clear strategic priorities to guide the ICZM and Marine Spatial Planning (MSP).
- The critical importance of human and technical capacities and institutional coordination at the scale of the island.
- The importance of awareness of the sustainable blue economy both at the scale of the island and the regional scale in the South-East region and the Gulf of Gabes.
- The need for a strong focal point to support the implementation and monitoring of sustainable blue economy policy in the island and its region.
- The need for access to high-quality information, knowledge, and research quality.

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