State of the Art and Future Development of Blue Growth Concept

Tunisian scale

ENI CBCMED
Cooperating across borders in the Mediterranean

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REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA

Co-Evolve4BG

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

Towards a Sustainable Blue Economy

Tunisian scale

INSTM

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Union for the Mediterranean
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الاتحاد من أجل المتوسط

CPMR
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OVERVIEW

The present document was produced in 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 Programme (Grant Agreement A_B.4.4_0075).

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REVIEW

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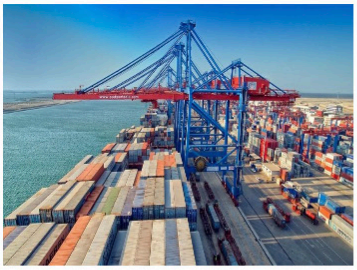



LAYOUT

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List of abbreviations

AFI	Agence Foncière Industrielle
AFT	Agence Foncière Touristique
ANPE	Agence Nationale de Protection de l'Environnement
APAL	Agence de Protection et d'Aménagement du Littoral
APIP	Agence des Ports et des Installations de Pêche
CITETE	Centre International des Technologies de l'Environnement de Tunis
CNDD	Commission Nationale de Développement Durable
CRDA	Commissariat Régional du Développement Agricole
CTN	Compagnie Tunisienne de Navigation
DGE	Direction des Grandes Entreprises
DGMM	Direction Générale de la Marine Marchande.
DGPA	Direction Générale de la Pêche et d'Aquaculture
DGPE	Direction Générale de la Planification et des Études
DHMPE	Direction de l'Hygiène du Milieu et de la Protection de l'Environnement
ETAP	Entreprise Tunisienne d'Activités Pétrolières
FTH	Fédération Tunisienne de l'Hôtellerie
INSTM	Institut National des Sciences et Technologies de la Mer
MARHP	Ministère de l'Agriculture, des Ressources Hydrauliques et de la Pêche
OMMP	Office de la Marine Marchande et des Ports
ONTT	Office Nationale du Tourisme Tunisien
OTEDD	Observatoire Tunisien de l'Environnement et du Développement Durable
STAM	Freight and Handling Company
STEG	Société Tunisienne de l'Electricité et du Gaz
SONEDE	Société Nationale d'Exploitation et de Distribution des Eaux

Abstract

This report focuses on the 'Sustainable Blue Economy', in Tunisia's maritime space context, taking into consideration the traditional sectors and the emerging sectors, and the main challenges for the Sustainable Blue Economy in Tunisia, and how it can enhance the tourism sector in Tunisia. The document is structured in 8 chapters.

The first chapter highlights the concept of the Blue Economy and Tunisia's maritime assets. Chapter two and three illustrate the state of the art of the blue economy sectors in Tunisia. Chapter three highlights the government's initiative to promote the Sustainable Blue Economy. The next chapter demonstrates the main Challenges for a Sustainable Blue Economy.

Chapter five highlights main legal measures taken to enhance the Sustainable Blue Economy. The next chapter describes how Sustainable blue Economy can have a good impact on the tourism sector.

In chapter 7 there are some recommendations to have sustainable, inclusive, and smart growth of the blue sectors in Tunisia. The last chapter provides conclusions.

I. Introduction

I.1. Summary

Oceans, seas, and marine and coastal resources represent an essential link between every region of the planet. In various ways, they affect the lives of people all over the globe as they are drivers and enablers of national and regional economies as well as a source of survival. Indeed, Ocean covers about 71% of the earth's surface.

Maritime and land-based activities in the Mediterranean region, along with the progressively more artificialized coastline, are at the origin of a wide spectrum of pressures affecting marine and coastal ecosystems. Current patterns of economic development in the region are characterized by resource intensive production processes as well as intensive consumption lifestyles both of which contribute to resource scarcity, pollution, waste generation, and greenhouse gas emissions. For instance, a large part of the pollution in the Mediterranean is caused by inefficient industrial processes and unsustainable management of waste. Hence, there is an urgent need for a holistic approach to reach the Sustainable Development Goal 14 (Sustainable development goals, 2021) (SDG 14), which is 'life below water'.

An integrated maritime policy called the 'Sustainable Blue Economy' is the key to reach the sustainable development goals, taking into consideration the three pivotal aspects which are the social, the economic and the environmental aspect. It is important to bear in mind that the concept of Sustainable Blue Economy (Sustainable Blue Economy, 2021) concept was called the concept of Blue Growth and it was amended introducing the concept of Green Deal 2 in May 2021.

The aim of this report is to highlight the state of the art of blue sectors in Tunisia and the main challenges for the Sustainable Blue Economy and provide some recommendations to reach a sustainable, inclusive, and smart growth in blue sectors.

I.2. Sustainable Blue Economy Concept

The concept of Sustainable Blue Economy 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).

The communication starts from the premise that a dualism between environmental protection and economy is ineffective. Hence, it proposes a pattern shift: from 'Blue Growth' to a 'Sustainable Blue Economy'. In order to fulfil 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.

It is important to study the enabling conditions (Cisneros-Montemayor, 2019) for an equitable and Sustainable Blue Economy as mentioned in the following figure. Indeed, policymakers must engage researchers and stakeholders to promote evidence-based, collaborative planning that ensures that sectors are chosen carefully, that local benefits are prioritized, and that the blue economy delivers on its social, environmental, and economic goals. According to the European Commission (2020) (Sustainable Blue Economy, 2021), "the blue economy encompasses all sectoral and cross sectoral economic activities related to the oceans, seas and coasts". A blue economy approach must fully foresee and incorporated the impacts of climate change on marine and coastal ecosystems, impacts both already observed and anticipated.

After the Rio+20 conference (UNCSD, 2021), the Sustainable Blue Economy is seen as an ambitious framework for ocean management that needs to involve stakeholders, be managed in a goal-oriented approach and to account for the institutions in which stakeholders make choices.

It also foresees approaches to restore marine and coastal habitats, biodiversity and environmental status, during which innovation must support the development of cost-effective protection measures in support of an effective implementation of maritime, marine and coastal-related policies, agreements and international conventions like ; Marine Spatial Planning, Integrated Coastal Zone Management, RAMSAR, Barcelona and Black Sea conventions, the UN Convention on Biological Diversity, United Nations Framework Convention on Climate Change (UNFCCC) and the UN Convention on the Law of the Sea (Annex I).

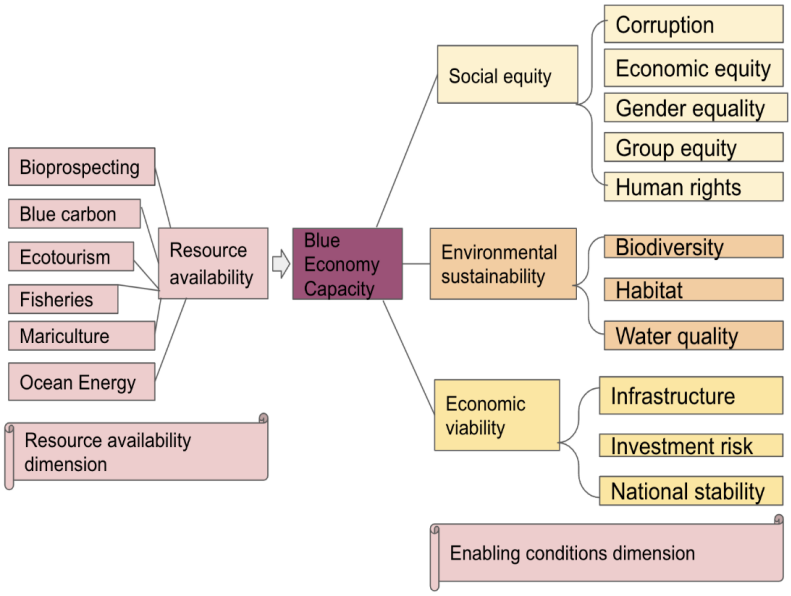


Figure 1. Dimensions and criteria used to evaluate the capacity to establish an equitable, sustainable and viable blue economy (Cisneros-Montemayor, 2019)

I.3. Blue Economy in the Mediterranean

The Mediterranean countries have engaged in making the best use of the potential of the blue economy associated with their shared sea to promote growth, jobs, and investment, while reducing poverty, safeguarding healthy and clean seas, and developing a clear vision for the sustainable and integrated development of marine and maritime sectors.

Cost-effective opportunities for countries to reverse the existing unsustainable production and consumption patterns and develop eco-efficient economies exist. The way in which goods and services are designed, produced, sold and consumed must be redesigned with the objective to drive the revitalization of industrial and socio-economic development; including Blue Economy relevant sectors; towards zero-waste, low-carbon, resource efficient and socially inclusive solutions.

To tackle this overall challenge, several international and regional organizations, including the Union for Med-iterranean (UfM), the United Nations Industrial Development Organization (UNIDO), the United Nations Environment / Mediterranean Action Plan (MAP), the Intern Mediterranean Commission (IMC) of the Conference of Peripheral Maritime Regions (CPMR), and the General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization (FAO) are closely collaborating. Thus, the environmental awareness in the Mediterranean is increasing.

I.4. Tunisia's Maritime Assets

Tunisia has many assets to excel in the Blue Economy. It has dominated trade in the Mediterranean and even in a good part of the east coast of the Atlantic for almost seven centuries. Tunisia is a reservoir of activities and jobs to be exploited. Indeed, it is an opportunity for technological innovations and training and a source of smart, sustainable and inclusive growth.

Tunisia's maritime area is high. It is about 135,000 $Km^{2,}$ 82% (Reconstruction of Marine Fisheries catches for Tunisia, 2021) of the territory. It is basically a second Tunisia (Fig. 2). It has quite varied maritime and port professions and the fishing fleet is active besides a highly developed seaside activity. The majority of foreign trade in Tunisia (95%) passes by sea, most of which with Europe. In addition, Tunisia has a fairly elaborate maritime regulatory framework based on the principles of international conventions in relation to marine and maritime activities. The sustainable development and exploitation of this maritime space constitute an opportunity for technological innovation, training and a source of smart, sustainable and inclusive growth.

However, despite those assets, a multitude of sensitive maritime areas with rich fishing potential must be protected and the maritime navigation traffic is very dense with potential risks of accidents and pollution. The maritime training and certification system is in accordance with international conventions and recognized by the European Union but needs upgrading. In addition, diverse maritime archaeological sites spread all over the coast can be better protected and valued.

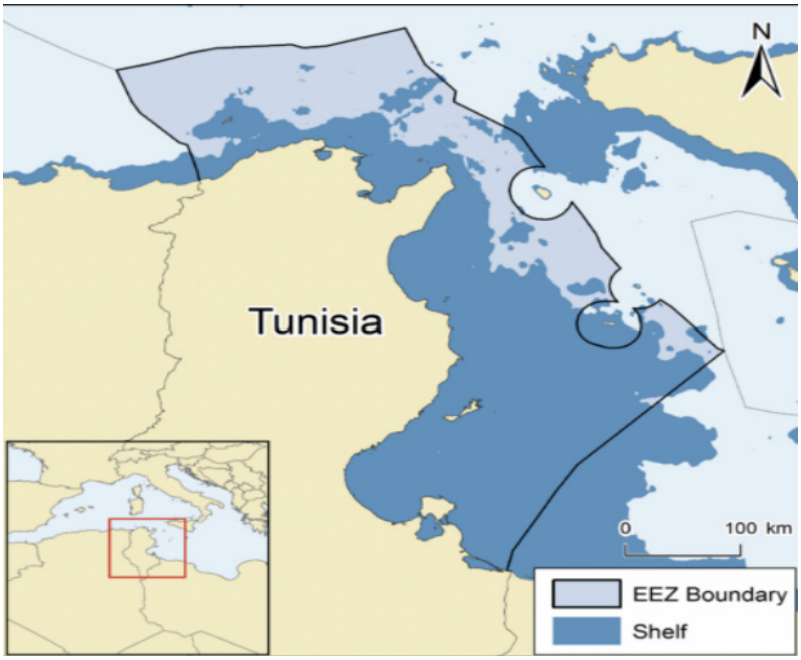


Figure 2. Tunisia's Maritime Space (PNUD, 2021)

I.5. Coastal Zone in Tunisia

The coastal zone of Tunisia is home to two-thirds of the total population (UNDPC: Tunisia, 2021). It is a densely populated area where the majority of the nation's large cities are found (*i.e.,* more than 1,000 inhabitants/km^2 in Tunis and Sfax against a national average of 57 inhabitants/km^2). The coastal region has a varied topography and an irregular 1 445 km of continental coastline extended from the North to the East, and 450km of island coastline.

Coastal wetlands are distributed among 100,000 ha of lagoons, 55,000 ha of Sebkha, 200 ha of estuaries, 31,000 ha of intertidal areas and 5,100 ha of coastal oases (World Bank Group, 2021). The coast of Tunisia has played a pivotal role in the countries' cultural and economic evolution. The diverse natural environment provides a wide range of services across a number of sectors. It is home to key public facilities (universities, high schools, schools, hospitals, telecommunication and transport infrastructures, port facilities) and supports the majority of industrial exploits for the country (textile, metallurgical and food processing industries, phosphate companies in the south).

For instance, as mentioned in the following figure, the Gulf of Gabes is considered as a biodiversity hotspot, however the coast and marine resources are facing intensive exploitation (Phosphate companies, Oil&Gas fields, Urban fabric, tourist area, solid waste, waste discharge from industries,...)

Overall, the coast houses more than 70% of economic activities, 90% (UNDPC: Tunisia, 2021) of the total capacity for tourist accommodation and a great part of the irrigated agriculture in the country. A recent global study by the World Bank identified Tunisia among the top 12 developing countries that are both highly exposed and vulnerable to coastal threats of Sea Level Rise (SLR). The study found that approximately 5% (APAL, 2015) of the population would be impacted by 1m SLR.

As mentioned before, the Tunisian coasts are subject to the continuous action of physical hazards (current, swell, tide...) which can be amplified by sea level rise (SLR) induced by climate change. A progressive retreat of the coastline is therefore expected. More than 3 000 hectares of urban areas are considered vulnerable and threatened by submersion due to SLR (Rapport mensuel, etap,2020). More than half of these potentially submersible lands are residential urban areas located mainly in the city of Tunis and in the city of Sfax. The vulnerable zones also include 781 hectares of industrial zones located mainly in Tunis and Sfax, and 560 hectares of tourist zones largely located on the eastern side of the island of Djerba (Rapport mensuel, etap, 2020).

Within a total of 2,290.12 km of coastline (continental, lagoon and island), Tunisia has only 570 km of sandy beaches suitable for swimming. Tunisia has already lost more than 90 km of beaches due to erosion or due to the construction of artificial defense structures. Of the 570 km of existing beaches, 190 km are very degraded and may disappear.

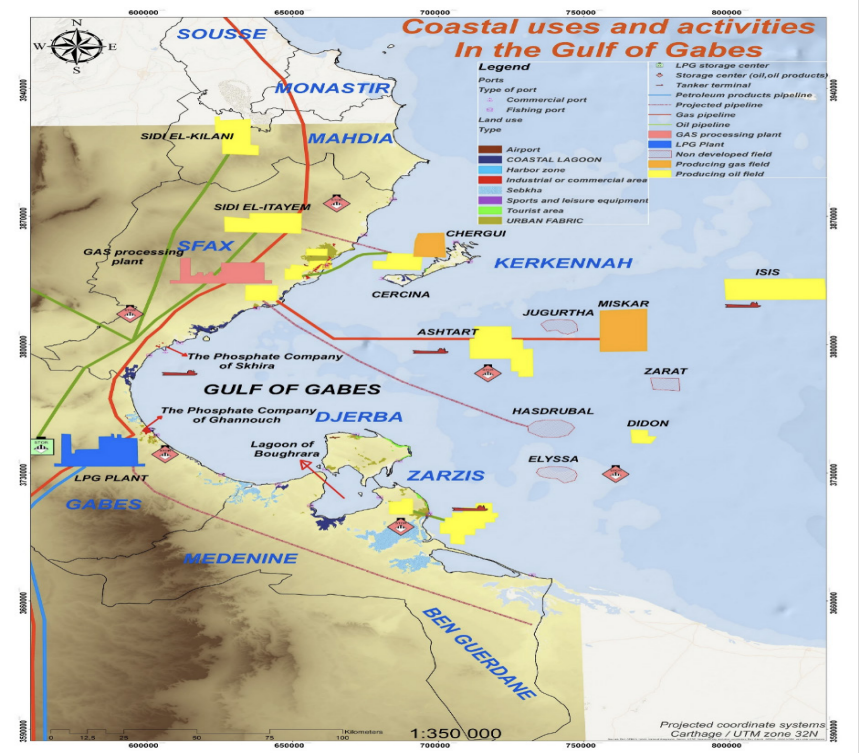


Figure 3. Coastal uses and activities in the Gulf of Gabes (Neji, 2021)

II. Established Sectors

II.1. Introduction

The main activities established in Tunisia or called as traditional ones are Fishing & Aquaculture, the Offshore Oil & Gas industry, Maritime Transport, Maritime and Coastal Tourism, Mineral Extraction, Submarine Cables, Maritime Defense.

As the COVID-19 pandemic stretches into 2021 and in a context of heightened socio-political unrest, Tunisia's growth and fiscal outlook is weaker than before. The recovery will require more stability and a joint national effort to steer the economy to the right path.

Real GDP contracted by 8.8% in 2020 as sharp declines in domestic and external demand followed the pandemic (O'Neill, A. 2021). With a 9.3% contraction, manufacturing, a mainstay of the Tunisian economy, was deeply impacted. An 80% decline in passenger arrivals also caused a downturn in tourism and transport (World Bank Group, 2021). Notably, business pulse surveys indicate that almost a quarter of formal firms (23.6%) (O'Neill, A. 2021) mainly in the services sector, were either temporarily or permanently closed by the end of 2020. This has a ripple effect on unemployment, which stood at 17.4% by end 2020, compared with 14.9% pre-pandemic.

According to the following diagram the public services were the leading contributor to the Tunisian gross domestic product (GDP) with over 7.2 billion U.S. $ as of 2019 (JORT n° 80 du 6 octobre 1995).

Trade, hotels, and restaurants were the second major contributors, as they yielded over 5.6 billion U.S. dollars. In addition, 5.2 billion US. dollars also came from manufacturing industries (O'Neill, A. 2021). The returns from agriculture, transport, as well as other services also made over 12.5 billion US. dollars of the GDP. The building and construction industry, in addition to electricity, gas, and water supply were the least contributors, as total returns from those sectors were estimated at slightly over one billion U.S. dollars.

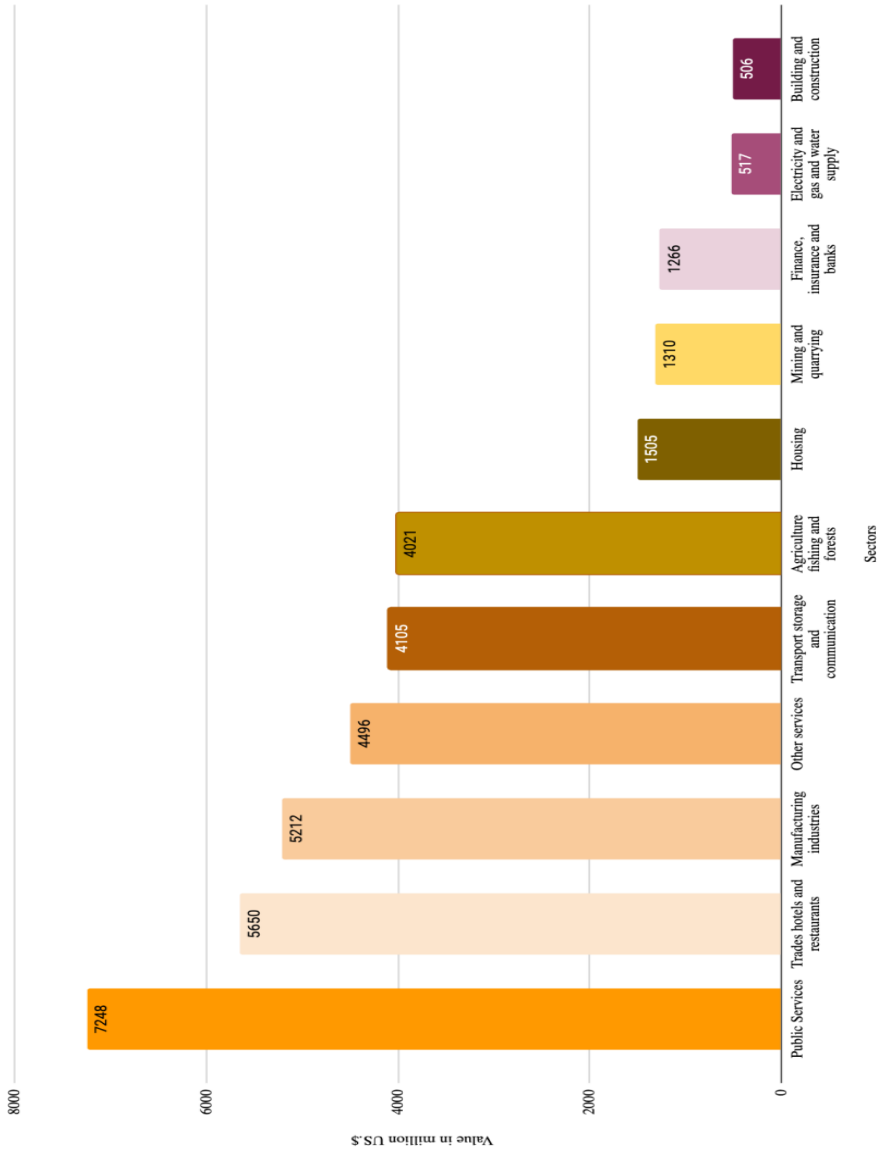


Figure 4. Sectors contribution to Tunisian GDP in 2019 (Saleh M., August 2021) – Compiled by Neji 2022

II.2. Marine living resources: Fisheries & Aquaculture

II.2.1. Description

As part of the established activities of the blue economy and in addition to its economic weight as well as its significant contribution to the trade balance, the fishing and aquaculture sector is one of the important socio-economic sectors. The Tunisian seabed is divided in terms of fishing activities and availability of fishery resources into three large, demarcated areas, under the provisions of article 4 of the order of the Ministry of Agriculture and Fisheries of September 28th, 1995 (JORT n° 80 du 6 octobre 1995) in:

- An area located in the north of the country, between the Tunisian-Algerian border and the parallel passing by the Borrj Kélibia lighthouse, characterized by a tormented relief and by a deep and often rough sea recognized as being underexploited.
- Then, a central fishing area made up mainly by the Gulf of Hammamet recognized as moderately exploited and extends from the Borj Kélibia lighthouse to the Borj Kapoudia lighthouse.
- Finally, a southern area characterized by a great fishery wealth and a relief absent with a very extensive continental shelf its bottoms are generally sandy-muddy.

II.2.2. Fishing Ports in Tunisia

Throughout its coastline, Tunisia has an important port chain on which 41 ports are installed and managed by 'Agence des Ports et des Installations de Pêche' (APIP) (Saleh M., August 2021). There are 32 for the exercise of the fishing activity of which we can distinguish, 10 offshore ports intended for trawling, tuna fishing, fire, and coastal fishing.

The other 22 fishing ports are accommodating small trawlers with vessel monitoring systems, sardine boats and localized coastal boats. The last 9 fishing ports are with shelter dikes or landing sites, and they are artisanal fishing units.

These fishing ports illustrated on the following figure provide the services necessary for the fishing activity as well as the landing, distribution, and storage of more than 150,000 tonnes of fisheries products per year (Saleh, 2021).

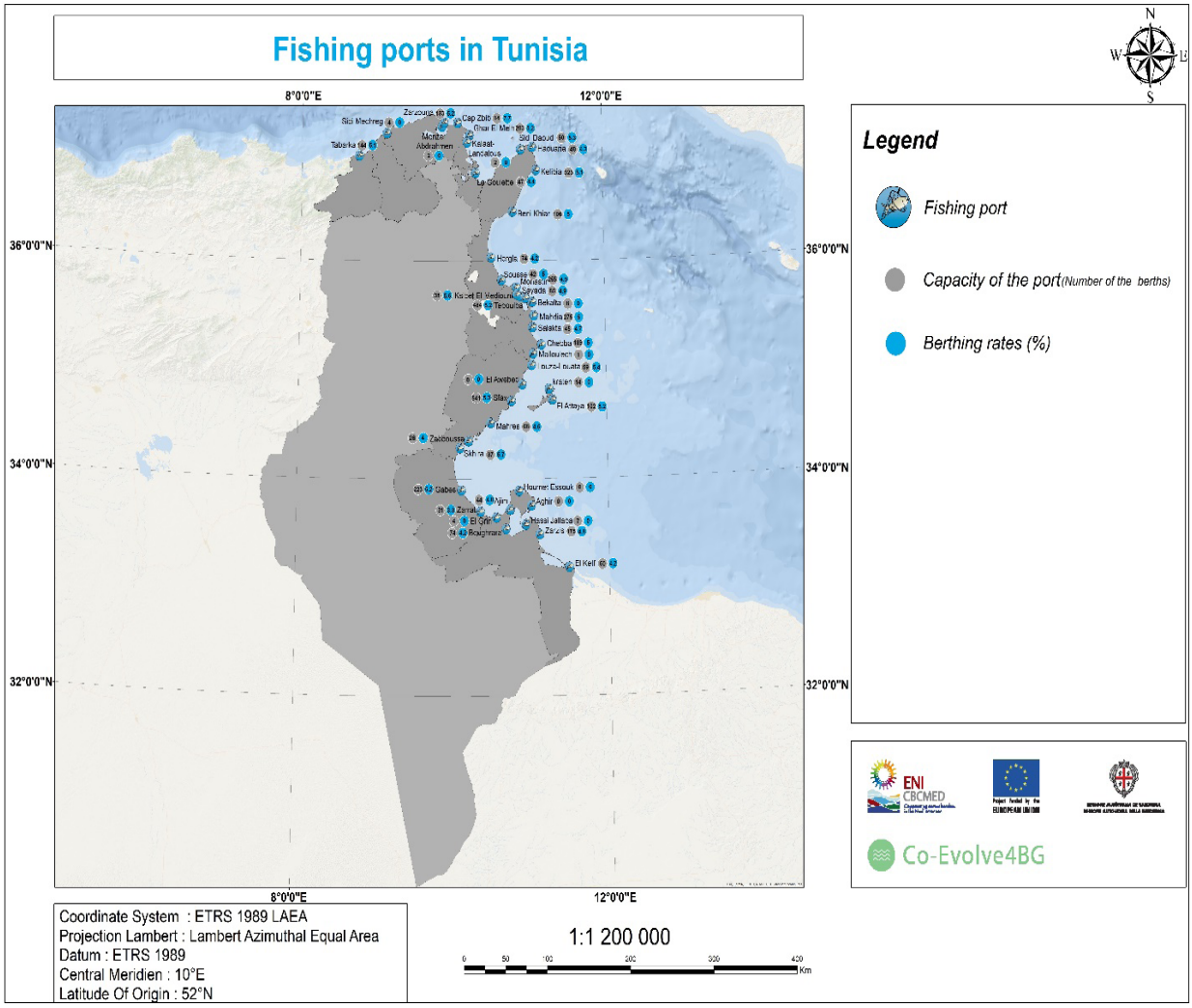


Figure 5. Fishing ports in Tunisia

II.2.3. Socio-Economic Weight

The fishing sector appears to be one of the most important sectors in the national economy representing 7% of the exports of the primary sector and offers about 50,621 direct jobs (Saleh, M., March 2021). As mentioned in the following figure, the contribution of the agriculture and fisheries sector to the gross domestic product (GDP) in Tunisia amounted to around 11.77 billion Tunisian dinars (roughly 4.24 billion U.S. dollars) in 2020 (Saleh, M., March 2021). The value slightly decreased compared to the previous year when it peaked at nearly 11.83 billion Tunisian dinars (4.26 billion U.S. dollars). From 2010 onwards, the value added of this sector generally increased.

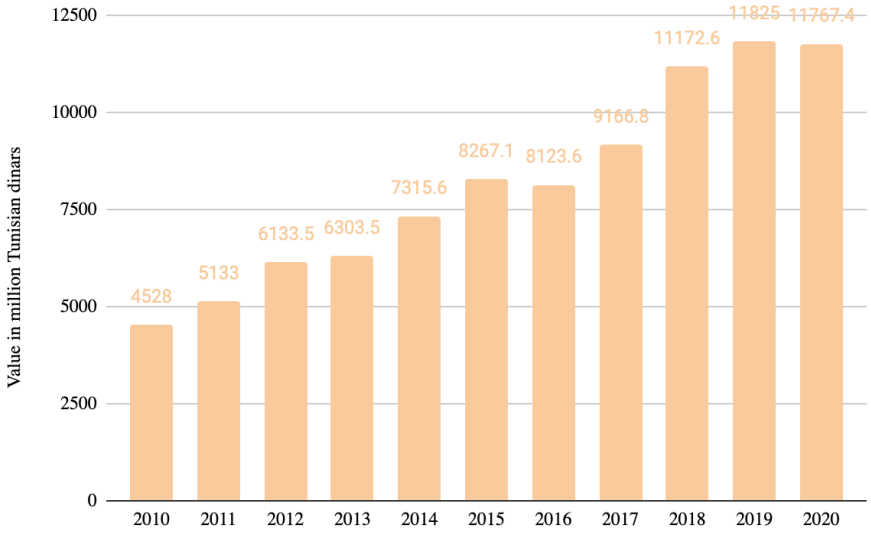


Figure 6. Contribution of the agriculture and fishery sector to the Gross Domestic Product (GDP) in Tunisia (Saleh, M., March 2021) – Compiled by Neji 2022

According to the following figure, fishing and aquaculture production was around 150,890 tonnes in 2019 (equivalent to 1,387,043,000 TD). The majority is produced in the seabed of the center and the south of the country from which we can distinguish several types of fishing practiced.

Three major types of fishing are practiced and present more than 80% of the national production. There are 54,558 tons for coastal fishing, and 21,753 tons for trawling and 47,592 tons for fire fishing, as well, other types of fishing such as tuna, sponge fishing, crustaceans, and shellfish (Tunisia Crude Oil Production, 2021).

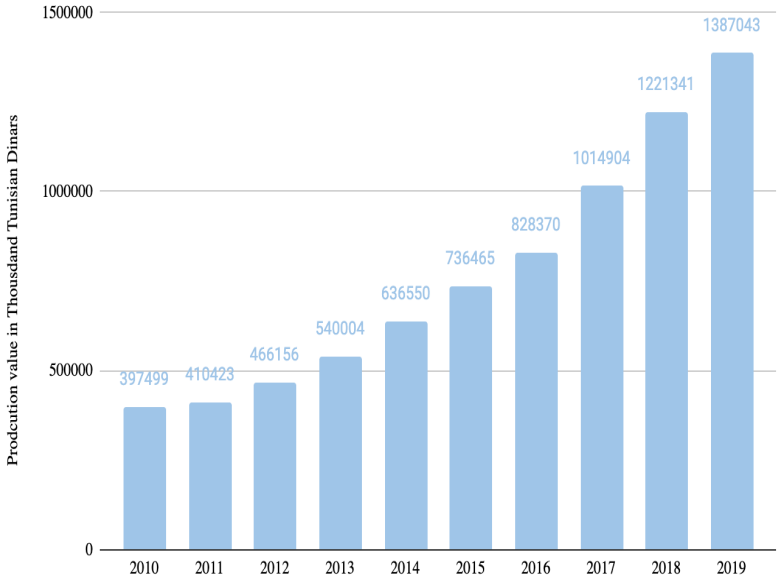


Figure 7. Production value of Fisheries & Aquaculture in Tunisia 2010-2019 (Saleh, 2021)-Compiled by Chaabouni, 2022

The Aquaculture sector makes a significant contribution to the food security and livelihoods of millions of people around the world. In Tunisia, the rates are considered low around 16% in terms of quantities of fisheries products and 1.76% in terms of direct jobs recorded in 2019 (Tunisia Crude Oil Production, 2021). The following diagram shows the evolution of aquaculture in terms of quantities per governorate during the last ten years.

The trade balance of the fishing and aquaculture sector recorded a positive surplus of the order of 226.9 million dinars in 2019 against 278.8 million dinars in 2018 and 131 million dinars in 2010 as indicated according to the following figure which shows the evolution of exports and imports of fishery products in terms of quantity and value over the last decade.

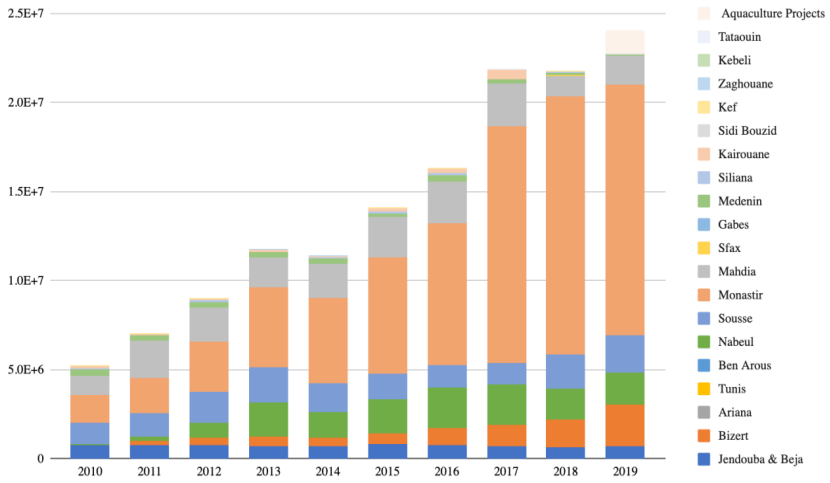


Figure 8. Evolution of Aquaculture production per governorate (Tunisia Crude Oil Production, 2021) – Compiled by Chaabouni, 2022

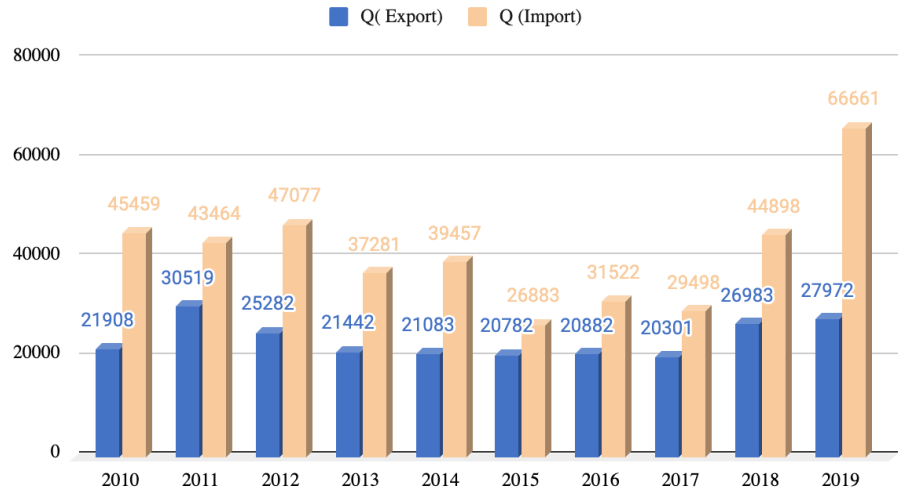


Figure 9. Evolution of the trade balance of the fishing and aquaculture sector in term of quantity (Tunisia Crude Oil Production, 2021) – Compiled by Chaabouni, 2022

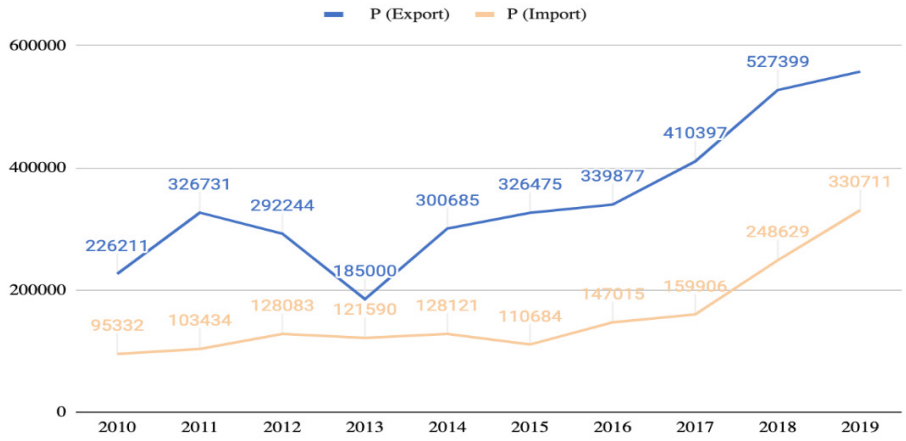


Figure 10. Evolution of the trade balance of the fishing and aquaculture in terms ofvalue (Tunisia Crude Oil Production, 2021) – Compiled by Chaabouni, 2022

II.2.4. Interaction with Other Sectors

Before addressing the interactions of the fisheries and aquaculture sector with other sectors, the intra-sectoral relationship is characterized by the emergence of conflicts of interest between these two activities. In fact, fixed aquaculture nets are distributed along the coast, in fishing ports and in marine areas. Less than 500 m from these fisheries, the exercise of fishing is prohibited by regulation (Decree of the Minister of Agriculture of September 28th, 1995, regulating the exercise of fishing, article 25, paragraph 2). Indeed, the maritime areas where those nets are located present a favorable environment to attract marine species which concentrate around due to the abundance of food.

The fishermen claim their right to fish near these nets, especially those practicing traditional fishing. In addition, once fixed aquaculture nets do not meet the necessary depth and technical requirements; they can generate pollution and affect the marine environment as water currents do not circulate properly in this area. They cause a concentration of fish droppings and other food on the seabed.

In addition, the fishing area is exposed to significant land-based pollution pressures generated mainly by industrial, domestic, and agricultural discharges. This negatively affects the quality of water in marine environments and consequently the development of fisheries wealth. Nevertheless, the activities linked to the maritime space are numerous and can compete in the coastal zone such as maritime transport, coastal tourism as well as recreational fishing activity which depends on the same resources as coastal fishing.

II.2.5. Climate Change Impact

The sustainability of fishing practices (foot-fishing, Charfia fishing) is threatened by sea level rise. Indeed, these types of fishing are practiced on the foreshores which may migrate inwards and therefore see their surface decrease. Inshore fisheries are also threatened, especially on Kerkennah Island. From a social point of view, SLR would affect the entire population of Kerkennah (15,500 inhabitants) for whom the only source of income comes from the sea (coastal fishing and sponge fishing).

Moreover, human activities have already degraded ecological habitats on the Tunisian coastline. These degradations are likely to increase with SLR, the water warming and the increase of its salinity. Ecosystems' degradation could be accompanied by a proliferation of invasive alien species, as already observed for the blue crab *Portunis segnus*, the Atlantic tropical crab *Libinia dubia* and the false Red Sea shrimp *Erugosquilla massavensis* which threaten the fish and seafood richness, as well as the fishing activity.

II.2.6. SWOT analysis of Fisheries & Aquaculture Sector

According to experts and from the above, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the Aquaculture & Fishing sector regard to the opportunities and threats generated by the external environment.

Table 1. SWOT analysis for Fisheries & Aquaculture

Strengths	Weaknesses
The coastline stretched over 2290 km on the Mediterranean Sea characterized by significant biological diversity.	Limited administrative framework, so efforts are scattered.
The port chain includes 41 fishing ports (150,000 tons/year).	The legislative and regulatory framework seems inadequate to the needs of the fishing and aquaculture sector.
Exports of diversified fishery products deemed of good quality for significant values in foreign currency.	Low allocation of human and financial resources to ensure governance of the sector.
Large maritime fleets.	Poor port infrastructure and equipment
Movement control system for vessels over 12 m (VMS).	An imbalance between port services
Existence of a public company for the management of ports (APIP).	Poor sanitary control of ships and the quality of products landed.
	Increased demand for fish, increased competition for maritime space.
Opportunities	Threats
Adoption of new management approaches such as integrated management of maritime and coastal areas.	Spread of pollution from ships
Adoption of the policies that consider the effects of climate change.	Degradation of biological diversity and the marine environment
Integrate the sustainable development approach into the management of fishing activities.	The concentration of two-thirds of the population on coastal areas is threatens both the coastline and the marine environment.
Guarantee competitiveness to maintain and promote exports of fishery products.	The profitability of aquaculture projects is considered low, and this is accentuated by the reluctance of investors.
	Biodiversity loss and invasive species.
	Climate change.

II.3 Marine Non-Living Resources: Offshore Oil and Gas

II.3.1. Description

The offshore energy sector, in particular the offshore oil and gas industry, is considered one of the maritime activities strongly linked to the blue economy approach. In 2020, we can identify 58 concessions for the exploitation of hydrocarbon deposits which in turn are divided into 41 onshore and 17 off-shore fields, 9 of which are already in production (Rapport mensuel, etap, 2020).

Offshore companies account for a small share of the private businesses in Tunisia. In 2019, the number of offshore enterprises in the country amounted to around 31 thousand, compared to the over 751 (Tunisia natural gas revenue, 2021) thousand onshore companies. For both types, the number of businesses has generally increased since 2003.

Since independence, the oil and gas industry in Tunisia has evolved gradually during three remarkable periods and this especially after the discovery of the biggest oil field of El Borma in 1964. The first period extended until the middle of the 1980s and is characterized by a positive trade balance surplus making it possible to finance several infrastructure projects.

Thus, the country's energy policy has been oriented towards an ultimate objective, namely the establishment of a national company to manage oil assets in order to increase its active and direct participation in research, exploration and development work.

As a result, the Tunisian Petroleum Activities Company (ETAP) was created in March 1972 and was entrusted with the management of the hydrocarbon sector under the supervision of the Ministry in charge of Energy, currently called the Ministry of Industry, Energy and Mines. Then, and until 2010, a new phase was triggered and was characterized by findings less significant than those previously detected. Thus, the state policy has been oriented towards the development of marginal deposits and the promotion of natural gas exploration. In addition, a recorded growing demand for national consumption of natural gas was noticed. Nowadays, the government has agreed to the need to adopt renewable energies as alternative energies.

II.3.2. Economic Weight

II.3.2.1. Oil Field

At the end of 2020, national oil production (including condensate and primary LPG) amounted to 1,676 kt (equivalent to 1,726 ktep), recording a decrease of 8.7% compared to 2019. Indeed, oil production has experienced a downward trend since 2011 which manifests itself in the decrease in the daily average which went from 35.4 thousand barrels/day at the end of 2019 to 32.9 thousand barrels/day at the end of 2020 against 40.6 thousand barrels/day in 2018 (Tunisia Crude Oil Production, 2021).

It should also be noted that this decrease is explained by the natural decline at the level of the main oil fields namely El Borma (-22%), Cherouq (-43%), Hasdrubal (-13%) and Miskar (-16%) as well as the closing of the El Kamour sluice gate for more than 3 months, following social demands from the population of the regions producing petroleum assets, thus causing the gradual reduction or even the cessation of production in several fields in the south of the countries according to their storage capacities.

Nevertheless, the oil production of the first two months of 2021 recorded a significant increase which amounted to 321 kt against 271 kt recorded at the end of February 2020. This in particular due to the contribution of the Halk el Manzel (offshore) field

which comes from enter production since January 07, 2021 (Associated Gas Utilization Report for Tunisia, 2021).

The following diagram shows that the Crude Oil Production in Tunisia decreased to 38 thousand barrels /day in June from 39 thousand barrels / day in May 2021 (Associated Gas Utilization Report for Tunisia, 2021).

According to the following diagram, there are fluctuations in oil revenue per percent of GDP (Tunisia oil revenue, 2021). In 2012, it was 5.02% and it decreased to reach 1.71% in 2019. This is mainly due to political instability.

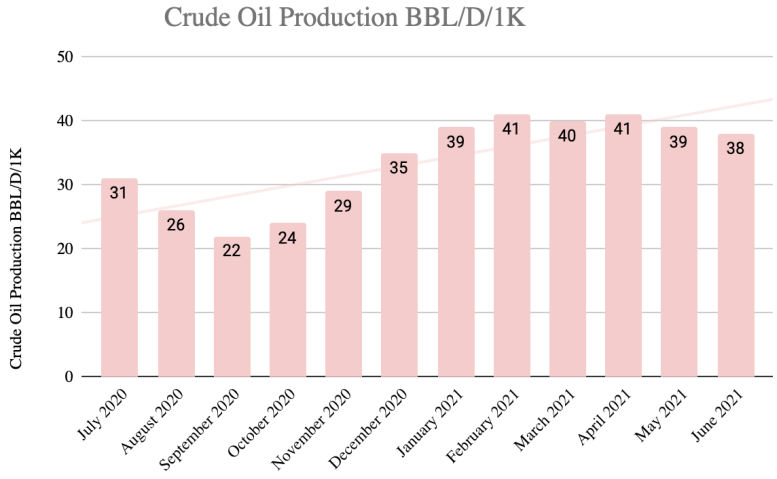


Figure 11. Crude oil production in 2020 and 2021 (Associated Gas Utilization Report for Tunisia, 2021) – Compiled by Neji, 2022

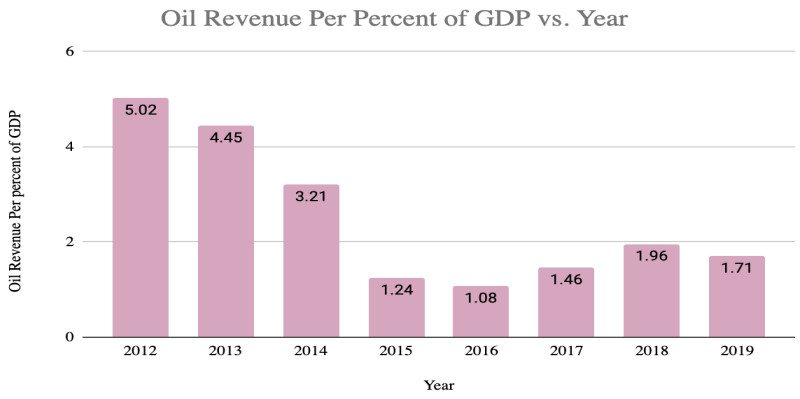


Figure 12. Oil revenue minus production cost percent of GDP in Tunisia (The Regional Action Plan on SCP in the Mediterranean, 2021) – Compiled by Neji, 2022

II.3.2.2. Natural Gas Field

The production of natural gas, including the gas royalties collected on the trans-Mediterranean gas pipeline allowing the export of natural gas from Algeria to Italy via Tunisian territory, has experienced a downward trend since 2010 (Tunisia natural gas revenue, 2021). Quantities produced amounted to 2,176 ktep recorded at the end of December 2020 against 2,030 ktep in 2019 and those of the order of 3,903 ktep recorded in 2010. Within North Africa, Tunisia's natural gas production is poor, especially compared to its neighboring countries Algeria and Libya, which rank among the leading natural gas producers in the African continent.

The limited production capacity in Tunisia does not allow for meeting domestic demand. With natural gas consumption being approximately three times higher than the local supply, the country relies on the imports of this commodity.

The following diagram highlights that the production volume of natural gas in Tunisia was 195.4 thousand cubic meters in March 2021. This represents an increment compared to the previous month. In the period examined, natural gas production in the country reached the lowest levels at approximately 137.7 thousand cubic meters in September 2020 (Tunisia natural gas revenue, 2021).

According to the following diagram, there is a fluctuation in the Natural Gas revenue, percent of GDP. In 2012, the revenue was 0,69% of GDP and in 2019 it decreased to 0.19% of GDP (Ecotourism and artisanal fishing in Kerkennah, 2021).

It should be noted that from January 07, 2021, the offshore oil field Halk el Manzel entered production with a considerable daily average attenuating 40.3 kt representing approximately 12.5% of the total oil production recorded at the end of February 2021 (Tunisia natural gas revenue, 2021).

In 2021, 10 offshore fields are respectively in production (Ashtart, El Bibane, Halk el Manzel, Hasdrubal, Miskar, Cercina/sud, Chergui, Baraka and Maamoura), five under evaluation (Ras el Beach, Cosmos, Birsa, Yasmine and Zelfa) and two in suspension (Didon has been on temporary shutdown since December 13th, 2017 following technical and economic problems as well as the ISIS field has been shutdown since 2006 and awaiting reassessment for its production (Tunisia natural gas revenue, 2021).

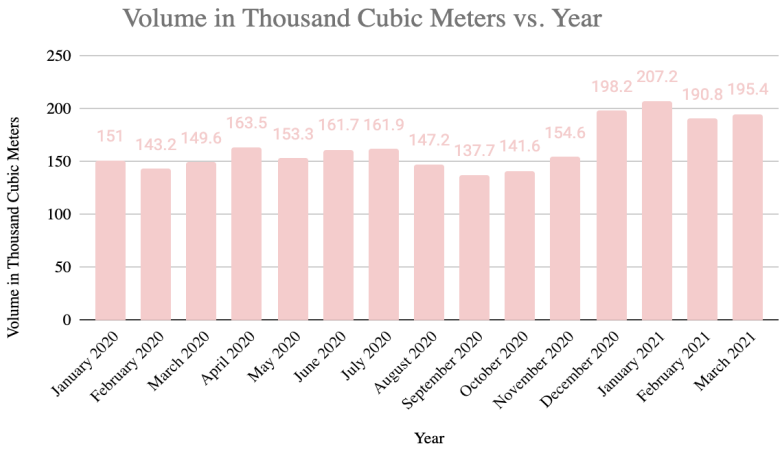


Figure 13. Monthly production volume of natural gas in Tunisia 2020-2021 (Ecotourism and artisanal fishing in Kerkennah, 2021)

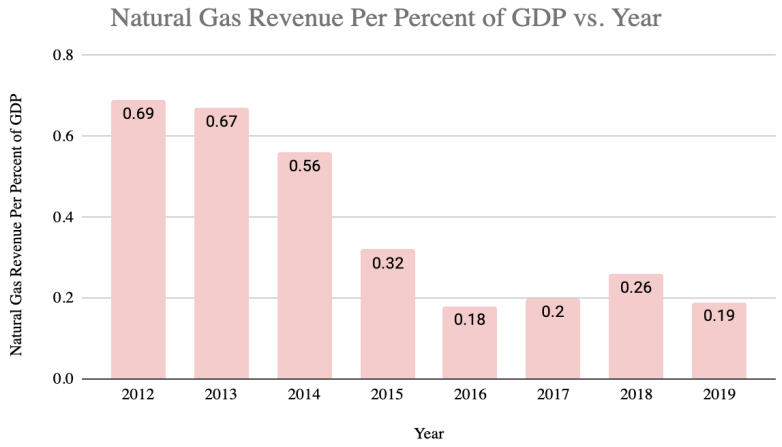


Figure 14. Natural Gas revenue % of GDP (Ecotourism and artisanal fishing in Kerkennah, 2021)

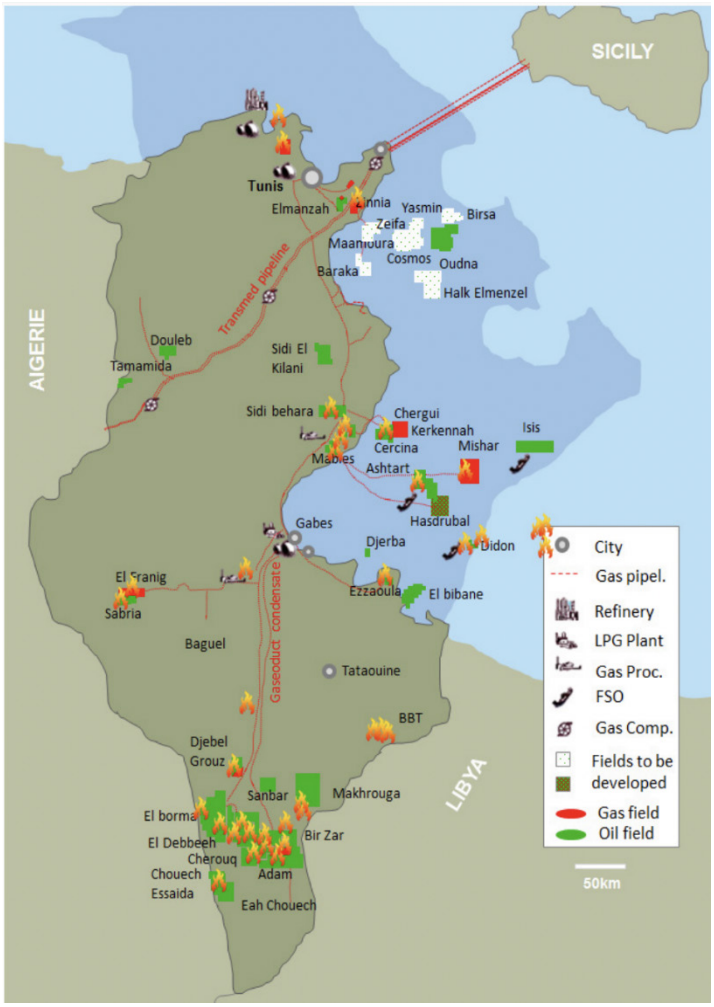


Figure 15. Major Oil & Gas field (Associated Gas Utilization Report for Tunisia, 2021)

II.3.2.3. Interaction with Other Sectors

The environmental impacts of the exploration and exploitation of hydrocarbons have shown major consequences on the marine environment. For example, in 2010, an oil spill occurred in a pipeline from an offshore oil field on the north coast of the Kerkennah archipelago.

According to the report published by 'Plan Bleue' in 2014 on the socio-economic assessment of maritime activities in Tunisia, the oil spill from the damaged pipeline created marine pollution that affected both the marine environment, including fisheries fixed at shallow depth, and the coastal zone by the propagation of the oil spill over at least 17 km along the coastline (The Regional Action Plan on SCP in the Mediterranean, 2021). This pollution has caused heavy losses on fishing activity and on fishermen who are severely impacted and a deterioration of the ecosystems of this maritime area.

Thus, the cost of the degradation of the environment on the coasts of the island of Kerkennah is estimated at around 2,737,200 dinars including 1,395,000 dinars for the decontamination of the marine environment and the cleaning of the beach. About 702 000 dinars are estimated in economic loss for fishermen and around 640,200 dinars for the surveillance and environmental monitoring work carried out by the ANPE (Meddeb, S.,2014).

In addition, the maritime areas in the Mediterranean have been devoted for a very long time to the exercise of fishing and the tourist industry. As well Just as this closed sea constitutes maritime routes to ensure the merchant traffic.

According to a report published by WWF in 2015 on Blue Growth facing the challenge of good ecological status in the Mediterranean, it turned out that conflicts of interest may have arisen due to the fact that of the installations of the oil industry and offshore gas (WWF, 2015). It can occupy maritime spaces which affect the marine environment, not only by the pollution caused by the discharge of chemical discharges but also by the intense seismic and sound effects during exploration and exploitation which have an inimical impact on maritime species.

Thus, these hydrocarbon exploration and exploitation projects, despite their economic contribution, come up against opposition from civil society, in particular associations for the protection of the marine environment.

II.3.2.4. Climate Change Impact

Increasing temperatures and the increased frequency and intensity of aridity and drought are expected to further increase energy demand. Changes in demand are likely to be through the expansion of peak-hour patterns, air conditioning intensity needs and the increased need for water desalination (used in processing and station cooling).

The existing infrastructure and generation capabilities in Tunisia are ill-prepared to cope with the projected effects of climate change and the increased demand. Existing energy systems are at risk of system failures and expanded energy outages.

Additionally, the projected decrease in precipitation and change in seasonal rainfall patterns are likely to reduce hydropower generation potential as well as the potential for revenue loss due to overbuilt hydropower, which may be under supplied. Increased evaporation rates from existing water storage facilities will also increase production costs, resulting in increased prices for consumers. Increased temperatures and changing rainfall patterns may also alter the seasonal demand for energy, increasing demand during peak loads with a projected increase in net electricity usage. While Tunisia has planned to increase its renewable energy consumption by up to 30% by 2030, infrastructure and investment have to keep pace with these goals.

II.3.2.5. SWOT Analysis for Oil & Gas field

From the above and experts' opinion, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the Offshore Oil & Gas sector with regard to the opportunities and threats generated by its external environment.

Table 2. SWOT Analysis for Oil & Gas Field

Strengths	Weaknesses
- There is a public company that has been entrusted with the management of the hydrocarbon sector (ETAP). - Discovery of major offshore and onshore oil fields in recent years. - Offshore production of oil and natural gas representing about more than 40% of total national production. - New exploration permits for potential offshore resources. - Framework for regional and international cooperation to develop the exploitation of potential resources.	- Poor energy balance, increased demand for energy. - Legislative framework requiring updating in view of the requirements of the blue economy approach. - Reluctance of investors in the oil and gas industry (high risk exploration and research cost). - Environmental degradation in regions producing petroleum assets, including the marine environment.
Opportunities	**Threats**
- Mediterranean cooperation and agreements in the management of the coast and the maritime domain. - Adoption of short- and long-term renewable marine energies including offshore wind turbines, wave power, tidal and thermal energy, designating a set of technologies that exploit the different forms of energy contained in the seas. - To have new energy sources with low carbon emissions. - Regional and international cooperation in environmental protection. - International treaties.	- Political instability. - Climate change. - Fluctuating prices for commercial oil and gas. - Competition at the level of the countries bordering the Mediterranean at the level of valuation of primary energy resources. - Decreased foreign investment in research and exploration work for the oil and gas industry. - Legitimate economic and social demands of the citizens of the regions producing oil assets.

II.4. Traditional Non-living Resources

II.4.1. Description

The nearshore and offshore areas of the Tunisian coastal zone constitute a vast storehouse of many minerals. Presently and in the immediate future, only some of these may be recovered, as the present level of science and technology in the country cannot make it feasible and economical to expand the range of mineral extraction.

In the meantime, large quantities of sand and gravel are being quarried from the inner shelf and nearshore areas, particularly around the Island of Djerba, and in the northern

shores of the Gulf of Tunis. We should note that the government has prohibited taking sand from beaches in Tunisia since the 1980s.

The rapidly growing exploitation of this resource in these areas is mainly due to environmental constraints for its extraction on land. Some of the minerals are dissolved or suspended in seawater. Salt, potash, magnesium, and bromine are being extracted now on a large scale and sea water will obviously continue to be an excellent source of these minerals.

Large quantities of high-quality marine salt are being produced along the coast, a substantial proportion of which is exported, thus participating in providing foreign currency for the country. Lately there has been a new announcement that can play a pivotal role in this sector, mainly in Salt extraction. The government officially notified the "Compagnie Générale des Salines de Tunisie" (Cotusal) on February 27 of its decision to not extend the agreement which allowed the subsidiary of the French Group Salins to benefit from extremely low operating tariffs.

Tunisia hosts two geological types of salinas: coastal and inland salinas. The nature of each type of salt is the source of an important ecological and biological diversity. The salt works are protected by the Ramsar convention (convention adopted since February 1971 and relating to wetlands, particularly as habitats for water birds). There are 2331 sites protected by this convention worldwide, of which nearly 40 are located in Tunisia.

II.4.2. Economic Weight

The Tunisian Salinas reveal a great biological richness in particular at the level of the ornithological component. This wealth could offer the opportunity of an economic development complementary to the production of salt by the development of eco-tourist activities.

Salt production in Tunisia has for years been able to meet the local demands and export to other countries (Kacem, 2018). Indeed, the production of salt is estimated at 1.5 million tons annually, 90% of which is for export. About 30 companies operate in the salt sector, offering 665 jobs and 26 of which (430) are filled by COTUSAL (Tunisia tourist, 2021).

COTUSAL carries out nearly 30 million dinars in turnover with an annual production of 1 million tons of salt (out of 1.5 million tons extracted in total in the country), of which 750,000 tonnes are intended for export. The annual production of sea salt by COTUSAL represents 70% of the salt produced in Tunisia. It is clear that the exploitation of sea salt in Tunisia is a national wealth from the moment. It is a wealth produced by resident factors of production, namely companies' resident in the territory (Tunisia tourist, 2021).

The following diagram illustrates the value of exports of commodity group 2501 Salt. It includes table salt and denatured salt and pure sodium chloride, whether or not in aqueous solution or containing added anti-caking or free-flowing agents (Kacem, 2018).

There are fluctuations in salt export revenue. Salt export revenue decreased from 241,783,340 US$ in 2010 to reach 182,126,004 US$ in 2019. This is due to the Political instability.

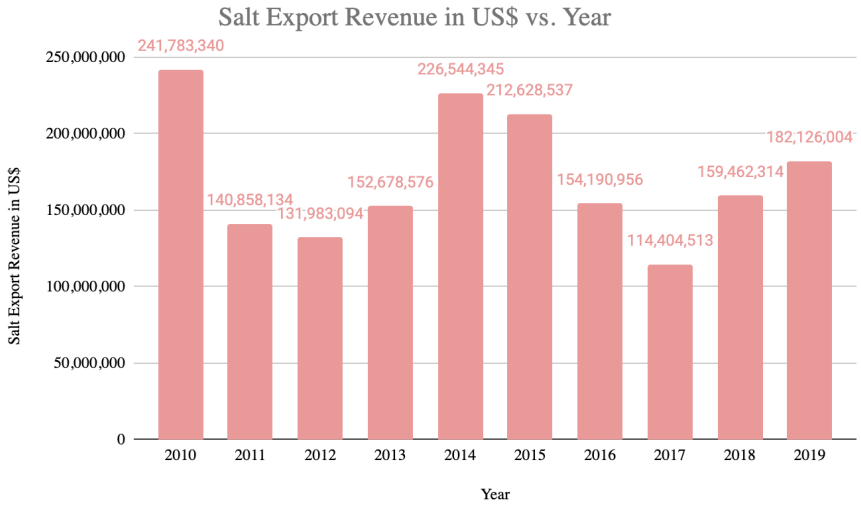


Figure 16. Salt exports value in US $ from 2008 to 2019 (Kacem, 2018) – Compiled by Neji, 2022

For instance, in Sahline city, the expanse of salt marsh is made up of communicating basins, fed with water from the sea approximately a km away. This saltmarsh languishes under the blazing sun, at an unchanging rhythm to end in a salt castle in the order of 400,000 tons per year. About half of this salt is exported from the port of Sousse.

Thus, with an area of approximately 10 km², dedicated to this activity, the output of the solar energy fountain debits 3,750 kW/year per m² and only 400,000 tons of salt are extracted from it.

It was an exploit dating from the middle of the twentieth century, with the old techniques, when the population of Tunisia was numbered at 1/4 of the present day and its level of consumption at 1/10 of that today.

It is important to note that with the prodigious technical progress of this century, the annual potential production to be drawn from this 10 km² open-air ecolo-solar field, via a solar power plant, would be expected as follows:

- Fresh water: 600 million m³, twice the annual production of 'Société Nationale d'Exploitation et de Distribution des Eaux' (SONEDE). With this water, SONEDE will be able to improve both the quality of the drinking water distributed, as well as the quantity supplied.
- Salt: 18 million tons, 10 times the national production of this product.
- Green electricity: 2,500 million kW, 1/5 of the current national production.
- CO2 avoided: 2 500 million tons, quota negotiable according to the Kyoto agreements at around 40 euros/T.
- Jobs generated: the injection of this additional contribution of 15% of water from our renewable resources will allow the creation of no less than 30,000 permanent jobs.

II.4.3. Interaction With other Sectors

Sand removal from beaches will reduce the erosion control capacity of sand dunes and consequently accelerate sea-level rise. Institutional transactions such as the non-implementing of environmental laws (interdiction of constructions on the Maritime Public Domain or interdiction of sand extraction) will enhance free-riding behavior of powerful actors like tourism entrepreneurs to annex parts of the public domain and so exclude local communities from getting benefits from recreation activities. Sand extraction will impact terrestrial biodiversity due to the impoverishment of the soil structure, which leads to yield reduction in farming systems.

II.4.4. Climate Change Impact

One response of saltmarshes to sea-level rise is a landward migration, such that the vegetation zonation is maintained relative to sea-level. If this upward progression is prevented by the presence of sea walls the marsh is said to be squeezed, and ultimately could disappear.

As sea-level rises the lower limits to the potential niche of each plant species moves upward and the expectation is that the upper species will disappear first and the pioneer zone species, those most able to cope with inundation, will disappear last. In addition, increasing temperatures associated with climate change could cause the birds to change their behaviour to depend to a greater extent on the marsh vegetation that could be available for less time because of sea-level rise. In addition, increasing temperature will have a negative impact on the workers who must work under hard circumstances to maintain their livelihoods.

II.4.5. SWOT Analysis

From the above and experts' opinion the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the fishing sector with regard to the opportunities and threats generated by its external environment.

Table 3. SWOT analysis for traditional nonliving resources

Strengths	Weaknesses
- Ideal conditions for salt exploitation - High demand in the international market - Salt is a national wealth	- Lack of funds - Lack of Technology - Fierce competition (China/India) - Lack of innovation and Capacity building
Opportunities	**Threats**
- Conventions between the Tunisian State and sea salt operators now are being subject to the provisions of article 13 (Tunisia's constitution in 2014). - Job creation - International treaties for climate change mitigation and adaptation (UNFCCC)	- Climate change - Sea level rise - Political instability

II.5. Maritime Transport in Tunisia

II.5.1. Description

Like all countries with a maritime vocation, maritime transport constitutes one of the important pillars to support the economic development of Tunisia, since around 98%trade is carried out by sea (Autorité Maritime – Office de la Marine, 2021). In fact, the total volume of goods passing through Tunisian commercial 41 ports amounted to 26.7 million tonnes in 2020 against 27.2 million tonnes in 2019, thus recording a decrease of around 2% (Tunisia tourist, 2021). Import traffic reached around 17.3 million tons in 2020 while export traffic registered around 9.4 million tonnes, down to 7% and 11% respectively from the values recorded in 2019.

Despite the efforts made, the various indicators of this sector have experienced a downward trend since 2010 which is manifested in particular by the decrease in the number of ships passing through Tunisian commercial ports.

This is mainly due to the intensity of competition in the Mediterranean that operators face in terms of cost and compliance with the safety rules for ships in transit, as well as the aging of most national ports and port facilities. They are not yet adapted to the progressive development of merchant ships, in particular in terms of tonnage, length, and depth of port waters.

As a result, the following diagram shows the evolution of the number of ships passing through the commercial ports each year compared to the base year 2010 of which we can clearly notice the deterioration of the activities of the commercial ports in terms of the number of ships having passed through Tunisia's commercial ports in recent years.

This significant fall mainly concerns most types of ships transiting through commercial ports (Tunisia tourist, 2021). In particular we notice the conventional ships, Ro-Ro, special ships and container ships, liquid and solid tankers and bulk carriers. Their decrease reached about 62% going from around 8,700 ships in 2010 to 3,300 ships in 2020. For cruise ships, their number has decreased from 1,728 ships in 2010 to between 0 and 1 ship registered during recent years. Their footprint is heavy on the maritime transport sector as well as on the tourism sector of the country.

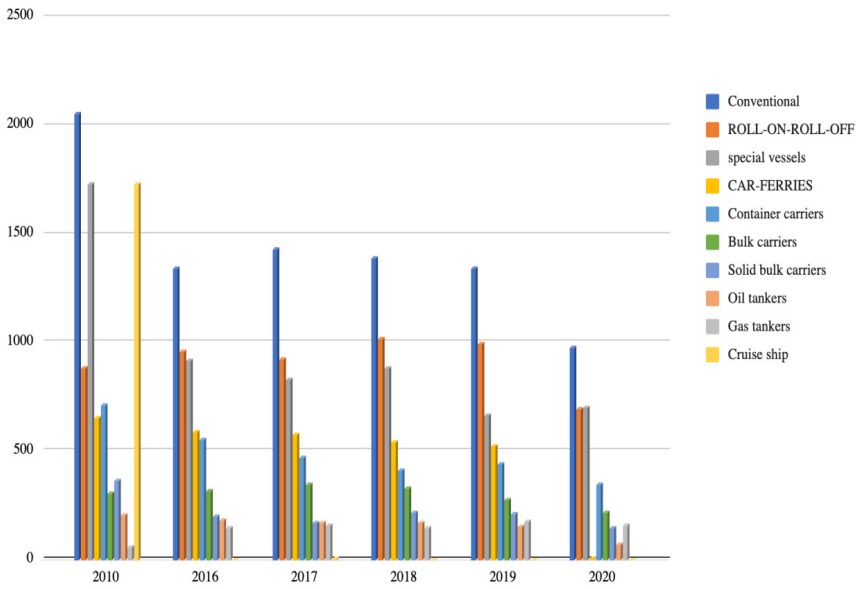


Figure 17. Number of vessels passing through commercial ports (Tunisia tourist, 2021) – Complied by Chaabouni, 2022.

II.5.2. Evolution of the National Merchant Navy Fleet

The national merchant navy fleet has experienced a remarkable decline, counting in 2021 six public ships managed by the Tunisian Navigation Company (CTN) unlike the 1980s when the national fleet numbered 38 ships and 21 ships in 1995. Since its creation in 1959, the CTN was entrusted with several strategic missions, namely, to ensure the maritime transport of passengers and vehicles as well as the transport of goods by towing or in containers on the regular lines connecting Tunisia particularly with the countries bordering the Mediterranean (Tunisia tourist, 2021).

Currently, its main mission is to manage the national maritime fleet which is made up of six owned vessels, of which we can distinguish two “Tanit” and “Carthage” car ferries for the transport of passengers and vehicles, and four Ro-Ro “Ulysses”, “Salammbo”, “Alyssa” and “Amilcar”, intended for the transport of goods and containers as well as a rolling ship chartered on time, together presenting a contribution to the transfer of national trade exchanges of about 11% against 21% recorded in 1995, which weighs heavily on the balance of payments and affects foreign exchange reserves because 89% of transport costs are thus paid in foreign currency (Lamparte, A., 2020).

Tunisia has eight commercial ports installed on the entire coast from the far north in Bizerte to the Libyan border at Zarzis, and whose management has been entrusted to the 'Office de la Marine Marchande et des Ports' (OMMP) under the supervision of the Ministry of Transport and Logistics in accordance with the provisions of Article 1 of Law No. 98-109 of December 28, 1998, which provides for the dual role of the OMMP to exercise the powers entrusted to the maritime authority and administration on the one hand and to the port authority on the other. In addition, its role also extends to ensuring the operation, maintenance, and development of commercial seaports, including the facilities attached to them, as well as to control port activities and provide port police inside commercial seaports.

As a result, the authority structures of the maritime administration include, at the central level, three directorates for the administration of ships, seafarers, and maritime safety while at the regional level, the structures of the maritime administration. The maritime authority is divided into 7 maritime regions, 3 districts and 19 maritime sub-districts.

With regard to the port authority, the port chain is made up, as indicated above, of eight commercial ports for which the OMMP is in charge of ensuring both in terms of time, cost and safety. and security. The handling of all vessels in transit and goods carried through commercial ports.

Thus, the following table presents the main commercial ports according to their specific maritime traffic characteristics.

Table 4. The main commercial ports according to their characteristics (Tunisia tourist, 2021) – Complied by Chaabouni, 2022.

Ports	Main traffic	Dock number (m)	Dock Length (m)	Pulling (m)
Bizerte Menzel Bourguiba	Hydrocarbon, Cement and Steel	12	1586	10.67
La Goulette	Passengers and cruise passengers	10	1870	9
Rades	Containers and Semi-trailers, Bulk Solids and liquids	11	1930	9.75
Sousse	General goods	7	795	8.5
Sfax	General cargo and chemical fertilizers	15	2250	10.5
La Skhira	Hydrocarbons and chemicals	3	450	15
Gabes	Chemicals and solid bulk	8	1725	11.88
Zarzis	Hydrocarbons and Sea Salt	5	875	8

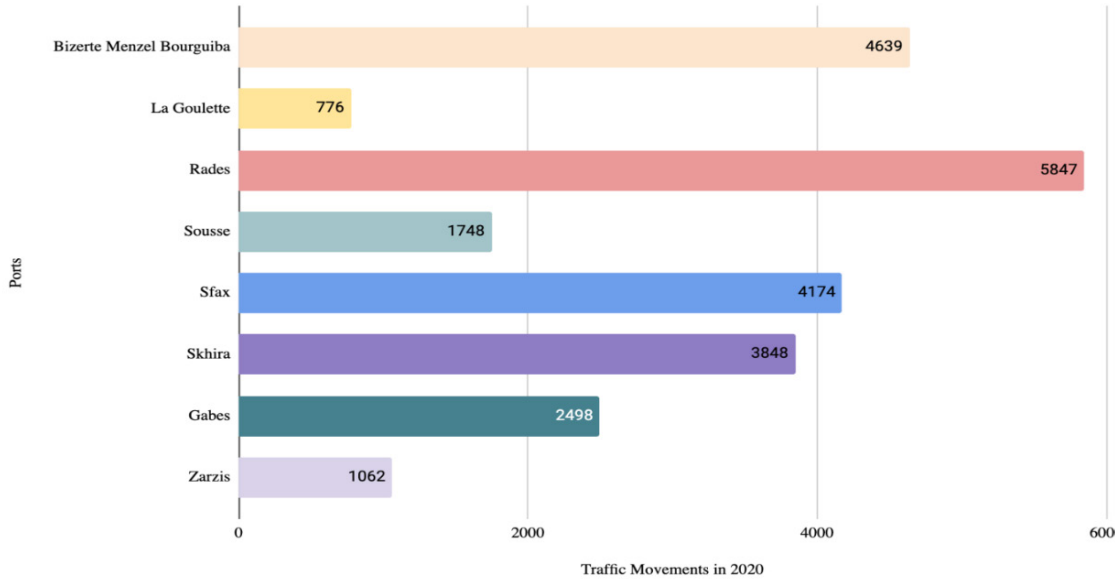


Figure 18. Traffic movements recorded at the end of 2020 (Tunisia tourist, 2021) – Compiled by Chaabouni

Depending on their characteristics, the following diagram shows the distribution of traffic movements recorded at the end of 2020 passing through the commercial ports in terms of the quantities of goods transported by each of the commercial ports. We can thus classify the port of Rades in first place as one of the most important commercial ports for the transport of containers, following the ports of Sfax, Bizerte and the port of Skhira dedicated to the transport of hydrocarbons and chemicals.

II.5.3. Economic Weight

As part of the activities related to the blue economy, maritime transport has contributed significantly to the country's economy, currently providing more than 6,000 direct jobs, and brings together more than 560 companies working in maritime trades such as shipping, transit, and port professions and so on (Tunisie, Ministére du Transport., 2021).

We can also identify more than 3000 companies whose activities depend on maritime transport which obviously ensures their movement of imports and exports of goods by sea.

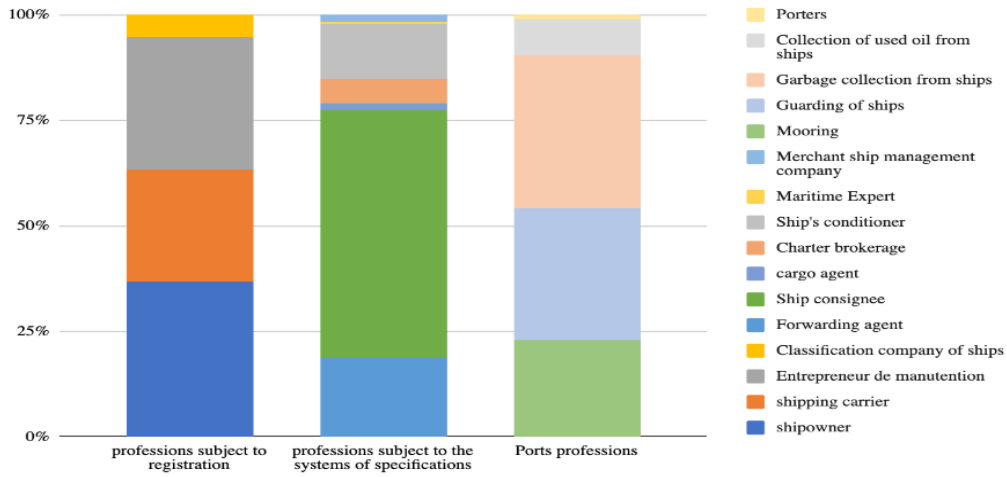


Figure 19. Professions with the Merchant Navy (Tunisie, Ministére du Transport., 2021) – Compiled by Chaabouni, 2022

II.5.4. Shipbuilding and Repair Industry

A country as Tunisia, facing one of the densest shipping routes in the world, is expected to earn annual revenue from naval repairs, bunkering, assistance and various logistical services of the order of two billions of dollars (Saleh M., 2021).

The shipyard of Menzel Bourguiba, nationalized in 1963, had largely contributed to the development of the young Tunisian state for three decades after the evacuation of Bizerte (Saleh M., 2021). In the absence of a maritime strategy, this valuable heritage was again granted to a foreign investor without collecting dividends apart from employment at the local level. This sector requires a special study to reclaim this site and to develop a global vision on the entire coastline in this very promising area.

The sector is focused on intelligent transport (energy performance, alternative fuels, safety, eco-design, autonomy) and industries that rely on its skills to go to sea (Kacem., 2018). In 2016, three countries built about 90% of the world's tonnage of ships – China, South Korea, and Japan. This concentration has only been confirmed for a decade. China continued to specialize in dry bulk and conventional transportation, Korea in container ships and Japan in oil tankers and dry bulk transport.

The shipbuilding trend remains on the rise, according to forecasts. In this regard it should be noted that the field of shipbuilding requires the use of a lot of labor, which explains the relocation to China mainly. With the evolution of the standard of living in China on the one hand and the rise of growth rates in Africa, Tunisia could easily position itself in this field on the African market given the very competitive costs and our fairly furnished industrial fabric.

II.5.5. Economic Weight

The shipbuilding and repair industries provide broad direct and indirect employment opportunities in various fields to absorb about 20,000 unemployed youth through retraining and on-the-job training for the most part, with the possibility of also to create other work opportunities through the creation of small and medium enterprises needed to activate these sectors (Saleh M., 2021).

The development in the field of construction, architecture, and naval maintenance in Tunisia in its three disciplines (trade, fishing, and yachting) and its impact on the national economy would be beneficial to the socio-economic needs of the country. Thus, there is a need to encourage foreign investors from developed and industrialized countries in the fields of shipbuilding and nautical industries to settle in Tunisia and take advantage of its strategic geographical position in the Mediterranean basin close to the main shipping lines in the world. Thus, it will offer better services and a much lower labor cost is used for the construction and the naval maintenance of merchant ships, war, trawlers and pleasure craft of foreign countries.

II.5.6. Interaction with other sectors

Pollution generated by maritime traffic seriously affects maritime and coastal biological diversity. In this context, conflicts of interest may arise with certain activities which occupy part of the marine space. We can cite the activity of tourism and fishing as well as fixed fisheries established along the coast or in the sea, and whose productivity and sustainability are closely linked to a healthy and clean marine environment. These activities with the facilities of the oil and gas industry and future off-shore wind farms that will be distributed at sea can in turn block the shipping lanes of merchant traffic.

II.5.7. Climate Change Impact

According to the World Maritime University, because ice continues to melt around the North Pole due to global warming, sea level is rising, coastal erosion is worsening, and sedimentation patterns are changing. These significant changes have largely impacted ship channels. Therefore, since existing routes are no longer as safe or easy to traverse as they were before, new courses have to be planned.

For instance, routing changes can be very inconvenient and deter productivity both for customer and shipping line because instead of continuing with their regular operations, shipping companies have to allocate time and financial resources on planning routes. In addition, sea level rise destroys port infrastructure. Indeed, port infrastructure is situated at sea level; so, when the water eventually rises drastically, the infrastructure will be submerged and destroyed. While it is vital to note that sea-level rise is quite steady and slow, its destructive nature is imminent.

II.5.8. SWOT Analysis

After presenting the current situation of the maritime transport sector in Tunisia and its impact on the economy of the country on the one hand, in particular on the balance of payments and on the marine environment on the other hand. We can summarize in the following table these results by applying the SWOT analysis to define the strengths and weaknesses of this sector with regard to the opportunities and threats generated by its external environment.

Table 5. SWOT Analysis for maritime Transport sector (Tunisie, Ministére du Transport., 2021)

Strengths	Weaknesses
- Strategic location of commercial ports along the Tunisian coast opens to important maritime corridors in the Mediterranean. - Significant participation of the maritime transport sector in terms of jobs (more than 560 companies and nearly 6,000 jobs). - Existence of a strategy for the development and rehabilitation of commercial ports based on the technical evolution of merchant ships. (Enfidha deep water port). - The existence of national public establishments responsible for naval traffic (CTN) and port management (OMMP).	- Limited national merchant fleet (4 freight vessels). - The shipbuilding industry is not developed. - Dependence on foreign carriers, low participation of Tunisian carriers in maritime trade. - Negative balance of payments (89% of maritime transport costs are remunerated in foreign currencies). - Aging ports, including port facilities, given the significant evolution of international ships. - Important legal framework but needs some updates to adapt to the requirements of international and European standards.
Opportunities	**Threats**
- International conventions (MARPOL, UNFCCC). - Paris agreement. - The creation of jobs, particularly in related services linked particularly to maintenance and shipbuilding. - The creation of new maritime highways considering Tunisia's geostrategic position at the crossroads of the Mediterranean. - Adopt an integrated maritime policy considering the blue economy approach.	- Strong competition at Mediterranean level in the field of maritime transport. - The negative impact of maritime activities on the marine environment. - Decrease in investments in areas derived from maritime transport. - Low rate of supervision of professionals combined with a training system that does not meet market requirements.

II.6. Maritime and Coastal Tourism

II.6.1. Description

With 9,429.46 million international visitors in 2019, Tunisia has established itself as one of the main tourist destinations on the southern shore of the Mediterranean basin. Thus, it represents one of the fundamental sectors of the economy and a major tributary of the country's development, playing a pivotal role in terms of foreign exchange income and job creation.

Tunisia currently has 08 active marinas with a mooring capacity of 3,200 rings with an occupancy rate of 80% (Saleh M., 2021). A program to set up new ports (Mahdia, Taparura Sfax, Madfoun Hergla) is underway to reach a total capacity of 8000 moorings by 2020. Studies have shown that the development of these activities will create 30000 direct and indirect jobs in Horizon 2020 (Saleh M., 2021).

The development of the tourism sector has been the result of several factors, of which we can cite as an example, the appearance of paid holidays in developed countries accompanied by the increase in wage income.

This is combined with technical innovations in the field of transport, which is characterized by the fall in its price, in particular for air transport.

As a result, and to compensate for its economic backwardness, several national measures have been taken to remedy the situation by setting up a system of incentives and assistance to attract national and foreign investors. Thus, a massive policy of building hotels along the coast was initiated to accommodate as many tourists as possible, which over time has become like a heavy industry.

Indeed, 95% of national tourism is seaside tourism which remains the main reason for the stay; with a capacity of over 200 thousand beds and hotels present the most preferred accommodation option for target visitors (Saleh M., 2021).

II.6.2. Evolution of Tourist Flows

Since 2010, the Tunisian tourist market has experienced significant fluctuations, whether in terms of the number of arrivals or in the overall overnight stays. The diagram below shows the evolution of the number of non-residents arriving in Tunisia in recent years (Tunisia tourist, 2021).

The Tourist Arrivals in Tunisia decreased to 2000 thousand in 2020 from 9,500 thousand in 2019 and this is due the Covid 19 pandemic.

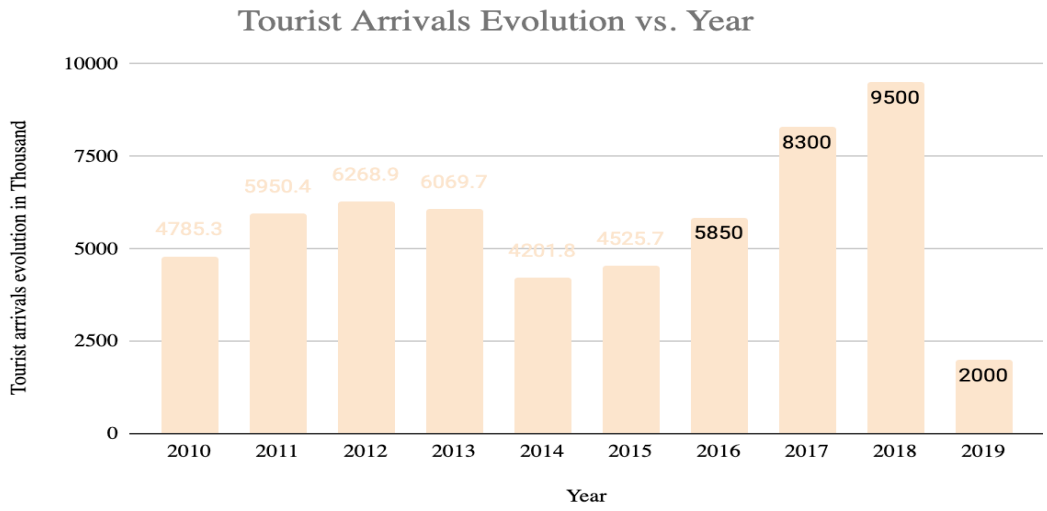


Figure 20. Tourists Arrivals Evolution (Tunisia tourist, 2021) – Complid by Neji, 2022

II.6.3. Economic Weight

The table below shows the evolution of tourist receipts recorded in recent years according to the number of arrivals at the borders and overall overnight stays compared to 2010 as the reference year.

Table 6. Evolution of Tourism Receipts (Tunisia tourist, 2021) – Compiled by Chaabouni, 2022.

Year	Tourist receipts (Million TD)	Overall overnight stays (Millions)	Border arrivals (Millions)
2010	3,522.5	35,565,104	7,828,075
2014	3,575.6	29,107,239	6,069,700
2015	2,354.6	16,177,575	4,201,800
2016	2,373.4	17,880,034	4,525,700
2017	2,831.0	22,042,523	5,850,000
2018	4,141.2	27,074,650	8,300,000
2019	5,619.2	30,018,511	9,429,049
2020	2,030.3	5,899,888	2,012,371

The results obtained in 2019 show a significant evolution of around 13.6% in terms of the number of tourists and around 11% in terms of overall overnight stays, thus offering a tourist income of around 5,478.5 million dinars corresponding to an increase 35.7% compared to 2018; and around 60% recorded at the end of 2010. These results can be

explained by the efforts that have been made in recent years by the Ministry of Tourism and Handicrafts in promoting the tourism product.

Tourism activity contributed significantly for around 14% of the national GDP, *i.e.,* 16 billion dinars recorded at the end of 2019, which helped cover around 21% of the trade balance deficit. Tourism sector brought together some 400,000 direct and indirect jobs representing more than 12% of the working population.

According to the following diagram, in 2020 employment in the tourism industry represented 8 % of the total employment in Tunisia (Saleh, 2021). The share decreased compared to the previous year when tourism accounted for 11 percent of the labor market. Due to the coronavirus (COVID-19) pandemic, around 119 thousand jobs in the tourism sector were lost in the country.

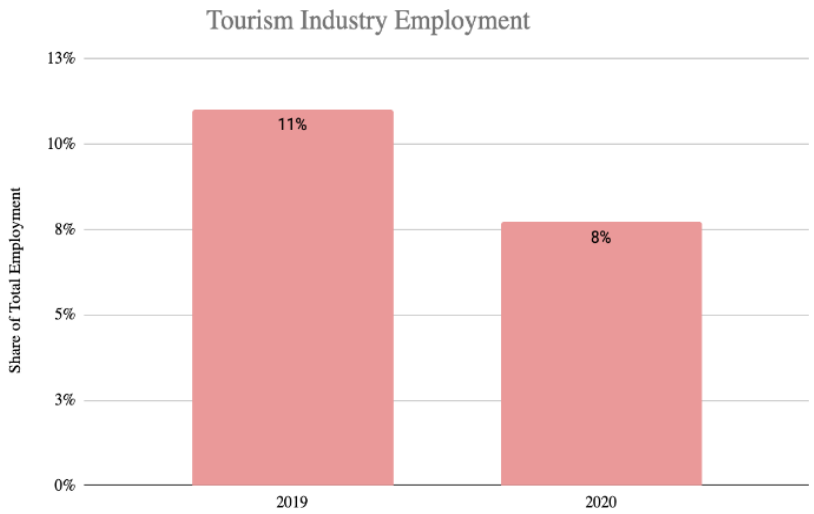


Figure 21. Tourism Industry Employment in 2019 and 2020 (Mili, S., 2021) – Compiled by Neji, 2022.

II.6.4. Interaction With Other Sectors

The tourist activity is strongly dependent on the quality of the environment which illustrates the landscape of the country regard to the tourist flows and their requirements; however, this activity presents a major threat to the degradation of the coastal zone and the marine environment.

For instance, in Djerba island, the annual quantities of household waste collected from hotels are about 3,500 tonnes/year (Rapport mensuel, etap, 2020). In 2014, the inhabitants of Djerba protested against SEGOR French Company that treated the waste in Guellela landfill and since that time it was closed, however, the special delegation no longer places the garbage as the second landfill in Medenine city is not authorized to receive waste from the island. At the same time the authorities did not seek to have a

radical solution for that till now. Indeed, the groundwater in Djerba was contaminated and citizens were protesting against the water quality and water sanitation.

The pollution generated by this activity or by any other action likely to develop along the coast, such as the offshore oil and gas industries or the extraction of mines in the marine environment, can in turn contribute to the degradation of biodiversity, which consequently affects the coastal and maritime tourist activity. In addition, it should be noted that the occupation of maritime space can in some cases deprive fishermen of certain coastal areas, especially during the tourist season.

II.6.5. Climate Change Impact

Expected increasing temperatures and decreasing precipitation under climate change should have a significant impact on the attractiveness of tourist destinations. The seasons and regions favorable to tourism should be modified, directly affecting the tourist flows and therefore the economy resulting from this activity. The summer season should be very hot, aggravating discomfort during the day and degrading the night respite. This type of atmosphere already shows a clear upward trend both in terms of frequency and intensity of heat. Nevertheless, an extension of the tourist season in spring and autumn should be made possible. Saharan tourism is likely to be highly vulnerable to climate change, given the already extreme climate characterizing these regions. Summer tourism could become impracticable in the southern regions of Tunisia, especially for the Saharan and mountainous tourist hubs of Tozeur, Kebili and Gafsa.

As tourism is largely developed towards the seaside in Tunisia, the coastline is a fundamental resource for tourism. Sea level rise is therefore considered as the major threat to this sector. Signs of beach erosion have already been observed and are becoming more and more pronounced in heavily modified shorelines. A 0.5 to 1.5 m/year. shoreline retreat is often observed however the retreat can reach 7 m/yr., affecting many tourist destinations (Rapport mensuel, etap ,2020).

The potential impacts of climate change could also result in an increase in the operating cost of hotels related to the management of water and energy resources. Failures in the drinking water supply could appear in over-frequented areas (coasts and islands in particular) and for some leisure facilities (swimming pools, golf, *etc*.) and infrastructures (hotels, *etc*.), which would directly affect the seaside tourism activity.

Even though the sector uses less than 1% of the country's water potential, the demand for water related to tourist activity is mainly concentrated during the summer, coinciding with periods of low water availability, and is concentrated in areas naturally lacking in drinking water resources (coastlines, islands, and oasis). In addition, desalination is an expensive adaptation option, for mostly small and financially fragile structures. The intensification of heat waves should also intensify the hotels' air conditioning needs and, consequently, energy consumption, thus impacting their cost of operation.

II.6.6. SWOT Analysis

From the above and experts' opinion, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the coastal and maritime tourism sector with regard to the opportunities and threats generated by its environment.

Table 7. SWOT Analysis for Maritime and Coastal Tourism

Strengths	Weaknesses
- Strategic position in the Mediterranean enjoys an attractive climate. - An important hotel infrastructure with more than 200,000 beds. - A privileged sector in the country's development policies. - Significant contribution to GDP and generator of currency. - Almost stability in recent years in terms of the number of arrivals at the borders and in terms of overall overnight stays. - The geography of the coast offers a potential for diversification of the tourist product. - Approximately 400,000 direct and indirect jobs are integrated into the tourism sector.	- The seasonality and the concentration of tourist activity (95%) on the coast. - The tourism product suffers from regional competition and seaside tourism remains the main motivation for tourists. - The country's political, economic, and social instability affects tourism activity. - Limited tourist flows with low purchasing power. - Dependence on international markets which fuel tourist movements. - The negative impact of mass tourism on national wealth and on the marine environment.
Opportunities	**Threats**
- Development of new models based on integrated coastal management and taking sustainability into account. - Improvement of the tourism sector for the benefit of alternative activities respectful of the environment. - Interaction with other sectors such as fishing, aquaculture, and maritime transport - Ensure integration into international tourism markets.	- Gradual decline in number of European tourists. - Strong competition for the same tourist product from countries bordering the Mediterranean (Morocco, Egypt, Turkey, Jordan). - Geopolitical instability in the Mediterranean basin (following increasing tension in exploration and research work on energy sources). - The environmental impact caused by the phenomena of climate change. - Inappropriate solid waste management.

II.7. Renewable Marine Energy

II.7.1. Description

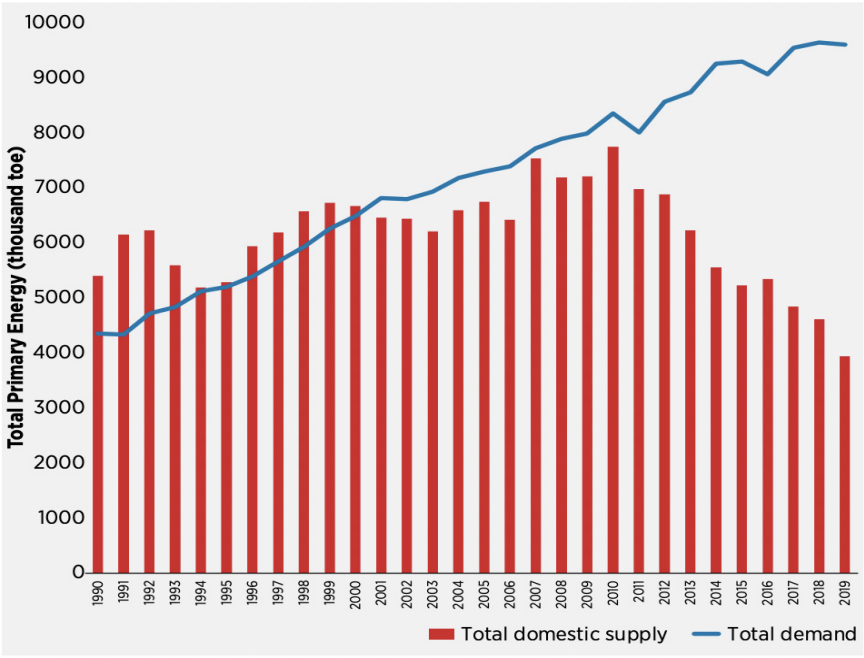
Tunisia has one offshore wind farm project of which none currently operating, none where construction has progressed enough to connect the turbines and generate electricity, none are in the build phase, and none are either consented or have applied for consent. Tunisia has good renewable energy potential, especially solar and wind. Due to the lack of technologies, investments and research, this sector is still underdeveloped in Tunisia; however Marine Spatial Planning is an opportunity for Tunisia to promote this sector.

On March 16, 2021, Tunisian government officials took part in an offshore wind training course organized by the Netherlands, representing the country's first steps towards offshore wind energy. Tunisia has witnessed growing deficits in its energy balance over the past two decades. This trend is largely the result of increasing energy consumption in all economic sectors, coupled with the decline of hydrocarbon production. This led to an energy deficit amounting to 50% in 2019 compared to 7% in 2010, thus leading the country to become more dependent on imported fossil energy (Hamedi, Z. et al, 2021). There is an urgent need for alternative energy resources like marine renewable energy.

The electricity generation mix is dominated by natural gas, while renewable energy resources represented only 3.0% in 2019 (Mili, S., 2021). This strong dependence on natural gas has serious implications for Tunisia's energy security since domestic production of gas has stagnated to the point of even declining in recent years. In response to the energy security challenges of the early 2000s, and Tunisia's vulnerability to volatile international energy prices, the country has decided to embark on an energy transition process as part of its wider sustainable economic and social development strategy.

The energy sector is a key contributor to Tunisia's various economic sectors. In the past two decades, however, the country has witnessed a growing energy balance deficit, largely as a result of relying on fossil fuel sources – oil and natural gas – to meet its heightened energy demand. The decline of its own hydrocarbon resources has led to increased dependence on fossil fuel imports, which rose to record levels in 2019 when the deficit in the balance of primary energy reached 5,67229 thousand tonnes of oil equivalent (ktoe), as shown in the following figure , highlighting that 49% of total energy consumed is imported (Mili, 2021).

In response, Tunisia has begun to leverage its wide array of renewable energy sources to diversify its energy mix. This is coupled with energy efficiency programmes to alleviate its energy balance deficit.



Source: (MISME, 2019a)

Figure 22. Evolution of domestic primary energy and demand in Tunisia (Mili, 2021)

II.7.2. Tunisia's Energy Transition

Amid the coronavirus outbreak in early 2020, renewable and energy efficiency have become a key part of the country's recovery plans.

Tunisia's energy transition is notably based on (Mili, 2021):

- Diversification of the energy mix and integration of renewable energies
- Strengthening energy efficiency
- Rationalization of the energy subsidy
- Strengthening of the grid and the interconnections

The implementation of an energy management strategy that is built on the increase of two components (WWF, 2015): Energy efficiency and the development of renewable energy, with a 30/30 target to reduce primary energy demand by 30% in 2030 compared to the trend scenario. Renewable energy to 30% of the electricity production by 2030.

To achieve the country's update objectives, the TSP has established a target for total installed renewable energies capacity at 1,860 megawatts (MW) by 2023 and 3,815 MW by 2030, a five-fold and ten-fold increase, respectively, from the 2017 installed renewable energy capacity. The targets were updated to reflect Tunisia's climate commitment to reduce the country's carbon intensity by 41% compared to 2010 by 2030 compared to an unconditional target to reduce carbon intensity by 13%, specifically as pledged in its Nationally Determined Contributions under the Paris Agreement.

The bulk of the country's identified mitigation potential arises from the energy sector, including 68% from energy efficiency and 32% from renewable energy (Mili, S., 2021). The considerable amount of installed renewable energy capacity needed to meet the targets set out in the Tunisian Solar Plan (TSP) will require extensive private investment support. In response, the Tunisian state adopted regulatory reforms in 2015 through a new law (Law No. 2015-12) relating to the production of electricity from renewable energies.

The objective is to establish a legal framework that is conducive to private sector investment in the production of electricity that will arise from renewable energy sources through three new regulatory regimes (Mili, S., 2021):

(a) Self generation/consumption.

(b) Independent power production for local consumption (concession and authorization).

(c) Independent power production for export.

Indeed, the new legal framework and the various measures adopted by the Tunisian government over the past two years, several of these measures include enabling policy initiatives, updating the current documentation surrounding current electricity purchase agreements, and establishment of guarantees to encourage the development of renewable energies.

II.7.3. Economic Weight

Energy is used in various end-use sectors in the economy, including transport (32%), industry (27%) and the residential sector (27%). This is followed by the commercial and agricultural sectors (8% and 6%, respectively), as shown in the following figure.

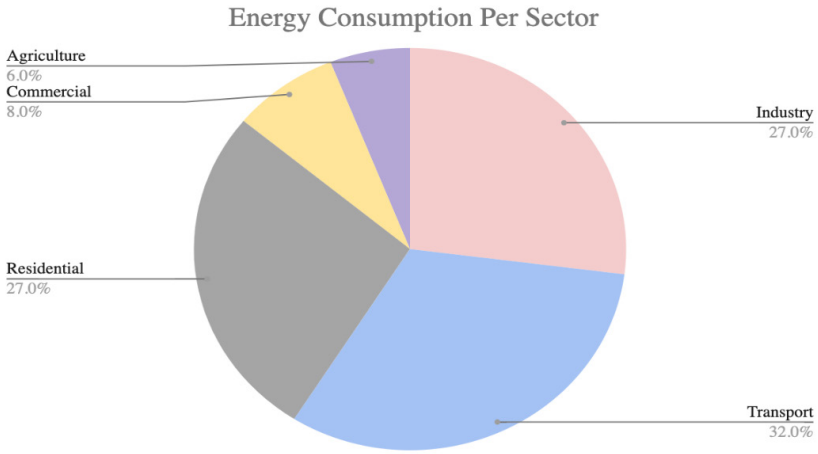


Figure 23. Energy Consumption Per Sector (Mili, 2021) – Compild by Neji, 2022.

With a growing energy balance deficit, there is a compelling case for renewables, based on a decline in conventional resources against a sustained increase in demand. The ability of renewable energy to address energy imports in Tunisia is significant. Renewable energy solutions bring about important benefits to energy security, including availability, accessibility, affordability and a long-term outlook. In addition, with the reduction in the cost of renewable energy technologies over the past decade, Tunisia became able to search for renewables projects to benefit from.

We have to take into consideration that Tunisia, in its Nationally Determined Contributions (NDCs), has included measures to reduce its carbon intensity with a focus on reducing greenhouse gas emissions by 41% with 75% of these reductions stemming from mitigation measures in renewable energy and energy efficiency. The development of renewable energy is a central pillar of decarbonising the energy mix while securing a reliable energy supply.

In 2018 alone, renewable energy generation from solar PV and wind avoided nearly 1.5 million tonnes of carbon emissions (WWF, 2015). The creation of new jobs can therefore be expected at the local, national and continental scale, adding to the already growing demand for highly qualified professionals.

II.7.4. Interactions With Other Sectors

Offshore wind energy can generate conflicts with Other Sea Space Uses. Wind turbines may interfere with commercial shipping and fishing and recreational boating. It is possible that wind turbine energy facilities may disrupt air traffic control and maritime radar systems also. In addition, the underwater support pilings, anchoring devices, scour-protection materials, and electromagnetic fields can cause an increase or decrease in benthic communities, alter natural environments, and possibly affect migration patterns. Marine Spatial Planning would be an important tool to avoid user-user conflicts.

II.7.5. SWOT Analysis

According to experts and from the above, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the marine renewable energy sector with regard to the opportunities and threats generated by its environment.

Table 8. SWOT Analysis for Marine Renewable Energy sector (WWF, 2015)

Strengths	Weaknesses
- One of the few areas with high potential significant offshore wind power in the Mediterranean region (although the actual capacity has not yet been fully assessed). - National policy to support renewable energies.	- No machinery production capacity (wind). - Planning of marine areas to avoid conflicts between activities over time. - High investments required in comparison of other traditional energies or renewable (solar) - Impacts of infrastructure on the ecosystem if they are not well designed and well managed. - Lack of blue skills and capacity building.
Opportunities	**Threats**
- Available sources of investment and capacity building at the regional level. - Specific funds and international funding sources. - Marine Spatial Planning. - Job creation.	- Political instability. - Economic crisis.

II.8. Submarine Cables

II.8.1. Description

Located in the northernmost part of Africa with a wide opening to the Mediterranean, Tunisia through the city of Bizerte is naturally favorable for landing submarine cables. Tunisia's luck is its geographical and strategic position in the heart of the Mediterranean, there is now a strong opportunity to host digital import and become a hub of the global internet network. There is also the submarine geography which makes that all the cables of the Mediterranean pass between Sicily and Tunisia even at the level of the seabed the city of Bizerte is naturally favorable to be a point of wise interest of the cables.

Today there are initiatives to take advantage of Tunisia's positioning and strengthen its connectivity. For instance, the African digital project is one of the ambitious projects which aims to connect Africa with the rest of the world through what are called digital cardinal points.

Through this project Tunisia will strengthen its digital position at the national and international level.

The country is now on cable SEA-ME-WE4 commissioned in 2005 which comes from the Far East. It is finished in Marseille and there is a landing in Bizerte so there we have 16 consortium members 20 000 km long and 2 pairs of fiber (Lamparte, A., 2020). The capacity is shared between all members and adding capacity is crucial to meet the growing demand for connectivity which will cost relatively more than replacing existing cables.

II.8.1.1. Submarine cables in Tunisia

So far Tunisia has 4 submarine cables with the design capacity per capita (kbps) of about 1 821 (Submarine Cable Map, 2021): SEA-ME-WE4, DIDON, HANNIBAL, TRAPANI-KELIBIA and AFRICA-1.

- **SEA-ME-WE4 :** South East Asia–Middle East–Western Europe 4 (SEA-ME-WE 4) is an optical fibre submarine communications cable system that carries telecommunications between Singapore, Malaysia, Thailand, Bangladesh, India, Sri Lanka, Pakistan, United Arab Emirates, Saudi Arabia, Sudan, Egypt, Italy, Tunisia, Algeria and France. It is intended to be a complement to, rather than a replacement for, the SEA-ME-WE 3 cable. The cable is approximately 18,800 kilometres long, and provides the primary Internet backbone between South East Asia, the Indian subcontinent, the Middle East and Europe.
- **The AFRICA-1**: The submarine cable system spans 10,000km, initially landing in Kenya, Djibouti, Pakistan, United Arab Emirates, Kingdom of Saudi Arabia, Egypt and France. The Africa-1 cable system will also land in Sudan, cross Egypt through diverse new terrestrial routes on the way to France, and further connect other countries in the Mediterranean such as Algeria, Tunisia and Italy. The Africa-1 cable system is supplied by ASN and is supposed to be ready for service by the end of 2023.
- **HANNIBAL** System became ready for service around October 2009.The system has a length of 178 Kilometers and is owned and/or operated by Tunisie Telecom.HANNIBAL System has landing points in Tunisia and Italy.
- **DIDON:** The fiber optic submarine telecommunications cable system Didon became ready for service around May 2014. The system has a length of 170 Kilometers and is owned and/or operated by a consortium consisting of Ooredoo Tunisie, Orange Tunisie. Didon has landing points in Tunisia and Italy.
- **TRAPANI-KELIBIA:** The fiber optic submarine telecommunications cable system Trapani-Kelibia became ready for service around November 1995. The system has a length of 209 Kilometers and is owned and/or operated by a consortium consisting of Telecom Italia Sparkle, Tunisie Telecom. Trapani-Kelibia has landing points in Tunisia and Italy.

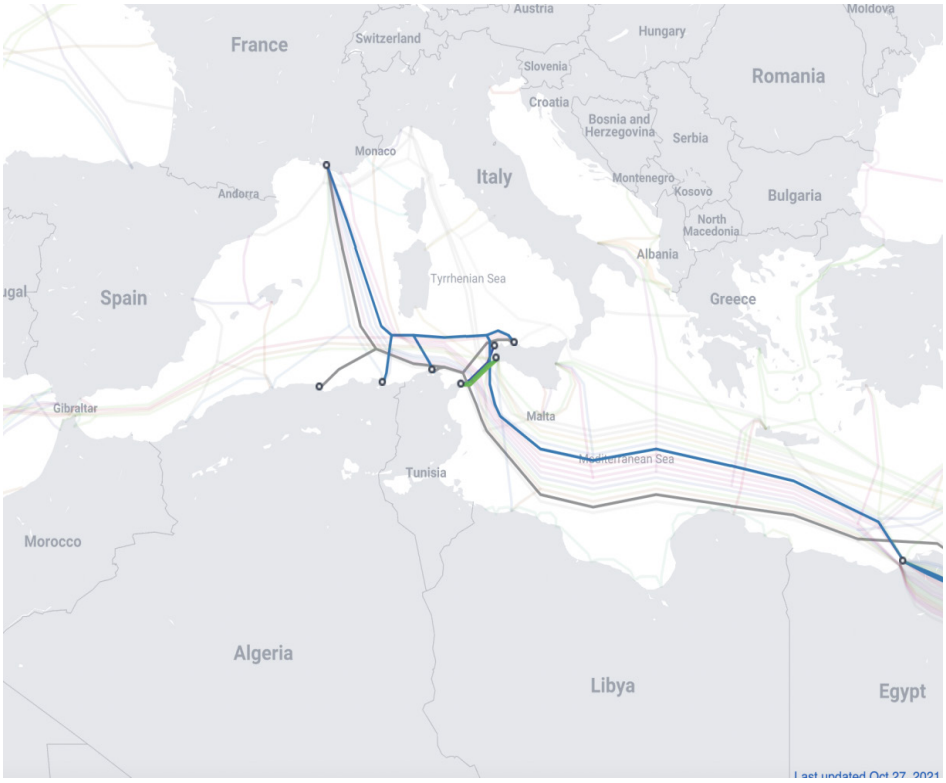


Figure 24. Map of submarine cables landing in Tunisia (Submarine Cable Map, 2021)

II.8.1.2. Regulated Access to Submarine Cable Landing Stations in Tunisia

In 2009, Tunisia had a monopoly on the physical layer of international communications (all calls and data communications needed to transit through the submarine cable landing stations that are owned by incumbent Tunisie Telecom.

In 2014, the alternative operators Tunisiana and Orange jointly built an alternative submarine cable and landing station. The Tunisian ICT regulatory authority (INT) issued a decision enforcing the interconnection regulation on the access to submarine cable landing stations of the incumbent operator. It is well established under international law that submarine cables and cable landing stations, either on a given territory or in its territorial waters, are under the full jurisdiction of the coastal state.

In accordance with Article 2 of the United Nations Convention on the Law of the Sea, On December 10, 1982, a coastal state has sovereignty over its territorial sea. It has the right to establish the breadth of that territorial sea up to 12 nautical miles from the coast. Thus, access to submarine cable landing stations is a necessary part of interconnection with Tunisie Telecom, Ooredoo, and Orange, as are any backhaul arrangements that are required to enable connection with the landing stations.

II.8.2. Submarine Cables Economic Potential

The lifespan of submarine cables is estimated at 25 years. The cables are placed in the water for 10 to 15 years and may be technologically outdated because the evolution is very fast. Thus, the replacement of existing cables is the smartest solution, and it will impact the next generation in Tunisia. Internationally, Tunisia through digital Africa should play the role of North Africa Gateway to be sovereign and autonomous in the future. Bizerte should be the first stone of the building. Tunisia has clear assets, and this opportunity must be seized, and Tunisia must move forward to switch to project mode and to be present on the digital map of submarine cables of the Mediterranean as soon as possible.

We have to follow the experience of Marseille. Due to the usage of the submarine cable on a European and international scale, the digital port of Marseille today represents as much business as the traditional port. Its economic impact is estimated at 8 billion dollars or the equivalent of the economic impact of the traditional port thanks to this new activity. The French city has succeeded in doubling its port. They are today at 14 digital cables in Marseille but in communications, they need diversity and there are many cities which will allow this diversity. For instance, Genoa in Italy and Barcelona in Spain are in the process of increasing in power and we see that the flows of data are directed from there 'Europe from North to South'. Thus, the next step will be to cross the Mediterranean, it is North Africa and more particularly Tunisia should play this role and take its place on the global digital scene.

II.8.3. Interactions With Other Sectors

Because of hazards posed by shipping, bottom trawl fishing, dredging and other activities on the continental margin, power and telecom cables may be buried below the seabed for extra protection. Such burial measures can disturb the bottom or benthic environment of the continental shelf and uppermost continental slope; however, compared to repetitive fishing, ships' anchoring, and dredging, cable burial is usually a one-off operation for the 20–25-year design life of the cable.

Further disturbance can occur, however, when a cable fails and requires repair and when a decommissioned cable is removed. Another consideration is the limited extent of burial, which is confined to a designated cable route. This contrasts with, for example, bottom trawl fishing, which is so widespread and repetitive in Tunisia that it has been described recently as the submarine equivalent of industrial-scale agricultural plowing on land.

It seems reasonably clear that within a Marine Protected Area (MPA), Tunisia can restrict activities over which they are given sovereign rights and jurisdiction under UNCLOS, 106 such as fishing and resource exploration and exploitation. However, the ability of Tunisia to restrict recognized freedoms such as navigation within MPAs is limited.

The International Maritime Organization (IMO), as the competent international organization responsible for shipping, is the only body that can control navigation

through MPAs. While there is no equivalent body for submarine cables, by the same reasoning it can be argued that as with navigation, Tunisia does not have the authority to impose blanket prohibitions on the laying or repairing of cables within MPAs. With designated cable protection zones, there has been the suggestion that such areas may act as MPAs as they prohibit potentially hazardous and environmentally damaging activities such as bottom trawl fishing, ships anchoring and seabed mining.

II.8.4. SWOT Analysis

From the above and according to experts the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the Submarine Cable sector with regard to the opportunities and threats generated by its external environment.

Table 9. SWOT Analysis for Submarine Cables

Strengths	Weaknesses
- Submarine geography. - Geographical and strategic position. - Many initiatives to take advantage.	- Lack of money and investment. - Lack of technology and research. - Lack of regulations. Lack of blue skills and capacity building.
Opportunities	**Threats**
- Strengthen Tunisia's digital position at the national and international levels. - Being the Hub of global internet network.	- Anchoring. - Trawl fishing. - Abrasion and erosion.

II.9. Maritime Defense in Tunisia

II.9.1. Description

Today the Tunisian Navy reportedly has bases at Bizerte, Kelibia, La Goulette, and Sfax. Formerly reported in service were six Kondor-II class minesweepers of 635 tonnes, equipped with 3 twin 25 mm Guns (Hamedi. et al, 2021). However, none were listed in service by the IISS Military Balance 2013. Also formerly in use were MBDA MM-40 Exocet and Nord SS-12M surface-to-surface missiles.

Like other administrations with means at sea, and according to the principles of the action of the State at sea (such as the National Guard and the Navy) and the coast guard function, the Customs should implement the missions of the State at sea. These missions are grouped into ten categories:

- Sovereignty and protection of national interests
- Safeguarding people and goods at sea
- Maritime Safety
- Protection of the environment
- Management of protected areas
- Maritime security
- Sanitary control and working conditions at sea
- Marine Heritage Management and Marine Public Resources
- Customs, tax, and economic police at sea

II.9.2. Maritime Defense Socio-Economic Potential

To ensure a sustainable blue economy, we must not lose sight of the essential functions of permanent surveillance and control both on the coast and on the sea areas throughout the Economic Zone in order to enforce the regulations on maritime traffic for to prevent collisions and illegal activities affecting the water column, the soil and the marine subsoil and to ensure the prevention of marine pollution, as well as the missions of assistance, rescue and maritime safeguarding.

Other threats include the blue economy, such as piracy and armed violence, human trafficking, arms trafficking, and drug trafficking, as well as natural threats such as tsunamis and hurricanes; sea level rise and ocean acidification as well as overfishing caused by illegal, unreported, and unregulated fishing and other unsustainable fishing practices also posing serious problems at sea, as well as accidental pollution.

These maritime safety missions are therefore to be entrusted to a Coast Guard, which specializes primarily in maritime law and in the prevention of pollution and illicit activities at sea and provided with appropriate means taking advantage of modern technologies and regional cooperation largely encouraged by the International Maritime Organization.

It should be noted that these missions generate jobs (in the order of 3,000 to 4,000 jobs) requiring specific training both on the coast and offshore (Saleh, 2021). Moreover, the budget required for the setting up and maintenance of this body is not entirely assumed by the State from the own income of the operations of assistance at sea and taxes imposed by the security to the profit users of the sea. In addition, surveys of tide gauges along our coasts show that sea level is constantly increasing. Although this evolution remains slow, of the order of a few centimeters per year, it is advisable to plan programs to fight against erosion phenomena. Due mainly to climate change, the rise of water intensifies pressure on a fragile coastal fringe where a large proportion of the population lives.

The government has anticipated the consequences of coastal degradation by reserving a budget of 90 million dinars for beach containment, but an expert study could determine the projects to be undertaken in the long term. It will be combined with development policies for the benefit of inland areas to put in place to curb migration to coastal areas.

Tunisian Navy officers need to improve their readiness at sea and their knowledge on maritime modelling and simulation. Indeed, Tunisia participated recently in a training sponsored by the North Atlantic Treaty Organization Science (NATO) for Peace and Security Programme to modernize its defense and upgrade its maritime simulator to NATO standards and architectures.

II.9.3. Interaction With Other Sectors

In the face of rising threats at sea, the defense of the sovereignty and protection of those at sea will contribute to the growth of the construction and naval maintenance market. In addition to the traditional threats such as piracy and maritime violence, a new form of threat is beginning to take shape, namely the electronic intrusions that hinder the IT systems of offshore platforms. This threat is to be taken into account in the medium term to prevent harm to our ships and our marine facilities. In light of the wealth of maritime resources and the proliferation of new trades and activities related to the sea, as described above, Tunisia is called to initiate a strategic reflection by establishing a national vision of development of the blue economy like all coastal states that have adopted an integrated approach to maritime planning.

II.9.4. SWOT Analysis

From the above and exports opinion, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the Maritime Defense sector with regard to the opportunities and threats generated by its environment.

Table 10. SWOT analysis for Maritime defense sector

Strengths	Weaknesses
- Regulations and legislations - Initiatives to enhance the sector	- Lack of trainings - Lack of technologies - Lack of investment - Lack of capacity building
Opportunities	**Threats**
- Growth of construction and naval maintenance market - Job creation - Environmental health and safety	- Sea level rise - Climate change - Economic crisis and political instability

III. Emerging Sectors

III.1. Marine Non-living Resources: Deep Seabed Mining

III.1.1. Description

The lack of funds, technologies and research are the main challenges that the Tunisian government is facing to develop this sector. In addition, the scarcity of data regarding the Tunisian seabed remains a challenge to get access into this sector. So far, this sector is still unclear and needs to be regulated and Tunisia didn't have exploration permits yet. Tunisia's key natural resources include phosphates, petroleum, zinc, lead, and iron ore. In 2010, the country was globally recognized as a significant producer of phosphate-based fertilizers and phosphate rock.

As land-based mining industries face increasing complexities, *e.g.,* diminishing return on investments, environmental degradation, and geopolitical tensions, governments are searching for alternatives. Following decades of anticipation, technological innovation, and exploration, deep seabed mining (DSM) in the oceans has, according to the mining industry and other proponents, moved closer to implementation. The DSM industry is currently waiting for international regulations that will guide future exploitation.

Globally, mining companies are eyeing a new source of mineral resources, the seabed. The UN's International Seabed Authority (ISA) in 2017 finalized the draft regulations covering deep-sea mining and African countries want to ensure that they have a say in benefiting from the "new gold rush". The European Commission anticipates that by 2030, some 10% of global annual mining production will come from the ocean floor (Banque mondiale, 2016). Global annual turnover of marine mineral mining is expected to grow from virtually nothing at present to €10 billion by 2030, according to the commission's outline proposal for the terms of reference for such projects.

Currently, the only other area where marine mining is taking place off the African coast is the Red Sea. ISA's Legal and Technical Convention (LTC) is currently collecting opinions from the organization's 168 member states on a range of aspects, including exploitation technologies, mineral rights, and the obligations of the companies and of their respective state sponsors with regards to the environment, as well as the royalties to be paid by the owners of exploitation permits.

III.1.2. Challenges for Deep Seabed Mining

The challenges involved in deep-sea mining can be extreme. Deep-sea mining poses technological challenges. According to the European Parliamentary Research Service (EPRS), many important mineral resources are found at depths of 4,000 m or more (Banque mondiale, 2016). So far, surveyed resources in this category include over one billion tons of copper and nickel and 100 million tons of cobalt, with even larger manganese deposits thought to be potentially available. These minerals are found

under the form of polymetallic nodules or polymetallic sulphides, which are contained in metalliferous muds, particularly in the Red Sea. Cobalt-rich ferromanganese crusts are found at shallower depths of between 400 and 5,000 m in areas of volcanic activity, with some located in the Comoros archipelago or around Madagascar. These crusts also contain iron oxide, molybdenum, zirconium, or rare earths. So far, ISA has issued just 27 exploration permits around the world (Banque mondiale, 2016).

Yet African states worry that they might be marginalized from the “new gold rush” and any of its benefits. At the ISA session, African states expressed concern at the “low level of interaction of member states” regarding the draft of exploitation regulations. African countries will want a number of specific issues addressed as well. These include the amount of royalties paid by mining companies, as well as the introduction of profit-sharing mechanisms. African countries argued that access to the resource and benefit-sharing must be based on equal and mutually agreed partnerships to address technological gaps.

III.1.3. Interaction with Other Sectors

Ocean mining could also significantly raise the turbidity of the waters where it occurs, according to Every ton of manganese nodule mined from the seabed could result in up to 5.5 tons of sediment deposited in local waters. Moreover, sediments transported to the surface with the minerals could decrease levels of sunlight there and hence photosynthesis, with long-term effects on biological productivity.

Marine scientists argue that ocean-floor mining could lead to the degradation of the seabed, pollution, habitat loss and threaten fragile marine life. Some 25 years after small surfaces of the deep seabed near the Galapagos islands in the Pacific were raked, the ocean floor was still damaged and the recolonization by marine organisms is slow. For these reasons, environmentalists are strongly opposed to seabed mining.

All these factors explain why the EU is pushing for the adoption of “ocean governance” principles to manage fishing activities, preserve ecosystems and regulate mining production before the start of a large-scale exploitation. Environmental NGOs, as well as other stakeholders, such as fishing companies, have demanded greater transparency from ISA; to ensure that comprehensive conservation-oriented regulations are adopted before the start of commercial mining operations.

III.1.4. SWOT Analysis

According to experts and from the above, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the deep seabed mining sector with regard to the opportunities and threats generated by its environment.

Table 11. SWOT analysis for Deep Seabed Mining

Strengths	Weaknesses
- Marine minerals are new natural resources capable of commercial exploitation in a region with few economic industries. - Technological improvements.	- Limited investments - Strong dependence on foreign funds - Lack of technologies - Technology is costly - Marine users' conflicts (Fisheries) - Social and cultural issues - Concerns over threats to marine environment
Opportunities	**Threats**
- Creation of new jobs - New uses and new markets - Economic growth	- Economic crisis in Tunisia - Lack of governance capacity and regulation - Political instability discourages investment - Climate change

III.2. Blue Bioeconomy and Biotechnology

III.2.1. Description

The global Biotechnology market is estimated to be over $6.4 Trillion for 2025 and it is used in different industries as mentioned in the following figure (Fethi, K., 2021). This sector is an emerging sector in Tunisia and Tunisian experience shows many signs of growth and interest in blue biotechnology. Indeed, the Investment in Research and Development (R&D) is about 1.5% of the GDP in 2019. Blue biotechnology in Tunisia has an Impact on aquaculture and it is contributing to its flourishment (breeding, diseases control, and optimization…).

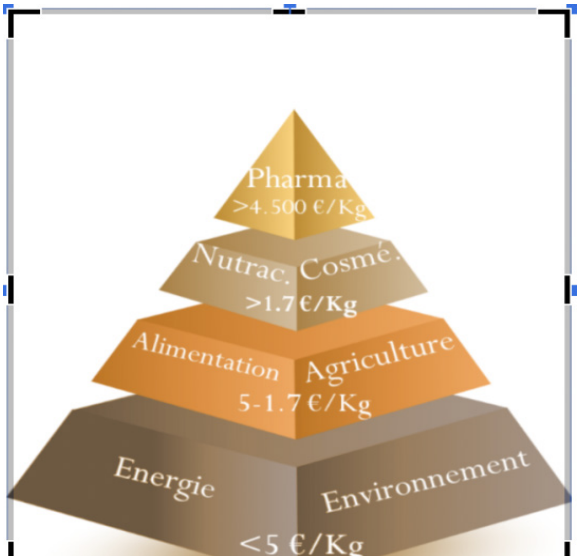


Figure 25. Marine biotechnology contribution (Onofri, L. et al, 2021)

The Biotechnology research centres are considered recent and factual information about biotechnology is too fragmented and scarce to do a robust valuation of the sector performance. But we have information about the output of selected research centres (e.g. the Centre of Biotechnology of Borj-cedria (CBBC) states 161 university diplomas (including PhD) and 352 articles). The total number of PhD graduates in biotechnology is not clear. Yet, biotechnological institutes and techno-poles are very active.

The Centre of Biotechnology of Sfax (CBS) lists 17 patent applications. The CBC states 17 patents. Vaccines and serums are patented by the Institut Pasteur of Tunisia. Successful experiences come from agricultural companies that produce biotechnology nurseries. One such example is Mabrouka » Trees and plants nursery Kheledia, north of Tunis. Covering 150 hectares, the company employs three engineers and many technicians besides 150 to 250 workers (Fethi, K., 2021). The nursery has a leading biotechnological laboratory. Currently, « Mabrouka » produces millions of olive trees, and is developing approximately 500,00031 new plants such as the Paulownia tomentosa (Fethi, K., 2021).

The Tunisian marine biotechnology research is carried on mostly at INSTM Departments, in five different research teams: one team in Carthage (pharmaceutical and health sectors, fishery and aquaculture); two in the Goulette Center (biotransformation of marine wastes and bioenergy); one in the Kheireddine Center (macro-algae biotechnology and their bioactive products) and the last one in the Monastir center (thermophilic microalgae and bioproduction). In the following table, many examples of marine products' valorization are illustrated.

Other research teams partially deal with marine biotechnologies are:

- The National Institute of Sciences and Technologiesy (INSAT), with one team focusing on thermo-tolerant microorganisms.

- The University El Manar, with some research on bioactive products in sponges and halophilic cyanobacteria.
- The Center of Biotechnology of Sfax, where a research team is focusing on aquatic microalgae and bio valorization.

In Tunisia, the financial capital for investment in Biotechnology market is provided by:

- The Government Creation of 6 technopoles between 2002 - 2006.
- The main Foreign investors from pharmaceutical units (Genopole Evry, The Medical Technology).
- Cluster St. Etienne, Nato, International Cooperation Agencies).
- Local banks (Pasteur Institute of Tunis biotech firms and pharmaceutical units).
- Europe FP7 funding projects.
- Private local capital, encouraged by a system of tax incentive, through exemptions and discount.

Table 12. Valorization of Marine Products in Tunisia (Fethi, K., 2021) – Compiled by Neji, 2022)

Research Institute	Valorization of Marine Products in Tunisia			
INSTM	**Bio molecules isolated from Marine organism:** 1.R-phycoérythrine extraction 2.Bio active molecules extraction from 11 algea species	**Valorization of macroalgae (Gracilaria and others):** 1.culture and extraction of products 2.Extraction of agar for different uses (cosmetics, food, dietary pharmaceutical	**Valorization of marine waste for the production of Rhizobium inoculant:** 1.Waste from seafood (tuna waste, and shrimp) used as substrate for the growth of different Rhizobium Strains	**Identification and characterization of sea food industry co-products and wastes:** 1.Optimal use of small pelagic fish Sardinella sp and Developing transformation processes 2.Co products of Seafood industry 3.Chitin from shell of Sepia officinalis
INSAT	The use of Pictada radiata in bone surgery			
INAT	1. **MED-JELLYRISK research Project (INAT)** : Medusa consumption **BIOMER** company extract collagen from the jellyfish for cosmetic			
INSTM/ SUREFISH	Blue Crab Powder Natural pigments extracted from marine yeasts			

III.2.1.1. Seaweeds as a Promising Resource for Blue Economy in Tunisia

Macroalgal cultivation and bioprocessing is still scarce in the Mediterranean area, particularly in Tunisia, where seaweeds are abundant on its coast; they remain little exploited. Indeed, there is a potential for the seaweed sector in Tunisia in terms of biodiversity, cultivation, and bioprocessing. They can be used as a natural renewable resource suitable for a large array of industrial applications (cosmetics, pharmaceutical products …). National statistics on the importation and exportation of algae and seaweed products (agar and alginates) were compiled from 2011 to 2019 (Fig. 26).

Maximum phycocolloid exportation occurred in 2015 with 109.7 t with 95% being agar (Fethi, K., 2021).

Algae exportation and importation data include both macro- and microalgae as no specifications are given in the national statistics database. The increase observed in national algae exportations since 2015 can however be mainly attributed to Spirulina/ *Arthrospira* production. Hence, the production of microalgae is reported to be growing in Tunisia.

In 2015, there were only 3 Tunisian companies producing Spirulina (*Arthrospira platensis*) while in 2019, 7 are registered for a production of 14 t. Meanwhile, seaweed resources are underexploited (few companies collecting natural biomass and selling internationally) and there are currently no national statistics, either for harvesting or for cultivation, of commercially important seaweeds in Tunisia. To date, only one company has been installed in Bizerte Lagoon to produce Gracilaria and Ulva, but production data are yet not available.

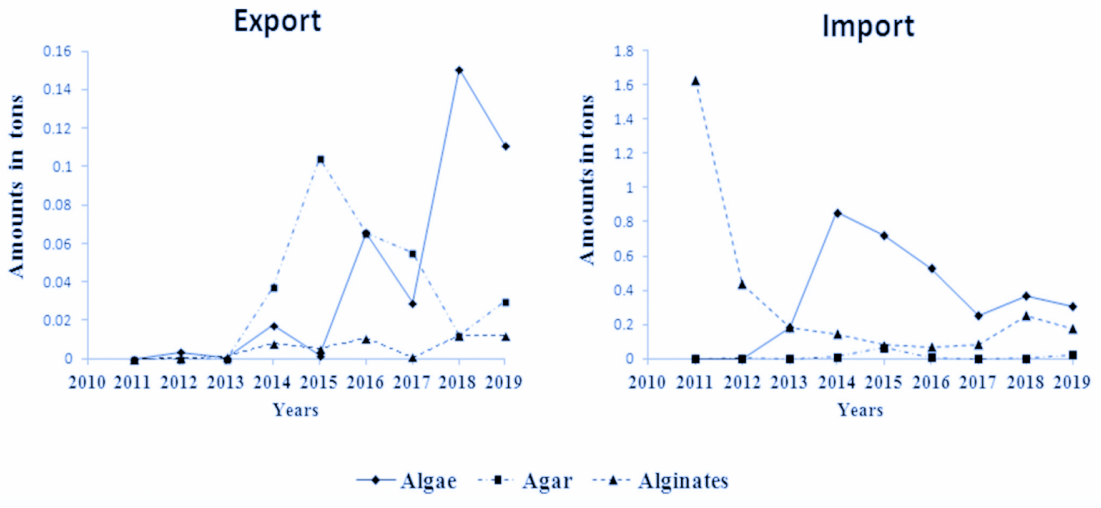


Figure 26. Algae and seaweed products exportation and importation (Fethi, K., 2021)

III.2.1.2. Development of Commercialization of the Blue Crab

Dietetic and high protein products of marine origin are more and more in demand. For instance, the blue crab powder as it is rich in proteins is highly demanded in the Asian and American markets. The following figure illustrates the crab powder biochemical characterization.

The exports of the blue crab, in Tunisia, reached, in the first half of 2018, values never reached before. In fact, the quantities exported increased by 02%, from 120.6 tonnes in the first 6 months of 2017 to 1,450 tonnes in the same period this year (Mili, S., 2021). The Ministry of Agriculture said that the blue crab, an alien species on the Tunisian coast, is a resource rather than a problem for fishermen. In fact, the economic value of exports of this species increased from 0.7million dinars in 2017 to 8.6 million dinars in 2018, with a growth rate of 23%.

The blue crab contributes to the increase in the value of exports of fish products, which goes to a total of 11,065 tons, with a value of 208.7 million dinars at the end of June 2018, against 9,968 tons for a value of 196.2 million of dinars during the same period of 2017 (Saleh M., August 2021).

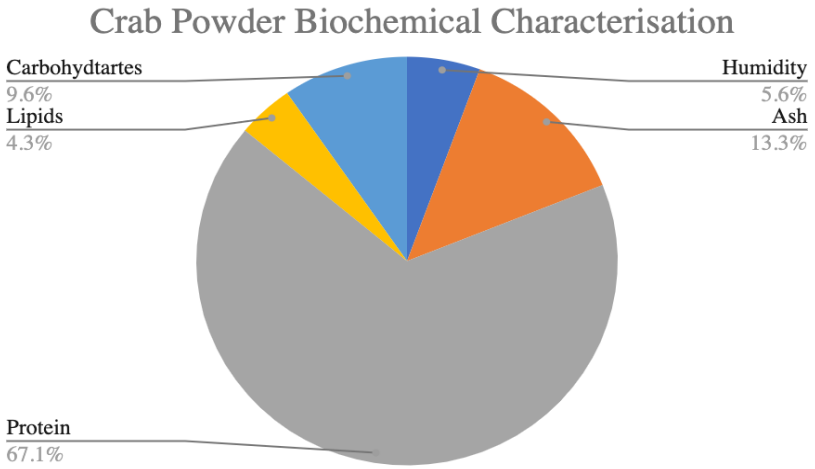


Figure 27. Biochemical characterization of crab powder (Lamparte, A., 2020) – Compiled by Neji, 2022.

III.2.1.3. Interaction with other sectors

The link between marine biotechnologies applied to wellness and thermal/health tourism might have a double positive impact on the economy; spurring research that can, in turn, generate incentives to specialize in a particular niche of the tourism sector, and therefore, present a comparative advantage with respect to Mediterranean competition, especially strong from France, Italy, and more recently Croatia.

Aquaculture is another sector that would broadly benefit from the application of marine biotechnologies that aim at improving breeding, minimizing and controlling diseases

and optimizing the cultivation process. From a quick check of 2010 FAO data, it appears that Tunisia's aquaculture sector is very promising, with active international trade, even though not completely developed. Therefore, the already existing stream of research that focuses on optimizing the inland and marine fish and shellfish cultivation methods might benefit the sector, improving the tradability and competitiveness of the products. In addition, aquaculture practices, reducing fishery, can improve the environmental status of the natural stock of marine resources (fish and shellfish).

III.2.1.4. SWOT Analysis

According to exports and from the above, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the deep seabed mining sector with regard to the opportunities and threats generated by its external environment.

Table 13. SWOT analysis for Blue Bioeconomy

Strengths	Weaknesses
- Existing biotechnology research institutes (not just marine). - Favorable national conditions (rich ecosystems, diversity). - Regional and international knowledge. - Existing on similar LV components of Tunisian marine ecosystems. - A new sector for research, development, and innovation. - Development of links between research and industrial sector.	- Limited investments and focus on research only (No innovations / transfers to industry). - Strong dependence on funding foreigners, foreign control of the future local industry leading to low local efficiency. - Lack of capitalization, integration, intersectoral cooperation and collaboration.
Opportunities	**Threats**
- Creation of new jobs. - Sunny and mild Mediterranean climate; favorable, unique geophysical and ecological conditions in the Gulfs of Tunis and Gabes; high productivity of the Mediterranean Sea (fish catch). - Intensive Government investment in advanced education.	- Economic crisis in Tunisia. - Political instability discourages foreign investors. - Current economic activities (maritime transport; polluting agricultural production techniques; overfishing) deplete natural capital.

III.3. Desalination Sector

III.3.1. Water Resources in Tunisia

The Water resources in Tunisia are inventoried and well identified. Tunisian Potential is about 4840 Mm3 (Surface water: 2 700 Mm3 – Groundwater: 2 140 Mm^3) and the available resources are about 4 640 Mm3 in 2014, Per capita/year and the water availability is about 440 m3. In 2014, about 93% of resources were mobilized (Fethi, K., 2021).

Tunisia witnesses limited water resources mainly in the Center and South of Tunisia. The non-conventional water resources (desalination, water reuse) and renewable energies are of greatest importance for water supply either for domestic, industrial or agriculture sectors (high value crops). Indeed, Tunisia has launched an ambitious program of desalination still in progress. Appropriate design of desalination units could be a solution for small communities and agriculture to thrive. So far the agriculture sector is the largest consumer of the water resources in Tunisia. It consumes almost 80% of extracted water (Project on Regional Development Planning, 2021).

By 2050, the overall decrease of water resources due to climate change could be significant. In particular, we could assist in a drying up of water sources, which constitute the main resources in some rural areas of the country. Among a set of about 215 water tables in Tunisia, almost a quarter is located in the coastal area.

These coastal aquifers store about 290 Mm3, i.e. 40% (Project on Regional Development Planning, 2021) of the groundwater potential and almost 6% of the total water resources that can be mobilized in the country. Sea water intrusion into the coastal water tables will contribute to their progressive salinization, especially since many of these aquifers already show signs of degradation (salinization, overexploitation). Sea level rise could be responsible for the loss of 220 Mm3 of water resources, about 30% of the total groundwater potential and 75% of the phreatic resources.

III.3.2. Current State of Desalination Sector

Production capacity of desalination plants in June 2020 is about 250,000 m^3/day. So far, the number of desalination plants is 120 and the desalination plants for domestic water supply are mainly present in the South of Tunisia (Project on Regional Development Planning, 2021). Five desalination plants are operated by SONEDE as mentioned in the following figure.

The five plants owned and operated by SONEDE are in the southern part of Tunisia which is particularly short of potable water and where there has been huge growth in tourism. SONEDE has responsibility for the production and distribution of potable water to the people of Tunisia.

Because of the lack of adequate good quality water resources in the southern part of Tunisia it has resorted to building desalination plants. In southern Tunisia there are sources of brackish water and SONEDE has chosen the desalination of these resources

as the cheaper option rather than desalinate seawater. SONEDE produces 374 MCM/ year of which only approximately 1% is from the desalination plants.

Table 14. Desalination Plants Operated by SONEDE (Project on Regional Development Planning, 2021)

Desalination plants operated by Sonede -I

Station	Gabès	Djerba	Zarzis	Kerkennah	Bengardène	Total
Nominal Capacity (m^3)	30 000	20 000	15 000	3300	1800	70 100
Maximal Capacity (m^3)	34 000	20 000	15 000	3300	2000	74 300
Conversion rate	74 %	75 %	75 %	75 %	70	75 %
Raw water salinity	3,2 g/l	6 g/l	6 g/l	3.7 g/l	14g/l	-
Osmosis water salinity	300 mg/l	300 mg/l	500 mg/l	300 mg/l	300mg/l	-
Lines number	04	05	03	4	3	16
Modules number	1584	756+162	756	144	100	3 502
Commencement of Operation Date	June 1995	August 99+08/07	January 00	En 1983	June 13	-

It is important to note that the drinking water alone accounts for 60% of production capacity. The industry sector and Tourism use respectively 26% and 1.2% of the desalinated water production. About 34 % of the desalinated water is from seawater, 64% is from Brackish water and 0.8 from surface water.

Whereas Tunisia has been privatizing state companies under a large privatization programme since 1987, water supply and sanitation services are still provided in full by the Government. In a study carried out in 1999 by a consortium of Study and Idea Consult it was suggested that a number of activities could be contracted out under service-contract arrangements. In order to promote private sector involvement in the development of non-conventional water sources, an amendment of the Water Code (national water law) was adopted. wind and solar are the main focus and have potential application with desalination in rural areas.

The Agency foresees the application of wind turbine driven desalination plants for remote applications and the Solar energy is seen as a major resource.

Law no. 116 allows private parties to produce and distribute water, either for themselves, or for third parties, as long as the intended use of the water is for industrial or tourism purposes, and as long as the source of water is non-conventional, for instance; desalination. A financial incentive program is linked to this regulation to enhance the development of non-conventional water for the industry and tourism sector. Regarding the involvement of the private sector in the development of public infrastructure, there is a need to invest in education of SONEDE staff with regard to BOT tendering, contracting and monitoring skills. In this respect, much could be learned from international best practices, but also from Tunisia's experience in the field of BOT contracting in the electricity sector and wastewater sector.

The rate of use of unconventional water remains very low in Tunisia, it is around 2.8% and has been stagnating for several years (Project on Regional Development Planning, 2021). An evolution at this level is essential in order to gradually release Tunisia to an increasingly important level of unconventional water use and, in this way, to give this new resource an increasingly privileged place in the global system. The use, more and more accumulated, of unconventional waters, appears today in Tunisia as an unavoidable alternative to those which must be started to adapt now.

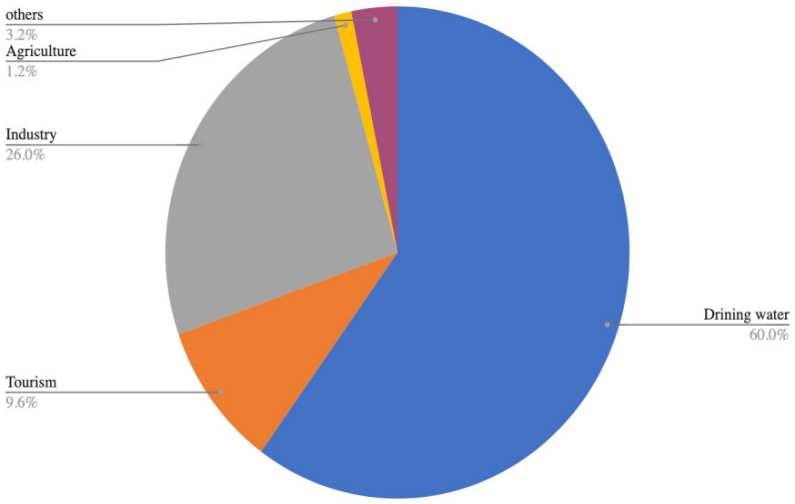


Figure 28. Distribution of Desalination Capacity by Usage in 2020 (Project on Regional Development Planning, 2021)

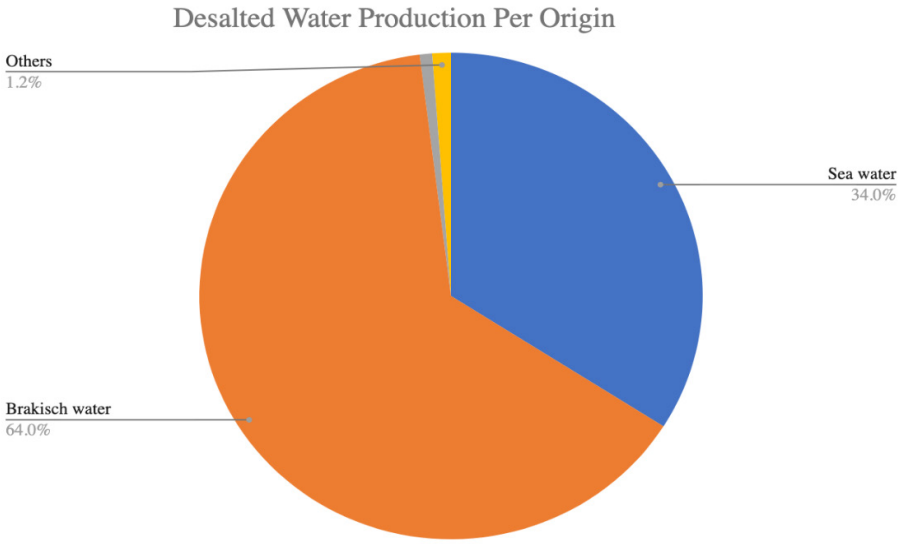


Figure 29. Desalted water production per origin in2020 (Project on Regional Development Planning, 2021) – Compiled by Neji, 2022

III.3.3. Programs for Improving Water Quality

Tunisia is implementing ambitious programs to improve water quality. The last program icarried out in 2 phases as mentioned in the following figures. The first one refers to regions with populations over than 4,000 habitants and where water salinity is greater than 2.0g/l. The second phase refers to regions where water salinity is between 1.5 g/l et 2.0 g/land population over 4000 habitants. The study is achieved and Tunisia is preparing the tendering procedure and there are some drilling startup works.

Table 15. First phase projects (Project on Regional Development Planning, 2021)

Programs for improving water quality

First phase projets (October 2017)

Governorate	Station	Capacity m³/day	Technology	Nombre lines	% progress rate
Tozeur	Tozeur	6000	OI	3*2000	100%
	Nafta	4000	OI	2*2000	100%
	Hezoua	800	OI	1*800	100%
Kébili	Kébili	6000	OI	3*2000	100%
	Souk Lahad	4000	OI	2*2000	100%
	Douz	4000	OI	2*2000	100%
Gabès	Matmata	4000	OI	2*2000	100%
	Mareth	5000	OI	2*2500	100%
Médenine	Béni Khédache	800	OI	1*800	100%
Gafsa	Belkhir	1600	EDR	2*800	100%
Total		36200			

Table 16. Second phase projects (Project on Regional Development Planning, 2021)

Programs for improving water quality

Second phase projets

Governorate	Station	Capacity m³/day	Technology	Number lines
Tozeur	Dégueche	2000	OI	2*1000
Kébili	Kébili extension	2000	OI	2*1000
Sidi Bouzid	El Meknassi-Mazouna-Bouzian	3000	OI	2*1500
Médenine	Ben Guerdane	9000	OI	3*3000
Gafsa	Gafsa Mdhila-Gtar-Metlaoui Redayef-Moulares	9000 6000	OI OI	3*3000 2*3000
Total		31000		

16

III.3.3.1. Sea water Desalination Program: Desalination Plant of Djerba

This project is in operation since 2018 and the main objective is to strengthen the capacity for water resources and improve water quality supply. The contracting method is the Turn-key. Basically the plant is operating with seawater as feed source and brine discharge. The desalination capacity is about 50,000 m3/day expandable to 75,000 m3/day using reverse osmosis technology. The produced water after being mixed with brackish water is stored then after the Deferrisation of the mixed water the desalination plant is connected to the distribution network.

III.3.3.2. Sea Water Desalination Program: Desalination Plant of Sousse

The main objective is to enhance the capacity for water resources and improve water quality supply in the Sahel region. The capacity is about 50,000 m3/day expandable to 100,000 m3/day and it will be achieved in two phases. The contracting method is the Turn-key.

The plant is operating with seawater as feed source and brine discharge. The desalination capacity is about 100,000[1] m^3/day using reverse osmosis technology. The desalination plant is connected to the Sahel distribution network (Sustainable development goals, 2021). The project is funded by the government and it will start in 2022.

III.3.3.3. Sea Water Desalination Program: Desalination Plant of Zarat

The main objective of the project is to foster the capacity for water resources and improve water quality supply for Gabes and Medenine regions until expiry of 2030. The Contracting method is The EPC. The plant is operating with seawater as feed source, desalination plant and brine discharge. Desalination capacity is about 100,000 m3/day using reverse osmosis technology. The project is funded by KFW and 65% of the work is supposed to be achieved in may 2021.

III.3.3.4. Sea Water Desalination Program: Desalination Plant of Sfax

In July 2017, SONEDE signed a loan agreement with Japan International Cooperation Agency (JICA) for JPY 36.7 million ($328 million) for a desalination plant at Sfax city (Tunisia's Sonede secures, 2021). The proposed plant will have a capacity of 100,000 m3/d, and the loan covers construction, procurement, installation of water transportation pipes, and consultation services including bidding assistance and construction supervision. The completion date is set for 2023.

III.3.3.5. Sea Water Desalination Program: Desalination Plant of Kerkennah

The main objective is to enhance the capacity for water resources and improve water quality supply for the Kerkennah Island. It is about well intake, desalination plant and brine discharge. The desalination capacity is about 6,000 m3/day using reverse osmosis technology and it is funded by Kuwait funds. This project is in progress and the tender has been prepared since the beginning of 2021.

III.3.4. Interactions With Other Sectors

Tunisian desalination plants are for brackish water; however, in the case of Gabes, for example, the water is discharged to the sea. The impacts are valid for sea discharges, and must be taken into account if future desalination plants have seawater as their feedwater. In Tunisia, it is notable that the existing plant at Gabes (a groundwater desalination plant) eliminates its wastes through approximately 10 km of pipelines into the sea; however, discharge from the pipe occurs in the dune area of the coast and not in an area where the brine would mix well into the sea.

This action could have an impact on surrounding groundwater quality, as well as organisms and the fragile habitat of the dune area. In Tunisia, one of the endangered species is the mother-of-pearl Pinna nobilis, a shellfish living in the Posidonia oceanica fields in the littoral zone. Posidonia ``herbaria" provide important benthic habitat for many different organisms; this plant is threatened by changes in saline levels and contaminants. Changes in brine concentrations may disturb this protected creature

III.3.5. SWOT Analysis

According to experts and from the above, the table below allows us to exploit these results by applying the SWOT analysis in order to synthesize the strengths and weaknesses of the Blue bioeconomy sector with regard to the opportunities and threats generated by its environment.

Table 17. SWOT Analysis For Desalination Sector

Strengths	Weaknesses
- Availability reduces vulnerability to droughts. - Great development for urban uses and for agriculture uses in Tunisia. - Allow increasing quality in water blending. - Thermal desalination processes are mature. - Diversity of technologies and their required temperature.	- High energy consumption and water price. - Agronomic concerns. - It should be mixed with other water sources. - Fluctuating demand depending on availability of other water resources. - Brine discharges. - Lack of water conveyance and regulation infrastructure. - Temperature of geothermal well may be more suited to certain desalination technologies compared to others. - Environmental impact of rejecting the brine. - Water footprint.
Opportunities	**Threats**
- Growing desalinated water for agriculture uses. - Limitations on the continuity of water transfers and ground water extraction will favor desalinated water expansion and aquifer recovery. - Foster local stakeholder involvement in decision making processes. - Desalination systems efficient even at small-scale. - Autonomous plants for rural and isolated communities. - Socio-economic impact and stability of the local communities. - Promote development and encourage research on Renewable Energy systems.	- High greenhouse gas emissions. - Urban water tariffs increases could aggravate situations of water poverty. - Unsustainable irrigable surface growth. - Manipulating brackish water having high salinity is corrosive for wells and plants. - Climatic conditions in desert regions are hard. - Rural and desert regions are difficult to access. - Desalination cost. - Risk of salt concentration of the groundwater.

IV. Initiatives to promote sustainable Blue Economy in Tunisia

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 the pandemic of COVID 19 being very difficult. The implementation of the SDGs in Tunisia began with the adoption of the first post-revolution development plan (2016-2020), and 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 with a view to strengthen its legislative and regulatory framework (UNCLOS, CBD, MARPOL, UNFCCC…). The international treaties are mentioned in annex I and in the following below. In addition Tunisia is a partner in many mediterranean initiatives: Westemed Initiative, Switchmed Initiative and in many projects: ENSAMBLE,Blue Hope,Bycatch,Blue Roses, Blue Adapt, Italy-Tunisia maritime cluster…

Table 18. Relevant frameworks for Blue Economy (Kolesnikova, 2019)

Short name	Long name	Link with Blue Economy
UNCLOS	United Nations Convention on The Law Of The Sea	Legal framework for all marine and maritime activities
CBD	Convention on biological diversity	Aichi biodiversity targets
MARPOL	International Convention for the Prevention of Pollution from Ships	Preventing and minimizing pollution from ships
UNFCCC	UN framework convention for Climate change	Paris Agreement
Agenda 2030	Sustainable Development Goals (SDGs)	SDG 14: life below water
West-Med	Western Mediterranean Blue Economy Initiative	Goal 2: a smart and resilient Blue Economy
MSSD 2015-2026	Mediterranean Strategy for Sustainable Development	Objective 5: Transition Towards Green and Blue Economy
ICZM	Integrated Coastal Zone Management	Sustainable Management of Coastal Areas
SCP-AP	Sustainable Consumption and Production Action Plan	Shifts towards circular economy

IV.2. National Plans and Projects for Fisheries & Aquaculture

In order to maintain a sustained fishing effort and reduce the growing pressure on fishery resources, the public authorities have been pursuing a policy of developing aquaculture in Tunisia for more than thirty years. To reduce the fishing effort on fisheries, particularly benthic, Tunisia has developed aquaculture, XIth plan of development, by the Ministry of Agriculture, Hydraulic Resources and Fisheries in 2007 (Project on Regional Development Planning, 2021). Indeed, the fishing effort has been reduced by 30 % since 2010 (Ecotourism and artisanal fishing in Kerkennah, 2021).

In addition, Tunisia has put in place a national strategy allowing the aquaculture sector to achieve a production equivalent to 10% of the total fishery production in 2016 (O'Neill, A. 2021). Recreational fishing which has impacts on marine biodiversity and fisheries are not studied well in Tunisia. In addition, the latest study concerning the elaboration of the national strategy for fishing and aquaculture in Tunisia (2016-2026), proposes an action plan for the period 2016-2026, with several actions aimed at minimizing the alterations and impacts of fishing on the marine environment, and those notably at the level of its "component 1" corresponding to "Fisheries Management (JORT n° 80 du 6 octobre 1995). Tunisia Set up in 2019, in collaboration with the various stakeholders in the aquaculture sector, a strategic study of aquaculture by 2030 which translates into an aquaculture production of 60,000 tonnes (DGPA, 2015).

Tunisia has drawn up and funded a national plan to promote crab fishing, development and marketing in the Gulf of Gabes. Faced with the weakness of internal demand, the orientation towards the export of crab stands out as a pertinent alternative to explore. This project aims to develop an action plan in order to enhance the marketing of the blue crab on a national and international scale in the northern region of Tunisia, precisely in the lagoons of Bizerte and Ghar El Melh (Mili, S., 2021). The creation of new jobs and the improvement of incomes for the vulnerable populations of the two communes of Menzel Abderrahmen and Ghar El Melh are the main expected results of this project.

Tunisia adopted the Tangem initiative (Ecotourism and artisanal fishing in Kerkennah, 2021). It was initiated in 2015 and aims to safeguard an artisanal fishing technique called Charfiya in Kerkennah. This ancestral technique involves fishing with palm leaves that are cut and arranged in water in V-shapes, forming a path. These paths lead the fish to the capture chamber, the traps (named drina in Tunisia), where fishermen collect the different types of trapped fish. Believing that Kerkennah has the potential to become a destination of interest for visitors, the TNAGEM initiative is dedicated to the development and promotion of ecotourism and sustainable artisanal fishing in the archipelago. TNAGEM contributes to the economic development and the efficient management of the natural resources of the Kerkennah Islands.

Tunisia is involved in the blue hope project and the main objective of the blue hope project is to contribute to improving the economic and social sustainability of artisanal fishing. Indeed,the program focused on two essential components; on improving the

physical, economic and social environment of the port of Zarzis and on the promotion of income-generating activities for women of different rural localities.

Tunisia is involved in the blue adapt project. The general objective of the BLEU-ADAPT project is to contribute to the sustainable development of coastal areas and conservation of natural habitats in the Mediterranean and this by improving management actions of the invasive resource, in particular in affected areas (Adaptive governance creates blue growth in Finland, 2021). For instance, the support for the national Strategy for the reinforcement fishing and valuation of blue crab in the gulf of Gabès (2017 - 2020). In addition, with the initiative of various stakeholders of small-scale fisheries, co-management of fisheries are established and adopted in the neighboring fishing ports, landing sites and shelters along the coast of Gulf of Gabes in the framework of the cooperation of the Japanese-Tunisian cooperation (COGEPECT/2012 - 2016).

IV.3. National Plans and Projects for Maritime and Coastal Tourism

Tunisia is involved in the ENSAMBLE project and it promotes sustainable tourism by enhancing the local territory, environmental and cultural resources and traditions linked to the sea and fishing with the participation of local communities, young people and women and the creation of pilot projects(Project, 2021). The Project sites in Tunisia are the Town of Tabarka and the City of Haouaria.

Tunisia has adopted the Jasmin Strategy on Economic and Social Development and a National Climate Change Adaptation Strategy for the Tourism Sector in 2010. In the context of the Xth Plan, the strategies of development of tourism are based on the use of all growth opportunities, developing niches, upgrading human resources and strengthening training professional upgrading of tourism businesses to improve the quality and competitiveness of the Tunisian tourism.

Tunisia has paid special attention to tourism development which allowed it to be ranked number one destination from 124 in 2007, in priority to tourism development in the report of the World Economic Forum on tourism competitiveness (Mazanec and Ring, 2011). This attention has materialized through the definition of strategic directions, through the five-year plans of socio-economic development of Tunisia and the quantitative targets and budget resources to achieve them.

In fact, the strategic development of tourism in Tunisia is based on four main routes:

- improving the quality of servuction;
- the improvement of infrastructure and maintenance of the tourism environment;
- the diversification and enrichment of touristic product and the positioning on promising markets; …
- the consolidation of the private sector role in tourism and attracting foreign direct investment.

In addition, Tunisia adopted a National Water Strategy for 2050 and a National Strategy for Coastline adaptation to Climate Change in 2012.

IV.4. Waste Management

Tunisia has a small separate collection system for packaging waste called ECO-LEF (Tunisia ECO-LEF, 2021).

ECO-LEF is a public-private partnership developed in 2001 to generate value from packaging waste. It includes 180 collection micro-enterprises and 55 sorting and collection points. Waste materials are then sold to local recyclers, who recycle about 70% of collected waste. "ECO-LEF" is financed by a mandatory contribution by packaging producers, and a 5% eco-tax paid on the imported plastics. In 2010, 14 kT of plastic were collected through this system, yet this dipped in 2011 following the revolution. Since 2001, the system has collected almost 150kT of plastic, and generated 18,000 jobs.

It should be noted that in Tunisia a major programme to rehabilitate and improve the performance of the national sanitation network (2018-2028) is currently being implemented. This programme aims at improving the capacities and performances mainly of the network of coastal treatment plants and its waste are discharged into the marine environment. Among other things, the programme aims to improve the effectiveness of the quality of discharges required of the transaction to the standard in force and the draft standard, and to ameliorate the effectiveness of the control of Industrial Wastewater.

IV.5. Blue Bioeconomy

Tunisia is involved in the SUREFISH project which works on innovative solutions to valorise traditional Mediterranean fish by fostering the supply-chain innovation and consumer confidence on fish products through deploying harmonised solutions and protocols to achieve unequivocal traceability necessary to confirm their authenticity (Lamparte, A., 2020).

Tunisia adopted many policies to support research and education and promote spin-offs and collaborative biotechnology research between industry and public research, through the Tenth Economic and Social Development Plan (2002-2006) stated for the creation of 6 technopoles in the country. In addition, Tunisia took many initiatives to support business courses in university degrees in biotechnology, through the creation of Higher Institutes of Biotechnology, where biotechnology applied to different themes is taught. Tunisia is fostering entrepreneurship through fiscal incentive, for the exploitation of public technology research.

IV.6. Water Resources

The «Stratégie du Secteur de l'Eau en Tunisie à long terme (Long-term water sector strategy in Tunisia; 2030) - EAU XXI» that was published in 1998 by the Ministry of Agriculture gives a clear overview of the water balance of the country (Eau XXI, 2021). The report includes the water balance of 1996 and provides projections for 2010, 2020 and 2030. The most important figures regarding water resources and water demand

have been compiled there. Tunisia has launched ambitious programs of desalination. Indeed, an appropriate design of desalination units could be a solution for small communities and agriculture to thrive. In Tunisia, the reuse of treated wastewater for irrigation became progressively a viable option with the development of the treatment wastewater facilities as well the water supply reliability, and the implementation of the waste-water treatment station across the country highly reinforced the capabilities of the wastewater reuse plan in Tunisia.

IV.7. Renewable Energy

Tunisia has decided to embark on an energy transition process as part of its wider sustainable economic and social development strategy (Hamedi, Z. et al, 2021). Amid the coronavirus outbreak in early 2020, renewables and energy efficiency have become a key part of the country's recovery plans.

The implementation of the energy management strategy is built on the increase of two components: the energy efficiency and the development of renewable energy, with a 30/30 target. Tunisia is planning to reduce primary energy demand by 30% in 2030 compared to the trend scenario and increase renewable energy to 30% of the electricity production by 2030.

The energy-saving action plan for 2017-2030 represents a total investment of 27.1 billion dinars, equivalent to 11.3 billion US dollars. The measures of this Action Plan address energy efficiency (EE), renewable energy (RE) development, and energy efficiency for the following sectors: industries, tertiary and residential buildings, transportation, public lighting and agriculture and fisheries. The energy efficiency mitigation goal was based on a bottom-up approach by aggregating the CO2 reductions expected by different measures, which would represent an emission reduction of around 11.2 MtCO2 by 2030 according to the baseline scenario (BaU). These reductions would come from the energy efficiency in buildings including the tertiary sector, residential and public lighting (56%), industry (32 %) and transportation (11 %).

IV.8. Climate Change

Tunisia is developing national strategies on climate change and is involved in many projects for instance; the Coastal Resilience project (2015 - 2020).

This project is carried out by APAL in partnership with the United Nations Development program (UNDP). Its objective is to promote strategies, adaptation of technologies and innovative financing options to face the risks involved by climate change on the populations and the main socio-economic sectors in the most vulnerable coastal areas of Tunisia.

The pilot areas concerned by the project are the NorthWest coast of the Gulf of Tunis (Sidi Ali El Mekki) and the East zone of Djerba. The main components of the project are:

- Institutional capacity building of partners,
- The implementation and dissemination of innovative measures to reduce climate risks in two pilot areas,
- The establishment of innovative and sustainable economic instruments that will be integrated into the national policies to encourage a change of scale measures in coastal adaptations.

In addition Tunisia is setting ambitious targets to reduce Greenhouse Gas emissions (GHG):

1. Reduction of the carbon intensity of the economy of about 60% in 2030 compared to 2009 levels;
2. Stabilization of the GHG emissions by 2050.

V. Main challenges for applying sustainable Blue Economy in Tunisia

V.1. Introduction

The main challenges for achieving Sustainable Blue Economy in Tunisia refer to critical environmental, social, and economic issues that need to be addressed by the Blue Economy.

In general, the Main challenges are:

- Loss of biodiversity and marine ecosystem, essential to food water and livelihoods provisions, accelerated by climate change, unsustainable tourism and harmful fisheries practices;
- Lack of governance and enforcement,
- Food insecurity caused by overfishing, low participation of aquaculture in fisheries production.
- Poor ports infrastructure.
- Water stress.
- Waste management.
- Climate change impacts on natural ecosystems and vulnerable islands (Djerba, Kerkennah).
- Environmental marine pollution and untreated wastewater, marine litter mainly in the Gulf of Gabes.
- Lack of jobs, inadequate skills, social inequity and increasing poverty in a country with a high unemployment rate, in particular among youth; approximately 17.4% (O'Neill, A. 2021).

V.2. Fisheries & Aquaculture

The major challenges facing the fishing sector in Tunisia are the fight against the spread of unreported and unregulated illegal fishing. In addition, the control of the exercise of fishing activity and the fight against maritime pollution, in particular plastic and chemical pollution. Thus, we can meet three levels of challenges related to the fishing and aquaculture sector21, mainly (Tunisie, Ministére du Transport., 2021):

- Governance of fishing activity and port infrastructure.
- The regulation of fishing practices and the protection of the marine environment.
- The low participation of aquaculture in the total production of fishery products.

V.2.1. Governance of Fishing Activity and Port Infrastructure

In Tunisia, we are witnessing an administrative framework of limited effectiveness characterized by the doubling of missions and poor coordination between the different actors as well as a cumbersome decision-making procedure. This is due to the fact that the structures involved at the regional level and under the supervision of the "*Commissariat Régional de Développement Agricole* (Regional Commissary for Agricultural Development - CRDA)", are not directly and hierarchically linked to the structures in charge of the management of the sector.

In addition, the CRDA, through the intermediary of the fishing districts, have been entrusted with a multitude of tasks related to the fishing activity, the most important of which concern the control of fishery products landed in ports as well as the management of fishermen. The CRDAs are not supported by the human and financial resources to carry out field inspections and verify the reliability of the data on the quantities recorded on the production sheets drawn up by the owners of the fishing vessels. In addition, the information system that covers this sector, in particular with precise data on the movements of the fishing fleet at sea and between fishing ports, seems weak in order to transmit updated information on fishing violations in real time. This had a negative impact on the activity of the fisheries administration in particular and on the productivity of the sector in general.

Similarly, the port chain suffers from the aging of infrastructure and port facilities. That is why there is an imbalance between port activities. Some ports, due to their capacity and the availability of equipment, are often saturated and overexploited, to such an extent that other ports remain inactive, which has consequently impacted the quality of port services. This phenomenon affects the governance of the ports which their management and maintenance are entrusted to the "Agence des ports et des installations de pêche" (Ports and Fishing Facilities Agency - APIP), which in turn faces enormous technical and financial difficulties due to the high cost of the maintenance and renewal works of the ports in order to meet the needs of the sector.

V.2.2. The Regulation of Fishing Practices and Protection of The Marine Environment

The second level concerns fishing activity and the marine environment where there is a persistence of infringements and an increase in fishing violations. Indeed, this level can be considered a social level because a large segment of the population depends on it. It should also be noted the unruly increase in the number of boats, fishing gear that does not comply with the regulations in force. In addition, the fishery wealth, in particular in the region of the Gulf of Gabes, has continued to decline following an anarchic and excessive overexploitation of marine stocks which does not take into account the periods of biological rest to ensure the renewal of maritime wealth.

On the other hand, in Tunisia there is the prohibited use of fishing tools harmful to the marine environment such as; nets whose meshes do not comply with the regulations.

There is a massive use of traps made of plastic (for fishing for octopus, crabs...) and abandoned at the bottom of the sea by fishermen. Their repercussions are enormous on biological diversity and in particular on the health of consumers.

V.2.3. The Low Participation of Aquaculture in the Total Production of Fisheries Products

The third level concerns the aquaculture industry. Indeed, the participation of aquaculture in the total production of fishery products is considered low. This is due to the absence of reliable statistics combined with a low representativeness of the structure which supervises the development of this activity. In addition, the current legislative framework governing aquaculture appears insufficient and needs updating to respond to progressive developments. Thus, several problems encountered by the activity of aquaculture and the protection of the marine environment are highlighted. For instance, those related to fish farms in which several violations were recorded for exceeding the authorized area, changing location without prior authorization and expiration of the validity of the license.

Similarly, these practices can also adversely affect the environmental situation at sea due to the fact that some aquaculture sites are close to each other, which has a negative impact on the marine environment. It threatens the interests of fishermen, in particular traditional fishing.

V.3. Oil & Gas field

Tunisia is witnessing an exacerbation of the energy deficit that has increased since 2000 and has grown steadily, putting more pressure on the state budget. In addition, social and environmental demands, in particular those which have taken place in the regions producing oil assets, have contributed to the improvement of this situation of energy deficit, due to the fact that these movements have sometimes reached the point of stopping the production of the majority of the so-called important oil and gas fields.

The challenge is that the government has to further rationalize energy consumption and promote its energy efficiency policy and adopt renewable energies as alternative energy and has to meet the new needs of citizens, in particular the improvement of the quality of life, the creation of jobs and the achievement of a fair balance between the regions.

The energy sector is seen as one of the strategic sectors whose impact is inevitable on the security, stability and economic and social development of the country. This therefore requires a multidimensional and comprehensive vision in order to achieve the strategic objectives set by the state.These objectives aim in particular to obtain energy in good conditions, to contribute to economic development and also to protect the marine environment. We can cite some of the challenges facing the energy sector which are manifested by four main axes (Meddeb S. , 2014): Development of oil and gas resources, cover at least 30% of primary energy needs; promotion of energy efficiency and renewable energies; protection of the marine environment.

V.3.1. Development of Oil and Gas Resources

The first axis concerns the development of national oil and gas resources:

- Encourage foreign investment in research, exploration, and exploitation of hydrocarbons.
- Diversify the sources of natural Gas supply in order to put in place a national policy to exploit Tunisia's geostrategic position in the Mediterranean to activate its role as a gateway to natural Gas trade (transit and transport).

V.3.2. Cover at Least 30% of Primary Energy Needs

The second axis concerns the control of national policies for strengthening the infrastructure for the transport, distribution, and storage of petroleum products. The main objective is to cover at least 30% of the primary energy needs of the national market with a quality adequate to that provided by the requirements of international standards, including those relating to the preservation of marine environments.

This requires the establishment of an in-depth study on the future directions of the energy sector and an investment program to ensure the rehabilitation of means of transport, production on the one hand, and to build capacity storage of oil assets in the medium and long term on the other hand.

V.3.3. Promotion of Energy Efficiency and Renewable Energies

The third axis is linked to the promotion of energy efficiency and renewable energies. The ultimate goal of this axis is to increase the contribution of renewable energies in the production of electricity to 30% by 2030. This increase must be at the level of 3.8 gigawatts additional of the capacity of renewable energies already produced in Tunisia.

Similarly, the policy of the State must also be oriented to develop the level of exchange of electrical energy between the neighboring countries with Algeria, Libya and those bordering the north of the Mediterranean basin, in particular with Italy. In this context, the Blue Economy approach offers the possibility of adopting offshore renewable energy technology which requires the establishment of an appropriate regulatory framework.

V.3.4. Protection of environment

The last axis concerns the protection of the environment, in particular the marine environment in which the installations of the Oil and Gas industry are located. Indeed, development policies for this activity must integrate tools for the protection and conservation of the marine environment, in particular for offshore oil fields because the risks of pollution by hydrocarbons are considered significant. This activity can affect marine species and the entire food chain as well as marine protected areas under direct threat of pollution from an oil spill. In this context, hydrocarbon exploration and

exploitation work can generate both chemical pollution by accidental oil spills and unexpected leaks during exploration and exploitation work and which are amplified over time. At the same time, there is intense noise pollution during drilling. These threats have an inevitable impact on maritime biodiversity. It will disrupt marine ecosystems, kill and migrate a wide variety of marine species.

V.4. Maritime Transport

Given its important role in the field of foreign trade, the maritime transport sector is considered as one of the vectors of growth and economic development of the country covering 98% of trade (MTL, 2021).

The main objectives to be achieved are to ensure the treatment of ships and to offer port services under good conditions to reduce the cost and time of transit as well as to strengthen the competitiveness of Tunisian commercial ports in order to attract foreign investment. Most indicators have shown a downward trend over the years despite the reforms adopted and the development efforts made. The maritime transport sector still suffers from certain shortcomings such as the low contribution of the national fleet to commercial traffic and the low job creation in terms of related trades, as well as the aging of ports and port facilities and the increase in the cost of maritime transport. Therefore, the main challenges facing the shipping industry can be grouped into three main levels: the low contribution of Tunisian carriers to maritime trade, aging of the port chain, protection of the marine environment against pollution generated by the maritime transport sector and the low contribution of Tunisian carriers to maritime trade.

V.4.1. The National Fleet

In fact, the reduction in the capacity of the national maritime fleet and the low participation of Tunisian carriers in maritime trade has many consequences. Firstly, it affects the stability of the foreign exchange reserves of the balance of payments because about 89% of exchanges are ensured by foreign carriers remunerated in foreign currencies. Secondly it affects job creation, in particular in related services linked in particular to maintenance and shipbuilding. In this context, future directions consist of encouraging investments to develop the national fleet under modern conditions and adapted to international commercial traffic. As a result, there will be an increase in the volume of commercial exchanges for the benefit of Tunisian carriers and to minimize dependence on foreign carriers.

In addition, state policy should encourage private sector partners to invest in the fields of shipbuilding and maintenance in order to attract foreign ships to carry out their maintenance operations and promote the creation of new positions of work.

V.4.2. Ports Poor Infrastructure

In reality, according to a report published by the World Bank, the physical constraints of commercial ports, in particular in terms of drafts, which in some ports do not exceed 9.75m for container ships and 11.8m for bulk carriers, negatively affect the development of the maritime transport sector (Banque mondiale, 2016). Also, most of the ports are old and surrounded by towns, because they do not have expansion possibilities. This situation is combined with the complexity of administrative and customs procedures as well as weak integration by land transport networks, in particular by spokes and logistics areas, which consequently weakens the competitiveness of the sector at national and Mediterranean scales.

Thus, State policies aim to continue the rehabilitation and development of ports according to their technical specificities as well as to set up port infrastructures adequate to the requirements laid down by international and European standards. This supports the safety and security of maritime navigation and also protects the marine environment against pollution.

In addition, it becomes necessary to adopt a pricing policy to attract more maritime traffic by exploiting Tunisia's geostrategic position at the crossroads of the Mediterranean. Tunisia must adapt the regulatory framework governing the maritime transport sector and ports to the provisions of international agreements, in order to ensure Tunisia's integration into Euro-Mediterranean policies, in particular in the integrated maritime policy and in the Blue Economy approach.

V.4.3. Protection of the Marine Environment Against Pollution

Indeed, state policies will have to take into account the pollution generated by commercial traffic. In this context, maritime traffic affects the quality of marine environments mainly through polluting chemical discharges and engine noise disturbing marine fauna, which can in some cases cause the abandonment of marine mammals or modify their behavior, particularly in areas with heavy maritime traffic along the coast.

V.5. Maritime and Coastal Tourism

Despite the results obtained, the tourism sector still suffers from several problems, two of which we can cite as focal points such as the seasonality and the concentration of this activity on the coast. Indeed, the tourism sector, in particular seaside tourism, has been considered the privileged sector of Tunisian state policies since the 1960s. The majority of non-resident arrivals are during the two months "July and August" of each year because of the climatic factors which characterize them. Thus, it represents on average more than 35% of the number of annual nights (Dribek, A., 2015).

Likewise, seaside tourism has remained the main motivation for tourists and most of the tourist centers are located along the coast. This flows from the tourism policy and model adopted, from the fact that the coastal regions are characterized by a concentration

of tourist centers and those fall centers are organized on the coast around the beaches. This consequently generates a concentration of the tourist clientele, both in space and in time. It can generate new constraints which affect the quality of the services provided, the profitability of the tourist activities. In addition, it affects the coastal zone and the marine environment.

As a result, we can see that the impact of tourism on the natural space in Tunisia manifests itself at several levels; the impact of tourism on the coastal zone, the impact of tourism on the environment.

V.5.1. The Coastal and Maritime Landscape

Most of the tourist activities such as swimming, sunbathing on the beaches, surfing, fishing, water sports are concentrated on the coastline. They contribute to the gradual deterioration of the marine environment. In addition, this type of mass tourism requires so many resources, including energy, food products, primary resources as well as the availability of freshwater, which is already a major challenge in Tunisia. Indeed, during the tourist peak, water resources, in particular withdrawals from groundwater are subject to overexploitation by the tourist industry due to the needs of certain leisure activities requiring water.

V.5.2. The Impact of Tourism on the Environment

In addition, the coastline and the marine environment are exposed to several sources of pollution and waste generated not only by this type of tourism but also by the urban concentration due to the increase of the population in the coastal areas. In this regard, we can cite solid waste and the contamination of freshwater and seawater by massive discharges of wastewater which also affect maritime biodiversity.

It should be noted that the impact of the environment on the tourism sector is important as the quality of the environment offered to border arrivals is an essential component in setting the price of the target destination. On the contrary, it results in lost revenue for the hospitality industry. In addition, the Office National du Tourisme Tunisien (Tunisian National Tourist Office (ONTT) is called upon to implement state policy in the field of tourism in order to improve competitiveness and support the sustainable development trajectory of the tourism sector. Thus, its main mission is to promote the quality of products and services which has become a key issue in overcoming the challenges of the environment and competition in order to attract tourists with high purchasing power for the benefit of the Tunisian market. In addition, it becomes necessary to adopt strategies to promote the image of Tunisia. This is by diversifying the tourist offer and by reducing the seasonality of the market and its dependence on international markets, that charge tourist movements as well as overwhelm new high value-added markets.

V.6. Waste management

Currently in Tunisia, there is a worrying deterioration in terms of solid waste management in both urban and rural areas, as evidenced by the proliferation of solid waste dumps and blackheads. Indeed, the current environment offers a pitiful spectacle with wild accumulation and the invasion of waste of all types along the roadways, sidewalks, in rivers, in urban parks, in the coast, in and green spaces, on the talus slopes and in the unbuilt land. The causes are multiple as mentioned below:

- Dissolution of municipal councils.
- Strikes by municipal workers demanding better working conditions.
- Closure of disposal facilities being challenged by the local population.
- Lack of information and communication plan adapted to the crisis.
- Total absence of enforcement and monitoring.
- Economic crisis in Tunisia since 2011.
- Unwillingness of the private sector to invest in waste management.

VI. Measures to promote sustainable Blue Economy in Tunisia

VI.1. Introduction

The Blue Economy covers a wide range of sectors with significant potential synergies in terms of activities related to the sea and integrated coastal management. The sea is an inter-ministerial object by nature supporting a large number of complementary and competing activities which form part of an extremely varied discipline. It has become essential to translate these questions linked to the governance of the sea into a governmental organization bringing together all the skills of the different ministries.

Indeed, we can identify more than 40 types of activities and procedures closely related to the sea and whose management includes many structures and institutions to carry out different actions. In the following table, we will present the different actors involved in the governance of maritime space and coastal areas in Tunisia beside the maritime cluster.

Faced with its international commitments, the Tunisian State has developed an exhaustive legislative and regulatory arsenal for the various aspects related to the sea, such as the management of maritime activities and public domain, the fight against pollution of marine environments and the protection of biological diversity. These texts are largely influenced by international developments and the directives of ratified international conventions. In the following, we will present the most important ones.

Table 19. Key stakeholders for marine governance in Tunisia

Ministry of National Defense	Ministry of Agriculture	Ministry of Interior affairs	Ministry of Tourism
- National Service Coastal Surveillance - Tunisian Naval Academy - Hydrographic and Oceanographic Service	- Ports and Fishing Facilities - INSTM - General Directorate for Fisheries and Aquaculture (DGPA) - Higher Institute of Fisheries and Aquaculture - Aquaculture Tech Center	- National Maritime Guard	- Ports of Pleasure - AFT, - ONTT
Ministry of Environment	**Ministry of Transport**	**Ministry of Industry**	**Ministry of Finance**
- ANPE, - APAL, - OTEDD, - CITET, - DHMPE	- DGMM, - DGPE, - OMMP, - CTN, - STAM	- ETAP, - DGE, A - FI	- Customs

VI.2. Laws and Regulatory Texts Relating to the Delimitation of Maritime and Coastal Borders

In addition, the public maritime domain is governed by the law n ° 95-73 of July 24, 1995, relating to the maritime public domain as modified by the law N° 2005-33 of April 4, 2005. This law stipulates, according to its article first, that the maritime public domain consists of the natural maritime public domain and the artificial maritime public domain.

Mention should also be made of decree N° 2000-1687 of July 17, 2000 establishing a national commission for the law of the sea attached to the Ministry of National Defense. Thus, any question falling within the area of the law of the sea is now submitted to the aforementioned commission for an opinion. Its missions extend, under Article 1, to the study and monitoring of developments in the law of the sea through state practice and case law. It also covers the collection, conservation and archiving of documents relating to the law of the sea in general and the delimitations of maritime borders in particular.

In addition and in accordance with the provisions of article 2 of this decree, the commission is chaired by the Minister of National Defense or his representative the Chief of Staff of the Navy and is made up of representatives of the various ministries involved in areas related to the sea.

Forms part of the natural maritime public domain and in accordance with the provisions of the United Nations Convention on the Law of the Sea as described in the previous part, Tunisia has established an Exclusive Economic Zone (EEZ) under Law No. 2005-50 of June 27, 2005 after long Tunisian-Algerian negotiations and those still in progress with the government of the Italian Republic with a view to delimiting its maritime borders.

By virtue of article 1 of the said law, Tunisia reserves the right to exercise, in this zone, its sovereign rights as well as all other competences provided for by the United Nations convention.

The width of the EEZ extends over 200 miles provided for by international law and the limits, if any, will be determined by agreement with the neighboring States concerned in accordance with the provisions of Article 3. Moreover, this law provides the possibility of creating more restricted areas of competence by regulation such as reserved fishing zones, fishing protection zones or ecological protection.

However, the negotiation process with the Italian government seems longer and more complex due to the fact that the latter is opposed to the institution of EEZs in the Mediterranean, and that it considers unacceptable the use of the delimitation line fixed for the continental shelf as single line (Submarine Cable Map, 2021).27. In addition, it should be noted that the delimitation of the continental shelf was established according to the agreement concluded between the two countries in 1971 and ratified by the Tunisian government by law n ° 72-16 of 10 March 1972.

VI.3. Laws and Regulatory Texts Relating to Fishing and the Conservation of Biological Diversity

Fishing and aquaculture activities are governed by Law No. 94-13 of 31 January 1994 relating to the exercise of fishing and all the texts which they have amended or supplemented. The main objectives of this law are to rationalize the exploitation of fishery resources, to organize the fishing effort and to conserve and protect the marine environment.

Having established general provisions relating to the organization of fishing, the law emphasizes fishing offenses and, in Chapter VII, refers to aquaculture under the term fixed fisheries.

The conditions for granting authorizations for the exercise of fishing are fixed by regulation, of which we can quote in this context, those most important such as the decree n ° 95-252 of February 13, 1995, fixing the conditions for granting fishing authorizations and the related fees, and the decree of the Minister of Agriculture of September 28, 1995 regulating the exercise of fishing as amended and supplemented. The provisions of the said decree regulate in particular the issuance of authorizations for the exercise of fishing and aquaculture, the organization of fishing effort and operations and similarly the fishing periods and the characteristics of fishing gear.

Thus, the law includes a multitude of measures to protect fishery resources according to which the competent authorities are empowered to define, by regulation, the list of gear prohibited for fishing and whose possession is prohibited on board fishing vessels. Likewise, the competent authority may, after consulting the advisory committee, prohibit the practice of fishing in the target sea areas and during specific fishing periods. These, determined by regulation, are called biological rest periods. The objective of which is to allow the restitution of stocks of aquatic resources. However, in recent years there has been a decline of fishery resources due to the pressures inflicted by this activity, and the gradual degradation of biodiversity, particularly in the south of the country. An alarming spread of pollution in marine and coastal environments is noticed too.

To deal with such a situation, we can cite in this context, Law n ° 49-2009 of July 20, 2009 relating to marine and coastal protected areas which, according to its first article, aims to create maritime or coastal areas with a view to protect and preserve biodiversity in marine and coastal environments as well as to the use of their resources within the framework of sustainable development. The questions related to the creation and delimitation of marine and coastal protected areas are submitted for the opinion of the National Council of Marine and Coastal Protected Areas provided for by the said law.

In addition, Tunisia ratified the Convention on Wetlands (Ramsar, Iran, 1971) and the Northwest Gulf of Tunis and Djerba have wetlands in the Ramsar List of Wetlands of International Importance.

The creation of marine and coastal protected areas is set by regulations. This is carried out following a public inquiry led by an investigating commissioner appointed by the

minister responsible for the environment and whose management is entrusted to the coastal protection and development agency (APAL) according to the Articles 9, 10, 11 and 22 of the said law. We can cite as an example, the decree of the Minister of the Environment of May 12, 2020, relating to the conduct of a public inquiry establishing a marine and coastal protected area in the two islands of Kuriat in the governorate of Monastir.

VI.4. Laws and Regulatory Texts Relating to the Fight Against Marine Pollution

Since the 1990s, Tunisia has become aware of the importance of protecting marine environments and combating marine pollution. Several measures have been taken to succeed in its engagement with the international community and to cope with the progressive degradation of biological diversity caused in particular by the spread of massive marine pollution. We can cite as an example the promulgation of Law N° 96-29 of April 3, 1996 establishing a National Urgent Intervention Plan (PNIU) to fight against marine pollution (JORT N° 29 of April 9, 1996).

The main objective of this law is to set the framework and the mechanisms of rapid and effective action allowing the public authorities to protect themselves against pollution from hydrocarbons and other harmful products, the repercussions of which are serious on the marine environment.

According to article 4, the law provides for the creation of a National Commission for the Prevention and Fight against Marine Pollution Events (NCPFMPE), its role is to decide on the appropriate methods and measures to fight against Pollution.

The NCPFMPE is chaired by the Ministry of the Environment and in the event of massive marine pollution, the latter assumes the role of national coordinator for the implementation of the national emergency response plan and takes all necessary measures in terms of coordination, interventions, and mobilization of material and personal resources. Similarly, this law provides under article 8 for the creation of a regional committee chaired by the governor of the region.

Regarding the pollution affecting the coastline, the governor assumes the role of coordinator at the regional level with regard to pollution control interventions on land and those in collaboration with other stakeholders at sea and on land.

VI.5. Laws and Regulatory Texts Relating to Maritime Transport

As part of the established activities of the blue economy, maritime transport is considered the backbone of Tunisia's foreign trade. With around 98% of foreign trade carried out by sea, maritime transport has undergone several reforms and is governed by a large body of laws and regulations in order to keep up with the progressive evolution of international circumstances.

Indeed, maritime transport is governed by the maritime trade code promulgated by law n ° 62-13 of April 24, 1962, promulgating the maritime trade code and the texts which they have modified or supplemented, covering the various aspects concerning ships, the maritime navigation regime and risks at sea. In addition, we can also quote the code of the administrative police of maritime navigation promulgated by the law N° 76-59 of June 11, 1976 governing the administrative regulation of ships as well as the navigation regime and penal provision.

VI.6. Laws Relating to Maritime Public Domain

Law 95-72 of 24/07/1995 (Domaine Publique Maritime, DPM) stipulates that the coastal fringe located within the DPM is considered public and may be used by anyone without restriction. In the absence of an approved development plan, it is forbidden to build less than 100 meters from the high-water line. This delineation aligns to Integrated Coastal Zone Management (ICZM) protocol of the Barcelona Convention of which Tunisia is a signatory. The 100-meter delineation is increased if the region is ecologically sensitive. If the area has an approved management plan, development cannot take place less than 25 meters from the high-water line.

VI.7. Laws Relating to Land and Urban Areas

The Code for the Management of Land and Urban Areas (Law 94- 1223; Law 2003-78), CATU and the Law (28/11/1994) on land-use and town planning, sets the rules for the organization and operation of best space planning, creation, and development of urban and residential areas.

VI.8. Laws Relating to Environmental Impact Assessment

The law 115 of 30/11/1992 and Law 2001-14 of 30/01/2001 and Decree N° 91- 362 focuses on the requirements for an environmental impact assessment which is administered by the National Agency for Environment Protection. The Decree differentiates projects based on A and B categorizations.

VI.9. Laws and Regulatory Texts Relating to Tourism Sector

Regarding regulatory texts, it should be noted the presence of the eco-tourism approach in various decrees relating to the organization of the attributions of the ministries in charge of tourism, agriculture and the environment. Similarly, article 3 of the decrees of April (Mazanec J. A., 2011),13, 200940, creating 3 new nature reserves, provides that: “The nature reserve is managed by the competent forest services under the Ministry of Agriculture and Water Resources in accordance with the provisions of the Forest Code.

However, it is possible to grant certain management operations to people, natural or private legal entities, in accordance with an agreement concluded between the Ministry of Agriculture and water resources and the people involved «. These private persons can intervene in particular in the realization of eco-tourism projects in the natural reserves.

Moreover, the said decrees provided for the development of a development and management plan integrated, which includes among these measures: the creation of spaces for information, recreation and rest for visitors, the creation of an ecomuseum specific to the nature reserve. This is a eco-tourism development clearly mentioned in these regulatory texts.

Another decree which deserves to be cited in view of its content, is decree n ° 2007-457 of 6 March 2007 relating to the classification of establishments tourist services providing accommodation services. This decree organizes accommodation as tourism activity in what are called rural lodges. Article 10 of this decree defines a gite rural as being: “a tourist establishment located in a rural environment, in sites with natural and cultural potential.

In addition to accommodation, the rural gite offers services to highlight the wealth in relation to the place (Lamparte, A., 2020).”42. This decree is essential and requires good implementation insofar as its applicability favors the attraction of visitors to the areas protected.

Accommodation allows tourists to discover the eco-tourism potential of these environments and enjoy the stay in a natural and cultural setting. Along these lines, some Tunisian environmentalists have proposed transforming the well-built and well-maintained gourbis, into rural gites for potential green tourism.

VI.10. Laws and Regulatory Texts Relating to Renewable Energy

The first regulatory framework allowing for the use of renewable energy to produce electricity was set up in 2009 through the promulgation of Law No. 2009-7 (adopted 9 February 2009). This law authorises households, companies and groups of companies active in different economic sectors to exploit renewable resources to produce electricity to cover their needs.

The law provides the possibility for companies connected to the medium voltage (MV) and high voltage (HV) grids to sell their production surpluses to STEG. The requirements and procedures for these projects were set by Decree No. 2009-2773. Aware of the need to establish regulatory reforms to mobilise private investment for the development of renewable energy, the Tunisian government began discussions in 2012 to put in place a new legislative framework more attractive to various kinds of private developers. In 2015 Tunisia adopted a new legislation relating to electricity sources from clean energy developments. Law No. 12 of 11 May 2015, relating to electricity produced from renewable energy sources, was implemented to promote the development of

renewable energy, encourage private-sector investment and liberalise rules regarding the production (and export) of clean energy. This new law provides for three regulatory regimes, as follows.

- Production projects for self-consumption
- Independent power producers (IPPs) to meet the needs of local consumption
- IPPs intended for export

VII. Blue Economy is boosting the tourism sector in Tunisia

VII.1. Introduction

The tourism sector in Tunisia is one of the most dynamic economic sectors in the country. Unfortunately, it has been suffering from several challenges such as the low profitability, the degradation of tourism service's quality, the decreasing competitiveness of tourism products and so on. Recently, the 'Jasmine revolution' consequences, in 2011, have caused social and political instability, which deeply affected the image of Tunisia, and as a result affected the decision of tourists to visit Tunisia. Nevertheless, tourism development implies a range of negative environmental impacts such as the degradation of natural resources, coastal degradation due to the increased urbanization of the coastal urban area, pollution mainly resulting from wastewater and the increased traffic and changes in marine ecosystem.

These problems have been intensified because of the increased competition in the tourism market, the political instability, financial crises, and recently terrorism problems have aggravated the situation. As a consequence, a new framework that promotes sustainable tourism in the country and increases its competitiveness is urgently needed. Planning for the sustainable tourism sector requires the integration of complex interactions between economic, social and environmental aspects. Sustainable tourism principles can be implemented with the help of an Integrated Maritime Policy, which is the Sustainable Blue Economy. This Strategy ensures the full integration of economic, social and environmental considerations while planning for a sustainable tourism sector in Tunisia. There is no sustainable tourism without a good environmental status and without social equity.

Blue Economy is an effective plan for preserving Tunisia's culture and heritage, historical sites, natural habitats, and physical environment. Likewise, local economic tourism strategies provide environmental sustainability, social profits, and economic development for the local community. Carefully thought out and well-integrated tourism plans within the master development plans of the country make a difference for the tourism industry. It is true that planning for sustainable tourism development in Tunisia is a complex activity; however, with Tunisia's initiatives to implement the Sustainable Blue Economy, things may become much easier.

VII.2. Blue Economy is Promoting Pesca-Tourism and Ecotourism

Blue Economy is fostering Pesca-Tourism, which is a new concept merging Tourism with Fisheries. This initiative enhances the local territory, environmental and cultural resources and traditions linked to the sea and fishing with the participation of local communities, young people and women. Indeed, Tunisia is involved in The ENSAMBLE

project. The Project sites in Tunisia are the Town of Tabarka and the City of Haouaria. This initiative is working to build vibrant fisheries and coastal communities and it emphasizes on bolstering economic, environmental and social development that will benefit communities dependent on fisheries and tourism for their livelihoods. In addition, in the framework of Blue Economy, the Blue Hope Initiative is used to develop, in a participatory nature, territorial investment plans to control long term financing. This is to make fisheries, aquaculture and associated value chains more productive and sustainable, more efficient and inclusive. As a result, the tourism sector will thrive, since fisheries and aquaculture have a great impact on the tourism sector. Indeed, the majority of tourists would prefer to eat fisheries products rather than other food products.

As we mentioned before in the Salt extraction industry, Tunisian Salinas reveal a great biological richness in particular at the level of the ornithological component. This wealth could offer the opportunity of an economic development complementary to the production of salt by the development of eco-tourist activities. These Salinas constitute the main habitat that offers favorable sites for the growth of flamingos. The fauna and flora are organized according to the progressive confinement of the waters. The diversification of the environments identified, as well as the richness of the flora and fauna populations, are strongly linked to the salina area which influences three main ecological factors: containment, water regime and the gradient of salinity. In addition, the water levels vary, not only depending on the handling of the levels by the salt-workers, but also according to the strength and the direction of wind. Those conditions are ideal for feeding waterbirds, as well as for nesting in a safe place (on islets) during the breeding season. The basins also serve as resting places. Under these conditions, all kinds of birds can be observed: cormorants, heron and spatulas, but especially shorebirds, seagulls, gulls and terns.

VII.3. Blue Economy is Promoting Nautical Tourism

Pleasure is a profession in its own right that requires, as in trade and fishing, a great experience of the sea and navigation, as well as the sense of service. Indeed, Boating attracts 27544 million tourists and generates $ 253 US billion in annual revenue (Hamedi, Z. et al, 2021). Tunisia currently has 08 active marinas with a mooring capacity of 3,200 rings with an occupancy rate of 80%. All along the coasts are located near 16044 nautical bases and 20 centers of diving besides the developed beaches and the growing flow of the cruises. In the framework of the Blue Economy initiative, studies have shown that the development of these activities will create 30,00044 direct and indirect jobs in the upcoming years (Hamedi, Z. et al, 2021).

Thus, it is recommended to establish boating schools in all marinas that will be used mainly for training in pleasure tourism and the issuance of boating licenses especially for the transport of people for a fee in collaboration with the European Commission which will create jobs in this field. Indeed, Blue Economy enhances the synergies between sectors.

In the framework of the Blue Economy, the boating sector in Tunisia should be reevaluated to include the industrial aspect by developing dedicated to maintenance,

refueling, wintering and guarding services to interest European-flagged yachts in adopting Tunisia as a home port due to our very low fares compared to European ports (the ratio being 1 to 5).

This approach could secure at least 20,00044 jobs in the above-mentioned specialties and increase the growth rate by around 0.5%, by opening the sector to private investment. Tunisia currently offers about 3,200 berths. This number could be multiplied by ten if we look at the bays and the coves which offer natural shelters and which do not require large investment of development. Moreover, Tunisia has islands which are quite attractive for organic nautical tourism while respecting the legal status of certain islands as nature reserves. Such activity is extremely profitable and can provide the country with considerable foreign currency earnings.

VII.4. Marine Spatial Planning as a Tool for Blue Economy

A sustainable blue economy calls for a strategic and integrated approach to planning the development of oceans and seas. Marine Spatial Planning, MSP in short, is increasingly gaining traction as a powerful instrument to put 'ocean space' on the sustainable development agenda and provide a breeding ground for new development paths towards a sustainable blue economy. MSP brings together different stakeholders, such as industry, government, conservation and recreation, and enables them to jointly make thoughtful decisions about how to allocate space among competing economic activities while protecting marine ecosystems.

Marine Spatial Planning works across sectors and national borders to encourage investments. It does so by creating more transparent rules and a more predictable investment climate. At the same time, it aims to ensure that human activities at sea do not further jeopardies the health of our oceans and seas. Coastal and marine space is "home" to a constantly growing number of human activities and facilities, the most important of which are those related to coastal and marine tourism. Being one of the largest segments of the maritime economic sectors, as well as the largest component of the tourism industry, coastal and marine tourism often raise controversy regarding the environmental impacts and the compatibilities with other human activities.

Marine Spatial Planning (MSP), is considered to be a promising procedure in tackling developmental and management issues related to the oceans and seas, and thus issues related to coastal and marine tourism. Indeed the present paper argues over the significant role of MSP in organizing and planning coastal and marine tourism activities and especially in ensuring:

a. Good environmental conditions for the tourism industry to prosper,
b. Quality of seascapes and coastal landscapes and other resources of importance to tourism,
c. Adaptation to climate change effects,
d. Spatial regulations so that coastal and marine space is not overwhelmed by tourism facilities and activities

VIII. Recommendations

VIII.1. Description

In this chapter necessary recommendations are introduced in order to achieve an integrated maritime policy and ensure a desirable transition towards a blue economy included in the sustainable development. These recommendations draw on the successful comparative experiences of countries that have made significant progress in the blue economy. In general Tunisia has to revitalize the traditional sectors and develop as much as possible the emerging sectors such as the desalination sector and marine biotechnology. In addition, there is an urgent need to tackle the energy deficit in Tunisia and promote the renewable energy sector which is undeveloped in Tunisia.

VIII.2. Recommendations

VIII.2.1. Recommendation.1: Have a Good Understanding of Existing Potential in the Marine Environment

This recommendation aims to encourage the competent authorities to invest more in the field of exploration of the maritime environment in order to acquire a good knowledge of the underwater relief, the existing maritime wealth, the environmental issues linked to biological diversity and impacts associated with human activities.

As previously described, Tunisia has a maritime zone under sovereignty and an exclusive economic zone which extends over a significant area roughly equal to the territory over which the State exercises its sovereign rights for purposes of exploration, exploitation and protection of natural resources. Considering that the definition of the concept of the blue economy is based on the sustainable use of what is available locally and the creation of new added value to meet basic human well-being needs, the objective of this procedure has therefore just covered all national maritime areas through maritime maps and inventories of marine resources such as biological diversity and areas likely to be gas or oil exploration in order to have a clear understanding of any potential and existing interaction between living organisms and human activities in the marine environment.

It should be noted that Tunisia has made significant progress in scientific, technological and environmental fields linked to studies relating to oceanography and the aquatic environment. This can be seen in the studies and research carried out by public establishments, in particular the hydrography and oceanography center of the French Navy and the National Institute of Marine Sciences and Technologies (INSTM). In the Mediterranean scale, current needs go well beyond the environmental domain and extend to supporting innovation in the fields of natural resources and integrated management of the maritime space.

VIII.2.2 Recommendation.2: Protect Biological Diversity and the Marine Environment through the creation of Marine and Coastal Protected Areas (MCPA)

The protection of maritime biological diversity has increasingly become a key issue in any future maritime action. It is compulsory to address the increasing intensity of the use of natural resources and the alarming spread of maritime pollution and its enormous impact on the environment.

This recommendation underlines the importance of the method of protection adopted to deal with such a situation, in particular the creation of marine and coastal protected areas (MPAs).The establishment of such zones is considered a privileged instrument for the protection of marine species and ecosystems, which consequently promotes the reconstitution of the biomass of living species, the management of fishery resources, as well as the implementation of good practices in integrated maritime space management.

In addition, the importance of creating more marine protected areas is not limited to preserving nature and contributing to healthy seas, but also extends to creating socio-economic benefits of various ways in which they help to secure the livelihoods of fishermen on the one hand, and offer new opportunities, in particular for alternative and sustainable tourism, on the other hand.

At the national level, Tunisia has a legal basis and a specific regime governing the creation of MCPAs. The conclusions drawn show that the adopted process is considered precise and allows the integration of more maritime areas rich in biodiversity and likely to be threatened by human activities.

Currently, Tunisia has a good number of MCPAs with 19 protected marine sites and three sites are in the process of being created. However, it should be noted that despite the effectiveness of this legal and administrative regime, the procedure for the creation of MCPA remains short, which explains why only 10% of maritime and coastal areas are currently considered marine protected areas.

VIII.2.3. Recommendation.3: Promote the Fishing and Aquaculture Sector

The fishing and aquaculture sector is a priority sector in Tunisia because of its economic weight and its socio-economic dimensions on which a large segment of the population depends, including the women who operate there. It is also one of the traditional maritime activities linked to the blue economy. The main recommandations for this sector are:

1. Ensure the Rational Exploitation of Fisheries Resources

The major challenge is to fight against the spread of illegal fishing. Like other countries, it is recommended at this level to ensure the application of the legislative and regulatory provisions governing the sector in terms of monitoring and control of the movements

of fishing vessels by generalizing the use of the monitoring system. Satellite Vessel Monitoring (VMS) to obtain real-time information on any infringement that has occurred and to transmit it instantly between fishing ports.

2. Adopt the Principles of the Ecosystem Approach as a Mode of Fisheries Management

The southern region, in particular the region of the Gulf of Gabes which is characterized by a diversity of fishing products and threatened by overfishing activity and a significant spread of marine pollution resulting from discharges from the chemical industry installed by the sea. It requires the establishment of an effective management program for reefs in endangered fishing areas as well as the revision of the biological resting system to promote the restitution of fisheries resources. This measure requires the adoption of the principles of integrated coastal zone management programs on the one hand, and the principles of the ecosystem approach as a mode of fisheries management on the other.

3. Enhance and Improve the Competitiveness of Fisheries Products Landed at Fishing Ports intended for Export

The control and preservation of the quality of fishery products landed in fishing ports are among the important elements to consider in order to comply with international health standards throughout the production chain, in particular European health standards because the European Union is the main importer of our fisheries products.

4. Encourage Private Sector Investment to Develop the Aquaculture Industry

Aquaculture is one of the sectors which have great potential in the blue economy. It is playing an increasingly important role in the production of fisheries products to meet the protein consumption needs of a large part of the world's population. In Tunisia and as we mentioned previously, aquaculture production rates are considered low. Indeed, the ultimate goal for the development of aquaculture is to ensure the availability of healthy, safe and high-quality products on the one hand, and to create jobs on the other hand.

5. Restructure The Fishing Sector, Revitalize the General Fisheries Commission

There is no single model for designing a successful new structural organization. Several studies are being carried out in this direction with a view to achieving a new mode of governance of the fisheries and aquaculture sector. In fact, these studies have proposed, in particular, the revitalization of the General Fisheries Commission (CGP) in the aim to unify the dispersed efforts of all the structures intervening in the sector in one single body, as well as the need to unify regional representation of the fisheries and aquaculture sector.

VIII.2.4. Recommendation.4: Diversify the Tourist offer and Promote Ecotourism and Cultural Tourism

Without replacing traditional tourism because of its importance and its economic weight, the idea is to put in place a strategy that forms the identity of the country (history, culture, environment,..) with regard to tourist flows to promote beautiful places in inland and coastal regions. Tunisia has around 25,000 archaeological and historical sites that are undeveloped and difficult to access. In the absence of a clear vision for the development of these regions and an adequate infrastructure to access them, these sites remain marginalized, and their discovery is a matter of chance.

The idea is to enhance the natural coastal and marine landscape, cultural heritage and archaeological sites in order to diversify the Tunisian tourist offer to partly depart from the seaside tourism model and reduce its impact on the environment.

Indeed, it is imperative to turn to other tourism products. Alternative tourism therefore constitutes an opportunity to remedy the sustainability problems of the sector as presented in the previous section. We can prioritize among the many forms of alternative tourism those of natural tourism, in particular, pesca tourism, ecotourism, and cultural tourism.

VIII.2.4.1. Develop Ecotourism

1. Optimizing The Use of Nature Reserves and National Parks

Tunisia has 8 national parks covering an area of approximately 201,752 hectares, and 16 nature reserves covering an area of over 16,138 hectares (Hamedi, Z. et al, 2021). These parks and nature reserves present attractive natural landscapes for interested tourists and provide opportunities for potential investors. to carry out appropriate development projects to meet both the environmental requirements characterizing these spaces on the one hand, and the expectations of visitors on the other.

2. Develop an Adequate Framework for Financing Ecotourism Projects

This tourism model is the subject of various projects underway in Tunisia with the aim of improving the attractiveness of the country's natural landscapes and preserving natural resources. Despite the financial difficulties, we can cite the tourist complex on the islands of Kerkennah which is one of the major development projects on the north-eastern coast of Tunisia. This project, covering an area of approximately 90 hectares, consists of developing an ecotourism hotel complex with entertainment facilities, parks and accommodation in order to attract more vacationers and tourist flows to discover the natural environment of the Kerkennah Islands.

VIII.2.4.2. Develop Cultural Tourism

Cultural tourism, a component of alternative tourism, constitutes all the cultural and natural sites, the historical heritage, the ancient monuments as well as the archaeological museums, the objective of which is to attract vacationers and excursionists to discover the cultural heritage and way of life of a region.

1. Prepare projects to promote the existing cultural heritage

According to the ministry in charge of tourism, Tunisia has a precious ancient and Islamic heritage such as the archaeological site of Carthage at the crossroads of all the civilizations of the Mediterranean. It is one of the largest archaeological museums in the world, the first mosque founded in the Maghreb, the medinas and so on. It presents a good reason for promoting cultural tourism and preparing high added value promotion projects.

2. Encourage Investment and Adopt a Marketing Policy

Tunisia has all the assets to promote alternative tourism. However, these potentialities have not been exploited and developed as best as possible because this tourist product has remained academic and little popularized. In addition, the major stake is to stimulate national or foreign investments to mobilize funds for development programs in this field. The state opts to reduce its backwardness in this area compared to other similar countries.

To achieve this, a first step must be taken, to enhance archaeological sites and improve circuits and facilitate access, on the one hand, and to adopt a policy of marketing projects to achieve these goals on the other hand. Alternative tourism generates a more profitable clientele and further reduces the seasonality from which the tourism sector suffers.

VIII.2.5. Recommendation.5: Promote Cruise and Yachting Tourism

Cruise and yachting tourism are among the maritime activities closely linked to the blue economy generating significant income in foreign currencies. They contribute significantly to the stability of the balance of payments on the one hand, and to direct and indirect job creation on the other.

VIII.2.5.1. Develop Cruise Tourism

As we have detailed by the SWOT analysis, the evolution of the landings of cruise ships in Tunisia has experienced significant fluctuations over the past 10 years. Since 2015, the date of the attacks at the Bardo and Sousse museums, cruise tourism has not been able to restart. The country has only hosted one cruise in 2019 since 2015, and another cruise ship carrying 600 tourists in April 2020. These results are incomparable with those recorded in 2010 with around 900,000 cruise passengers arriving in 2010 generating a figure of business of around 4 million euros.

1. Identify the Criteria Necessary for the Development of the Cruise Business

According to specialists in the field, the development of the cruise business depends on various factors, namely the seasonality of the area concerned, the attractiveness of cruise ports, the presence of appropriate infrastructure: ports with passenger terminals, and the purchasing power of the populations living in the target area.

2. Develop Cruise Tourism in Other Ports

It should be noted that the artisanal and tourist village of the port of La Goulette, the only cruise port currently in Tunisia, remains the first attraction for cruise passengers, most of whom they spend a day in Tunis to visit the Medina, the National Museum of Bardo and some tourist sites such as the suburb of Sidi Bou Saïd and the archaeological site of Cartage and spend an average of 100 euros per cruise line.

We can also mention that the Tunisian authorities are aware of the need to develop cruise tourism in other ports, in particular that of Zarzis, due to the fact that the clientele generated by this activity is deemed to have high added value with an estimated average consumption. at 200 euros, 78 which is much higher than that of an ordinary tourist. In France, 79 for example, the average consumption per day at the port of Marseille is estimated at around 60 euros by a single cruise line and can climb to 150 euros if he decides to spend a night there. A cruise passenger disembarking in Casablanca, Morocco spends an average of 140 euros, 80 more than twice the amount an ordinary tourist spends.

This orientation should also be accompanied by environmental protection measures. The pollution generated by this activity can be of concern as cruise ships may request stopovers at protected sites of high environmental value.

VIII.2.5.2. Develop Yachting Tourism

In terms of tourist flows, the Mediterranean ranks first in the world with more than 320 million arrivals, and is also the number one destination for yachting tourism with a world market share of around 30%.

Tunisia presents itself as a very potential country to develop this promising niche. It has an important geographical position in the heart of the Mediterranean with 3,226 rings spread over eight marinas, to which can be added a dozen fishing ports, accessible to boaters, which accommodate small boats.

Given its strategic position and its interesting assets, Tunisia attracts only 0.7% or the equivalent of 2,500 boats each year out of a total of 270,000 boats plying the Mediterranean. The equipment rate is around 0.25 boats per 1,000 inhabitants, one of the lowest in the region.

The yachting activity currently provides around 2,000 direct and indirect jobs and generates more foreign exchange income for a short period of time than traditional tourism income for the same period, knowing that people on board spend an average of 400 euros per navigation, or 30 euros per day and per person.

1. Simplify Procedures for the Temporary Admission of Pleasure Craft

The administrative procedures, the procedures for the temporary admission of foreign boats and the entry or exit formalities for pleasure craft are among the greatest obstacles to the development of pleasure tourism. We can also add that, the problems related to

port infrastructures and those related to the policy of communication with boaters, the absence of a nautical guide associated with a low representativeness at international boat shows, further limit the clientele generated by this activity. These obstacles, combined with increased competition from Mediterranean countries, contribute to reducing the attractiveness of the country for boaters to the benefit of their own.

2. Adopt Dry Ports to Protect the Coastal Environment

With regard to the blue economy, there is no doubt that marinas have considerable added value on the socio-economic situation of the country. However, these marinas have a negative impact on the coastal environment, particularly in terms of beach erosion.

To this end, several Mediterranean countries have adopted dry ports, which present an innovation in the yachting sector. The objective of this new measure is to deal with both the saturation of marinas and the lack of new facilities on the one hand, and to minimize the negative impact on the coastal zone generated by the construction of new ports. pleasure on the other hand.

The dry ports present a solution to the sustainability of the place and offer an efficient organization allowing to reduce the maintenance costs of the boat which remains less time in contact with the sea water, in particular the expenditure on the antifouling which destroys flora and fauna in ports, and the treatment of ships can be carried out with reduced frequency.

VIII.2.6. Recommendation.6: Promote Long-term Offshore Energy Activities

Currently, offshore energy activities consist solely of oil and gas exploitation. The production rates of offshore oil and gas fields identified at the end of March 2021 are respectively 43% and 49% of national production. Despite this importance, it is a sector in decline.

According to a study on blue growth, 83 this decrease is mainly due to high production costs on the one hand, and the decrease in long-term oil prices (estimated at 10 years) questioning the future profitability of these projects. exploration and exploitation of petroleum on the other hand.

VIII.2.6.1. Diversify energy Sources and Adapt to the Energy Transition

Today, the world is moving towards an energy future that is less and less dependent on fossil fuels. Along with this rapidly advancing global energy transition comes a drop in demand for petroleum resources, leading to a long-term decline in oil prices.

The period of global containment that followed the spread of the Covid 19 pandemic demonstrated that the oil industry sector has suffered a shockwave from both, an oversupply of oil and a decrease in the global demand which consequently led to a drop in the price of a barrel to around 20 dollars 84 in 2020, registering a drop of more than 70%.

However, this drop in the price of oil poses a major challenge for many national oil companies in the MENA region known to be leaders in the oil and gas industry. These companies are likely to provide significant tax revenues for their state budgets and a wide range of public services that are part of their social responsibility. As a result, their earnings may decline significantly, and their ability to perform their assigned roles may also decline.

A study published by NRGI focused on the link between estimates of the price of a barrel of oil necessary for balanced budgets in producing countries in the MENA region on the one hand, and the economic weight of oil exports as a proportion of merchandise exports on the other. This study has shown that any drop in the price of a barrel of oil below that estimated for their budgetary balances generates a huge deficit that affects their economies heavily dependent on oil revenues.

As a result, these countries and their national oil companies are aware of the impact of this energy transition on their economic stability and of the need to adapt to this transformation by adopting visions or reforms aimed at diversifying their products, by investing in particular in the field of renewable energies.

In Tunisia, the oil and gas activity is governed by two main public actors, the State on the one hand through the ministry in charge of hydrocarbons as the Concession Authority, and the Tunisian Company of Petroleum Activities (ETAP) on the other hand, since it is a partner in all hydrocarbon titles and holds 42 operating concessions (including 10 offshore concessions) and manages around 68% of national crude oil production and around 75% of gas production recorded at the end of March 2021.

National offshore oil and gas reserves are considered more or less low and high in cost. Faced with the future orientation of financial capital towards the clean and renewable energy industry, it will be difficult for the national company to undertake new exploration activities while mobilizing significant public financial resources and attracting interested foreign investors without real reserves, in order to mitigate the risk that new exploration efforts fail to discover new oil and gas deposits.

This energy transition has thus called into question the profitability of these activities in the face of such a drop in the price of oil in the long term on the one hand, and its impact on the energy balance of the currently deficient country highly dependent on imports of conventional energies. on the other hand.

VIII.2.6.2. Adopt the Wind Turbine at Sea

As we have noted, the contribution of renewable energy to the country's energy balance remains modest at no more than 1%. Although offshore wind turbines are not yet included in the state's energy policy, it is important to note that like other countries on the southern shore of the Mediterranean, Tunisia has real potential wind power technique.

A map showing the wind atlas of Tunisia updated in 2015 by the National Agency for Energy Management (ANME) shows an energy potential in sites favorable to the establishment of onshore wind farms estimated at 10 GW. The technical potential of

offshore wind is estimated at 258 GW according to a map published by the World Bank in March 2020. These assets that Tunisia possesses present important alternatives that can be exploited in the short and long term in the energy policy of the state as developed in the countries of the northern shore of the Mediterranean.

VIII.2.6.3. Establish a Regulatory Framework for the Dismantling of Offshore Oil Platforms, Considering the Cost, and the Impact on the Marine Environment

The expected future decline of the oil industry highlights a very important future phenomenon which concerns the issue of the dismantling of offshore oil platforms and its impact on the marine environment.

Indeed, the signed hydrocarbon conventions provide for a return to the initial state of the site (in which the oil platform is installed) after operation. However, the issue of decommissioning is little addressed during the design phase, and rarely present in oil or gas exploration and production projects.

In addition, as soon as they are submerged at sea, oil rig installations help to change the marine environment by creating a new ecosystem, due to the fact that in a few weeks l he steel underwater infrastructure thus becomes an artificial reef conducive to a new marine ecosystem.

In terms of cost, a study published by the European Commission in September 2018, 90 focused on the cost of dismantling an oil platform in the EU which amounts to 30 billion euros in the next 30 years. A significant amount that requires real consideration.

This approach requires the establishment of new regulations to identify the necessary tools and mechanisms to determine the costs and environmental impact of dismantling the required platforms.

VIII.2.7. Recommendation.7: Promote Maritime Transport and Ports

With regard to the blue economy, this recommendation targets the development of the maritime transport sector and the conservation of the marine environment. This requires the implementation of several measures.

VIII.2.7.1. Put in Place Adequate Mechanisms to Encourage Private Sector Participation

One of the most important measures to consider is to encourage the participation of private sector companies in all activities of the sector:

- Strengthen the capacities of investment companies in the renewal of the national fleet.
- Facilitate and promote investment in vessels adapted to Tunisian categories of goods and compliant with international standards.

- Put in place an adequate framework to develop the maritime industries of construction, maintenance and repair of maritime equipment and containers.
- Improve and adapt the port chain to international standards.

VIII.2.7.2. Adapt the Existing Port Infrastructure to the International Standards

The constraints mentioned in the previous section which the commercial ports are confronted with negatively affect the development of the maritime transport sector. State policies aimed at the development of ports are essentially based on the following axes:

- Put in place adequate measures to improve the services offered to vessels in transit in order to achieve international performance indicators.
- Further simplify administrative and port procedures.
- Optimize the operation of shipping lines and promote alliances between Tunisian ports.
- Apply international standards to enhance safety and security in commercial ports.
- Continue the creation of the deep-water port in the region of Enfidha.

VIII.2.7.3. Reduce the Negative Environmental Impact Generated by this Activity

These aforementioned measures must be accompanied by approaches to protect and conserve the marine environment in order to reduce the negative environmental impact generated by this activity. In this context, we can refer to a study on growth blue which proposes:

- Prevent maritime accidents by improving the control of ships and anticipating the increase in the traffic of noxious and potentially dangerous substances.
- Apply IMO guidelines to fight invasive species in the Mediterranean.
- Foster regional and international cooperation in order to ensure a better organization of the reception of maritime traffic.
- Set up safe ports with the necessary means to accommodate ships in distress under good environmental security conditions.

VIII.2.8. Recommendation.8: Encourage Marine Biotechnologies Applied to Thermal Tourism and to Aquaculture

Marine biotechnologies in Tunisia, though less developed, can have a valuable impact if interfacing to key economic sectors, for instance, aquaculture and thermal/health

tourism. In Tunisia, there exists extensive research carried on in the field of marine algae that contain antioxidants, pigments and vitamins increasingly used in cosmetic products. They are also a source of natural, non-toxic colors (i.e. orange pigments from Chlorophyta, blue and red pigments from Rhodophyta). In addition, fish extracts are broadly used in cosmetics. In addition, cosmetic companies are able to produce a variety of smells and flavors once impossible to make in the lab. The future of flavor production lies in new metabolic pathways or fermentation methods that might be isolated from the sea. Several enzymes from marine organisms are certainly responsible for producing tastes and smells that might be linked not only to food, beverages or perfumers.

The link between marine biotechnologies applied to wellness and thermal/health tourism might have a double positive impact on the economy; spurring research that can, in turn, generate incentives to specialize in a particular niche of the tourism sector, and therefore, present a comparative advantage with respect to Mediterranean competition, especially strong from France, Italy, and more recently Croatia.

Aquaculture is another sector that would broadly benefit from the application of marine biotechnologies that aim at improving breeding, minimizing, and controlling diseases and optimizing the cultivation process. From a quick check of 2010 FAO data, it appears that Tunisia's aquaculture sector is very promising, with active international trade, even though not completely developed.

Therefore, the already existing stream of research that focuses on optimizing the inland and marine fish and shellfish cultivation methods might benefit the sector, improving the tradability and competitiveness of the products. In addition, aquaculture practices, reducing fishing effort, can improve the environmental status of the natural stock of marine resources (fish and shellfish).

Finally, we have empirically shown that Tunisian researchers are extremely productive and determinant for the generation of high technology products. The third policy suggestion refers to designing "attraction" policies that avoid "brain drain", since skilled labour is fundamental to the research and biotechnology sector. It is very interesting to signal that international companies and research agencies already invest in Tunisia researchers, thereby acknowledging their professional, international competitiveness.

VIII.2.9. Recommendation.9: Promote Research, Awareness, Information and Capacity Building

There is a clear need to reinforce the general public's knowledge on the basic concepts and the issues and risks related to climate change and education on blue sectors. The subject of climate change has not yet been seized by the media. Substantive work is required to form a core of specialized media, which would relay information in this area. The executive bodies of the Energy, Forest and Rangelands, Water and Agricultural Lands sectors seem to be globally well informed on the issues related to climate change. Nevertheless, gaps remain in the sectors of Tourism, Health and Education in terms of awareness and information.

On the other hand, important progress has been made in Tunisia in the field of mitigation. Beyond the enabling activities, Tunisia has set up the Information Cell on Sustainable Energy and on the Environment within the National Agency for Energy Management (ANME). Several new concepts such as Nationally Appropriate Mitigation Actions (NAMAs) and the Measurement, Reporting and Verification of Greenhouse gas (MRV) system have been promoted and adopted.

Significant technical, institutional, regulatory and financial shortcomings are identified. The categories of actors that have benefited the most from capacity building actions are central government officials and NGOs, and to a lesser extent decentralized state services in the governorates. The other groups have been less targeted so far, in particular parliamentarians, local authorities, academia and research, and private sector and financial players.

VIII.2.10. Recommendation.10: Marine Spatial Planning

Marine Spatial Planning can play a significant role in the growth of a sustainable blue economy, in particular as a catalyst for innovative blue technologies. By identifying suitable testbeds and demonstration sites, it provides space to test innovative technological solutions and facilitate their de-risking.

For instance, the offshore renewable energy industry remains in its infancy, but given the right conditions, it could grow into a significant contributor to the global energy mix. A number of inter-related barriers, such as resource and user conflicts, regulatory complexity, and a limited understanding of environmental impacts associated with offshore renewable energy technologies, as well as the general challenges surrounding ocean governance, hamper the development of the industry. Marine spatial planning is emerging around the world as a practical tool for promoting a more rational and wise use of the oceans. It could also play a significant role in promoting the speedy and environmentally sound deployment of offshore renewable energy by assisting in overcoming the various hurdles to the development of that sector of the blue economy.

VIII.2.11. Recommendation.11: Integrated Coastal and Marine Area Management

Integrated Coastal and Marine Area Management Coastal zones are among the most productive areas in the world, offering a wide variety of valuable habitats and ecosystem services that have always attracted humans and human activities. Coastal zones are also among the areas most vulnerable to climate change and natural hazards. Risks include flooding, erosion, and sea-level rise as well as extreme weather events.

These impacts are far-reaching and are already changing the lives and livelihoods of coastal communities in Tunisia. Unlike sectoral approaches that can lead to disconnected decisions, inefficient resource use, and missed opportunities, integrated coastal and marine area management seeks to coordinate the application of different policies affecting the coastal zone and maritime activities.

It is an iterative process that includes a variety of approaches from mapping, delineation, and demarcation of the hazard lines and coastal sediment cells to building the capacity of agencies, institutions, and communities to make informed decisions about growing the blue economy within the carrying capacity of its living natural resource base.

According to the Convention on Biological Diversity, this integrated management is now being applied in the majority of coastal countries. As a holistic approach, it can be used to manage the multiple threats and pressures in the coastal zone, and it is a major component of developing a blue economy approach

VIII.2.12. Recommendation.12: Better Consideration of Climate Change in Coastal Zone Management

Capacity building on the choice of the most appropriate technologies for Tunisia, is among the immediate needs of the country to fight climate change. Additionally, facilitating access to the most recent knowledge and participation in research and in-depth studies is one of the country's priority needs.

Tunisia would also benefit from benefiting from the experience of other countries in combating and adapting to the variability and climate change by having rapid and efficient access to information and by having the opportunity to visit other countries where successful experiences have been made. In addition, and although today, a large number of environmental associations are interested in the issue of climate change and the actions to be taken to reduce its impacts, a more effective contribution of these associations depends on strengthening their capacities in the field. Finally, a weak link that deserves to be strengthened both at the level of public structures and at the level of civil society concerns access to climate finance. Capacity building in materials is in fact necessary in order to promote the mobilization of additional funds for mitigation and adaptation to climate change.

VIII.2.13. Waste management

Despite great efforts to improve the household and similar waste management process in Tunisia, there is still much to review and do as well on the strategy level as on the operational level. To manage this challenging post-revolutionary period involves several actions and initiatives:

1. Develop a clear national strategy to the public in the management of household and assimilated waste and mobilize the legal, institutional and financial resources for its implementation.
2. Strengthen financial, logistics, human and organizational capacities and planning and training for the communities and rural councils, to remove regularly and efficiently the generated household waste;
3. Solve the social problems of agents working in the sector (casual staff in public and private companies);

4. Implementation of a communication and awareness plan for crisis suited for this post-revolutionary period;
5. Enable the construction of regional landfills and transfer centres related and planned in the governorates of the country.

IX. Conclusions

The ultimate goal of the work is to highlight the importance of adopting the blue economy approach in future state policies. With regard to the blue economy, the maritime potential existing in Tunisia offers a real opportunity to improve the economic situation of the country and the well-being of the population, while ensuring the protection and preservation of the marine environment and of the coast.

The co-construction of the future vision will make it possible to concretize Tunisia's commitments vis-à-vis the international community, and to provide effective tools to the actors involved allowing the achievement of the previously defined objectives.

Recently, the political will to subscribe to the logic of the blue economy has resulted in the creation of the General Secretariat of Maritime Affairs. As we have mentioned previously and like other coastal countries, it has become crucial to put in place a national strategy for the sea.

The creation of a framework for cooperation and consultation is one of the essential steps in order to involve the various stakeholders in the field of the blue economy, including civil society. Maritime spatial planning and integrated coastal zone management are the first steps to provide a basis for the development of maritime activities.

This vision for the future does not only concern the national context but also extends to the Mediterranean level as the Mediterranean Sea presents a semi-closed multi-use area with 21 riparian countries along its 46,000 km of coastline. This therefore requires the establishment of a regional cooperation framework, in particular with neighboring countries bordering the Mediterranean in order to guarantee sustainable exploitation of maritime resources while taking into account the aspect of environmental protection.

Although we have a central geographical position in the heart of the Mediterranean, whose historical, cultural and strategic interest is often extolled, it is difficult to take advantage of this position.

Indeed, few economic studies have been devoted to it, and none of them has been sufficiently deepened and integrated, to highlight the maritime interest of Tunisia as a pivotal state in the Mediterranean. With its two exceptional facades in the North and East, which pass through the densest traffic in the world (with the passage of more than 310 ships per day through the Strait of GIBRALTAR and commercial traffic between the eastern and western Mediterranean) providing 1/3 of the world traffic with 2,500 ships per day present at sea or in ports).

Thanks to the vastness of its maritime areas under national jurisdiction, our country should develop / apprehend an integrated maritime policy to promote this new and very promising form of economy. This ambition involves essential organizational and entrepreneurial actions combined with political will.

However, taking into account the blue economy in the context of a development policy is still limited in our country, it requires on the political scale an awareness and a deep appreciation of the extent of maritime issues as well as an effort to raise the awareness of all actors whose activities are related to the sea.

Unlike conventional sectoral approaches, this paper proposes to help better integrate the blue economy into our strategies, policies and laws. In a multisectoral and participatory vision that includes both the social dimension and the sustainable use and management of the biological and non-biological resources.

The approach of the development of the blue economy that we propose is based on sustainable use and conservation management of marine ecosystems, but it mainly refers to the principles of efficiency in terms of organization, specific and targeted training of managers and the creation of maritime-based enterprises at the national level to ensure development on a wider basis, with job creation as a priority objective. It also relies on a process of cooperation and regional integration in the framework of an active maritime diplomacy oriented towards all partner States, whether coastal or landlocked.

At the heart of this vision is the need to define a new mode of maritime governance and to modernize sea-related activity sectors in order to improve their efficiency and to facilitate our country's adherence to marine policy initiatives integrated with the sea. Mediterranean, African and global levels.

And at the heart of this national vision of the development of the blue economy in Tunisia is the Tunisian Institute of Strategic Studies ITES, which always keeps the traceability of a short-, medium- and long-term action plan, a vision and a sustainable maritime strategy that consists of bringing together all users, operators and actors involved in sea-related activities and ensuring interconnection between all the Ministries concerned (18 Ministries concerned).

Maritime Transport, Fishing, Nautical Pleasure, Environment and Coastal Protection, Marine Safety and Security, Education, Naval Industries, Marine Energy, Finance and Investment, Culture, Foreign Trade and Maritime Infrastructure are all concerned, and these aim to ensure that a serious program limited in space and time is prospected and pre-viewed for the development of the blue economy in Tunisia.

X. References

Adaptive governance creates blue growth in Finland. 2021. (n.d.). Retrieved November 08, from https://blueadapt.fi/en/frontpage/

APAL, 2015. Le littoral tunisien: 20 ans après la création de l'APAL, Décembre, .3.http://www.apal.nat.tn/site_web/Files/APAL%20_20.pdf

Associated Gas Utilization Report for Tunisia, 2021. (n.d.). Retrieved November 9th, from https://www.ebrd.com/documents/climate-finance/associated-gas-utilization-report-for-tunisia.pd

Autorité Maritime – Office de la Marine- OMMP, 2021. (n.d.). Retrieved November 10th, from http://www.ommp.nat.tn/autorite-maritime/

Banque mondiale, 2016. Livre blanc relatif au secteur des transports et de la logistique, 20.

Blue Economy in the Mediterranean - UFM. (n.d.). Retrieved November 8th, 2021, from https://ufmsecretariat.org/wp-content/uploads/2017/12/UfMS_Blue-Economy_Report.pdf

Blue growth, 2021. (n.d.). Retrieved November 08th, from https://s3platform.jrc.ec.europa.eu/blue-growth

Cisneros-Montemayor A.M., 2019. A Blue Economy: Equitable, sustainable, and viable development in the world's oceans. Predicting Future Oceans, 395-404.

DGPA, 2015. Annuaire des Statistiques de Pêche en Tunisie (Année 2015). Direction Générale de la Pêche et de l'Aquaculture, Tunis.

Dribek, A., 2015. Vers un tourisme durable en Tunisie : Le cas de l'île de djerba. Retrieved November 09th, 2021, from https://tel.archives-ouvertes.fr/tel-01216554

Eau XXI, 2021. Stratégie du Secteur de l'eau en Tunisie = a long Terme 2030. (n.d.). Retrieved November 09th, from http://www.citet.nat.tn/Portail/doc/SYRACUSE/20470/eau-xxi-strategie-du-secteur-de-l-eau-en-tunisie-a-long-terme-2030?_lg=fr-FR

Fethi K., 2021. Desalination in Tunisia - Solar power PV power PV - Case Ben Guerdene desalination plant. Retrieved November 10th, from https://unosd.un.org/sites/unosd.un.org/files/ms._olfa_mahjoub_presentation_0.pdf

Habib Slim, L'ASPIM,, 2007. Outil de légitimation dans la formation d'une norme coutumière régionale, , p.3. https://www.uicnmed.org/web2007/CDGovernance/conten/2-tallerexpertos/conten/b/s2/Habib_Slim.pdf Accédé le 09 avril 2021.

Hamedi Z., Ghezal A., Gönül G., Korban, R., 2021. Renewables readiness assessment: The Republic of Tunisia. Retrieved November 9th, from https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Jun/IRENA_RRA_Tunisia-2021.pdf

Ilboursa, 2020. PBR rating : Le secteur de l'agriculture et de la pêche, Fer de Lance de l'économie Tunisienne. Retrieved November 09th, 2021, from https://www.ilboursa.

com/marches/pbr-rating-le-secteur-de-lagriculture-et-de-la-peche-fer-de-lance-de-leconomie-tunisienne_24442

International Seabed Authority, 2021. Retrieved November 10th, 2021, from https://www.isa.org.jm/

ITES, 2018. Ezzeddine Kacem, Le développement de l'économie bleue de demain en Tunisie, . http://www.ites.tn/uploads/publications/files/be81808e6c0b6cfce40e37858d82a790.pdf

JORT n° 80 du 6 octobre 1995, p 1896 http://www.iort.gov.tn/WD120AWP/WD120Awp.exe/CTX_5736-32-NNcproiCcr/RechercheJORT/SYNC_-1440609529 Accédé le 23 mars 2021

Kolesnikova M., 2019. Mediterranean countries of the EU in a "Blue economy". Contemporary Europe, 3: 161-170.

Lamparte A., 2020. SUREFISH- fostering Mediterranean fish assuring traceability and authenticity. Retrieved November 09th, 2021, from https://ec.europa.eu/eip/agriculture/en/find-connect/projects/surefish-fostering-mediterranean-fish-assuring

Mazanec J.A., Ring A., 2011. Tourism Destination Competitiveness: Second Thoughts on the World Economic Forum Reports. Tourism Economics, 17: 725-751.

Meddeb S., 2014. GEF: Governance and Knowledge Generation Socio-economic Evaluation of Maritime Activities. Etude d'Evaluation Socioéconomique des Activités Maritimes en Tunisie. Retrieved November 9th, 2021, from http://www.environnement.gov.tn/images/fichiers/developpement_durable/Plan_Bleu_Evaluation_Socioeconomique_Activites_Maritimes.pdf

Mili S., 2021. Development of the fishing and commercialization of the blue crabs in bizerte and Ghar El Melh Lagoons: A case study of promotion opportunities of blue growth in Tunisia. Journal of Aquaculture & Marine Biology, 10: 66-74.

Ministère du transport et de la logistique, Projet annuel de performance, 2021

Nafti R., Van Oyen L., 2023. Tunisia. Towards Sustainable Development in Industry? 26 Nov 2003. doi:10.4337/9781781950616.00017

O'Neill A., 2021.. Tunisia - unemployment rate 1999-2020. (July 20). Retrieved November 09th, 2021, from https://www.statista.com/statistics/524516/unemployment-rate-in-tunisia/

O'Neill A., 2021.. Tunisia - share of economic sectors in gross domestic product 2010-2020. (July 22). Retrieved November 09th, 2021, from https://www.statista.com/statistics/524575/share-of-economic-sectors-in-the-gdp-in-tunisia/

Onofri L., Briand F., 2021. Blue Biotechnology potential in Tunisia - a preliminary study of national stakeholders' involvement in setting priorities. Retrieved November 10th, from https://www.ciesm.org/Tunisia_report.pdf

Project. (n.d.). Retrieved November 08th, 2021, from http://ensamble.eu/en/project/

Rapport mensuel, Fin Décembre 2020 - etap.com.tn. (n.d.). Retrieved November 9th, 2021, from http://www.etap.com.tn/conjocture/Conjoncture2020.pdf

Reconstruction of Marine Fisheries catches for Tunisia ... (n.d.). Retrieved November 8th, 2021, from https://hal.archives-ouvertes.fr/hal-02556974/document

Saleh, M. (August 18th, 2021). Tunisia: Agriculture and fishery to GDP 2010-2020. Retrieved November 09th, 2021, from https://www.statista.com/statistics/1258304/agriculture-and-fisheries-annual-contribution-to-gdp-in-tunisia/

Saleh, M. (July 28th, 2021). Tunisia: Share of tourism employment 2019-2020. Retrieved November 10th, 2021, from https://www.statista.com/statistics/1253720/tourism-employment-as-share-of-total-employment-in-tunisia

Saleh, M. (March 26th, 2021). Tunisia: Fisheries production value 2010-2019. Retrieved November 09th, 2021, from https://www.statista.com/statistics/1197414/production-value-of-fisheries-and-aquaculture-in-tunisia/

Submarine Cable Map. (n.d.). Retrieved November 10th, 2021, from https://www.submarinecablemap.com/country/tunisia

Sustainable Blue Economy. (n.d.). Retrieved November 17th, 2021, from https://ec.europa.eu/oceans-and-fisheries/ocean/blue-economy/sustainable-blue-economy_en

Tunisia Crude Oil Production 2021 Data: 2022 forecast: 1993-2020 historical. (n.d.). Retrieved November 09th, 2021, from https://tradingeconomics.com/tunisia/crude-oil-production

Tunisia ECO-LEF in Tunisia: A case study. (n.d.). Retrieved November 8th, 2021, from https://prevent-waste.net/wp-content/uploads/2020/11/Tunisia.pdf

Tunisie, M. (n.d.). Ministère du Transport. Retrieved November 10th, 2021, from http://www.transport.tn/fr/maritime/presentation?page=

Tunisia natural gas revenue - data, Chart. (n.d.). Retrieved November 09th, 2021, from https://www.theglobaleconomy.com/Tunisia/Natural_gas_revenue/

Tunisia oil revenue - data, Chart. (n.d.). Retrieved November 09th, 2021, from https://www.theglobaleconomy.com/Tunisia/oil_revenue/

Tunisia tourist ARRIVALS 2021 DATA: 2022 forecast: 1990-2020 historical: Chart. (n.d.). Retrieved November 10th, 2021, from https://tradingeconomics.com/tunisia/tourist-arrivals

United Nations Conference on Sustainable Development, rio+ ... (n.d.). Retrieved November 8th, 2021, from https://sustainabledevelopment.un.org/rio20

World Bank Group. (April 2nd, 2021). Tunisia's economic update - April 2021. Retrieved November 09th, 2021, from https://www.worldbank.org/en/country/tunisia/publication/economic-update-april-2021

WWF, Méditerranée : La croissance bleue face au défi du bon état écologique, 2015, p 49

XI. Annex: Institutional frameworks

International Framework

United Nation Convention of the Law of the Sea (UNCLOS)

UNCLOS provides an international framework for the conservation and management of marine living resources. In their Territorial Seas (TS) and Exclusive Economic Zones (EEZ) coastal states are empowered to establish fishery zones and determine zones in which fisheries activities are prohibited.

Fisheries jurisdiction in the TS is based on the sovereignty of the coastal state. In the EEZ, the coastal state determines the allowable catch of the living resources and has the duty to maintain and restore the living resources through proper conservation and management measures taking into consideration a multi-species approach and ensure that the living resources are not endangered by overexploitation (Art.61, UNCLOS).

Nationals of third states, fishing in the EEZ of the coastal state, must comply with the law and regulation of the state (licensing of fishermen, fishing vessel and equipment, determination of species can be caught through quotas or catch by vessels and gear specification (Art.62, UNCLOS). Nevertheless, several duties were set for the states to cooperate in conserving certain species (*e.g.,* highly migratory species, marine mammals), as stated in Articles 64 and 65 of UNCLOS.

Convention on Biological Diversity (CBD), Rio de Janeiro Convention (1992)

The CBD's objectives are to take all appropriate measures to protect and preserve biological diversity, rare or fragile ecosystems, as well as species of wild fauna and flora which are depleted, threatened, or endangered as well as their habitats.

CBD supports the Sustainable Development Goals 14 (SDG 14) to conserve and sustainably use the ocean seas and marine resources and achieve the following targets: By 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution. It regulates harvesting and prohibits overfishing, illegal, unreported, and unregulated fishing and destructive fishing practices and implements science-based management plans, to restore fish stocks in the shortest time possible.

It prohibits certain forms of fisheries subsidies which contribute to overcapacity and overfishing. CBD eliminates subsidies that contribute to illegal, unreported, and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation.

By 2030, it will increase the economic benefits for Small Island developing States and least developed countries from the sustainable use of marine resources, including through the sustainable management of fisheries, aquaculture, and tourism.

International Maritime Organization (IMO)

The IMO provides international rules and regulations concerning maritime safety and efficiency of navigation and the prevention and control of marine pollution from ships. Other duties given to IMO are competency for the establishment of the special areas, where transportation can cause risk for the environment regardless of if it is in national water or not. The IMO has produced the international convention for the prevention of Pollution from ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) (*e.g.,* the regulations concern the design of the ships, their equipment, and operational discharges).

These IMO rules are the same as other international regulations regardless of the jurisdiction. Designation of Sensitive Areas is regulated by law regarding Particularly Sensitive The designation of Sensitive Areas is regulated by the Particularly Sensitive Sea Areas (PSSA) Act and the IMO provides Guidelines for the identification and designation of Particularly Sensitive Sea Areas (PSSA) of ecological, scientific, or sociological importance. It exhausts the special negative impact protection of transportation industry recognized as PSSA.

Fish Stock Agreement, 1982 FSA-FAO

The FSA is a modification of the UNCLOS provisions relating to fishing in the high seas, also in two articles, Art 6 and 7, takes into consideration precautionary approach and compatibility of conservation and management measures to provide applicability on the national jurisdiction waters.

This agreement is a United Nations agreement for the implementation of the provisions of the United Nations Convention on the law of the sea relating to the conservation and management of straddling fish stocks and highly migratory fish stock.

Mediterranean and EU Regional Regulations

The Barcelona Convention and Protocols

The Mediterranean States have concluded one of the first regional treaties for the protection of the marine environment, the Convention for the Protection of the Marine Environment, and the Coastal Region of the Mediterranean (Barcelona Convention). This treaty extends to all.

Mediterranean waters, irrespective of their legal condition, provide the general principles and the institutional framework for the protection of the marine environment.

Integrated Coastal Zone Management (ICZM)

The ICZM is the Protocol to the Barcelona Convention, a very special legally binding instrument on coastal management (the first significant step in the development of international legislative instruments for ICZM) which aims to bring Mediterranean States and the EU to better manage their coastal areas, as well as dealing with new coastal environmental challenges, such as climate change.

Mediterranean Action Plan (MAP)

The MAP is a regional cooperative effort involving 21 countries bordering the Mediterranean, as well as the EU. Through the MAP these contracting parties to the Barcelona convention and its protocols are determined to meet the challenges of protecting the marine and coastal environment.

General Fisheries Commission for the Mediterranean and Black Sea (GFCM)

The GFCM is an intergovernmental organization established under article XIV of the FAO constitution and part of the UN system.

The GFCM agreement was registered with the secretariat of the United Nations on April 5th, 1952, to:

-Support livelihoods for coastal communities through sustainable small-scale fisheries. It is agreed that commitment is needed, by 2020 to support livelihoods within sustainable small-scale fisheries, consistent with SDG target 14b and 14.7.

-Reduce IUU fishing in the Mediterranean and black sea by 2020, consistent with SDG target 14, by developing a holistic regional plan of action to fight IUU fishing.

The Marine Strategy Framework Directive (MSFD)

The MSFD is the environmental pillar of the Integrated Maritime Policy (IMP) and refers also to other directives such as the Water Framework Directive (WFD), the Habitat and Birds Directives that establish the Natura 2000 network.

The overall target of MSFD is the achievement of Good Environmental Status (GES) of all European Seas by 2020, measured by 11 descriptors. To achieve GES by 2020 each member is required to develop a marine strategy.

EU Integrated Maritime Policy (IMP)

The IMP is a common and comprehensive framework for EU policies relating to maritime issues: it promotes an inter-sectorial approach, without replacing sectorial policies but ensuring coherence among each other, at the different decision-making levels.

The IMP focuses its action primarily in the following 5 areas:

- Maximizing the Sustainable Use of the Oceans and Seas

- Building a knowledge and innovation base for the maritime policy

- Delivering the highest quality of life in the coastal regions

-Promoting Europe's Leadership in International Maritime Affairs

- Raising the visibility of Maritime Europe.

The introduction of the "Blue Growth" concept into IMP, which is now called Sustainable Blue Economy, makes it fully consistent with the Europe targets: the sector of blue

economy is crucial to achieve the challenge of a smart, sustainable, and inclusive growth.

In fact, EU regional policies in the Mediterranean Marine Region and in the Ionian Adriatic Region both referred to these two main EU strategies, Europe 2020, and PMI, unified by the paradigm of "Sustainable Blue Economy'', which must be given due consideration in any planning exercise in the region.

The Ecosystem Approach, which has been fully adopted by the EU, requires environmental protection requirements to be integrated into the definition and implementation of the Union maritime policies and activities, with a view to promote sustainable development. In this sense, any MSP activity should adopt an ecosystem-based approach.

Environmental Action Program (EAP)

The MSFD was the key component of EU activity towards the marine environment under the 6th Environmental Action Program, adopted in 2002 and ended in 2012. The 7th Environmental Action Program (EAP), adopted in November 2013, is the new Environmental Program guiding European environment policy until 2020.

The program lists nine priority objectives for the EU to achieve by 2020: To protect, conserve and enhance the Union's natural capital; The EAP expresses the commitment of the EU, national authorities, and stakeholders to speed up the delivery of the objectives of the 2020 Biodiversity Strategy and the Blueprint to Safeguard Europe's Water Resources.

The EU Biodiversity Strategy to 2020 sets six main targets and actions needed to halt the loss of biodiversity and the degradation of ecosystem services and restore them as far as feasible. The 7th EAP outlines that it is necessary to step up the implementation of that Strategy, and meet the targets contained therein to enable the Union to meet its biodiversity headline target for 2020. Whereas the Strategy includes built-in measures to improve the implementation of the Birds and Habitats Directives, including the Natura 2000 network, reaching the headline target will require the full implementation of all existing legislation.

Water Framework Directive (WFD)

Regarding flood risk prevention, part of the objective of the WFD, as stated in Article 1, is to "contribute to mitigating the effects of floods", however, risk prevention is not part of the main objectives of the WFD.

Following the adoption of the WFD, the need for a European legislation on the management of flood risks was expressed in the 2004 European Communication on flood risk management, based on the likelihood of an increase of floods frequency and severity due to climate change.

On October 23rd, 2007, the European Parliament and the Council adopted the Directive 2007/60 on the assessment and management of flood risks.

According to the Directive, by December 22nd, 2015, Member States must prepare and implement flood risk management plans for each river basin district, based on flood hazard maps and flood risk maps.

Maritime Spatial Planning Directive (MSP)

The MSP is explicitly considered an essential crosscutting tool for the implementation of the EU Integrated Maritime Policy and an instrument to strengthen the EU maritime economy.

In fact, the main objective of MSP is to facilitate the coherent and sustainable implementation of the different policy initiatives relevant for seas and coasts. The full respect of the sea's natural capital and the coherence with global fight against climate change are the main pillars of any environmental-based consideration in MSP.

Towards Integrated Coastal Zone Management (ICZM) and Marine Spatial Planning (MSP). It is worth to briefly consider here the efforts made in the last two decades by the European Union to promote measures to remedy deterioration and to improve the situation in the European coastal zones, as they are in many ways a precursor to MSP.

DISCLAIMER

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