

Coastal Protection Measures-Pilot Area Scale

Batroun, Lebanon





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

Coastal protection measures- Pilot Area scale Batroun scale, Lebanon



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OVERVIEW

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REVIEW

Contributors

Myriam LTEIF, PhD

📍 National Center for Marine Sciences – CNRS, Lebanon

Myriam GHSOUB, PhD

📍 National Center for Marine Sciences –CNRS, Lebanon

Anthony OUBA, PhD

📍 American University of Technology, Lebanon

Nahed MSAYLEB, PhD

📍 Lebanese University, Faculty of Agriculture, Beirut, Lebanon

Reviewers

Talal DARWISH, Pr.

📍 National Center for Remote Sensing – CNRS, Lebanon

Amin SHABAN, Pr.

📍 National Center for Remote Sensing – CNRS, Lebanon

Hatem KANFOUDI, PhD

📍 National Engineering School of Tunis, Tunisia,

Supervisors

Béchir BEJAOU, PhD

📍 National Institute of Marine Sciences and Technologies, Tunisia

LAYOUT

Khouloud ATHIMEN, Engineer, Technical Coordinator

📍 National Institute of Marine Sciences and Technologies, Tunisia

Houaida BOUALI, Engineer

📍 National Institute of Marine Sciences and Technologies, Tunisia

Mohamed Ali BRIKI, Engineer

📍 Coastal Protection and Planning Agency, Tunisia

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Abstract

Tourism in coastal areas is indispensable for its flourishing in terms of economy. However, it can be affected by the terrain stability of the area, and in turn, affects its sustainability. This report aims to assess the coastal protection measures in the light of tourism in the Batroun coastal area. In this context, field visits were implemented in March 2022 to survey the latter area and document by photographing the coastal protection measures available. Defense measures along the Batroun coast were observed and mainly consisted of rock-based embankments, sea defense boulders, retaining walls, retaining wall-supported embankments, and traditional protection measures. At the end of the report, several recommendations were issued to ensure the sustainability of tourism along the coast of Batroun City.

I. Introduction

This deliverable provides an analysis of coastal protection plans at the pilot area scale (Batroun). First, it presents an overview of the morpho-dynamics of the coastal area of Batroun, as well as the coastal threats and mitigation measures. Then, it provides an analysis of the commonly adopted approaches for monitoring the Batroun coastal area. Later, it evaluates the potential coastal management planning measures implemented in the area.

Batroun, located 53 km north to the Capital Beirut, has its name derived from the Greek “Botrys”. This coastal city was founded by the Phoenicians on the southern side of the promontory “Râs Ach Chaq’a” in ancient times. The coastal area of Batroun comprises many important architectural, archaeological, and heritage sites, in addition to its natural ones that are threatened by urbanization (UNEP – ERML, 2012).

Batroun well-represents Lebanon at a smaller scale in terms of being a touristic attraction and subject to several pressures at the same time. Such pressures comprise urbanization, infrastructure development, recreational activities, unmanaged waste disposal, emerging pollutants, unregulated building of coastal resorts, illegal violation of the maritime public domain, coastal privatization, beach erosion, as well as land and ecosystem degradation. Therefore, coastal protection planning, and management are crucial to protect and sustain the coastal environment, as well as the tourism sector in the area.

This report identifies the existing protection measures along the shoreline of Batroun City, evaluating their technical status and feasibility to protect the coast. This was based on the analysis of satellite images accompanied by field surveys, to identify these measures and their dimensions. This in turn will facilitate the proposal of new measures (whenever needed) and the maintaining approaches for the existing ones.

II. Materials and methods

The information and data obtained to elaborate this report that targets the coastal protection measures in tourism areas along the coast of Batroun City Are based on the analysis of satellite images, field observations, and backed up by published reports and articles that concern the coastal sensitive areas and legislations, as well as available reports and strategies from concerned institutions (*e.g.*, ministries, universities, and international organizations). Maps were drawn from satellite IKONOS images using Arc-GIS software.

This report also covers coastal protection plans designed or implemented along the Batroun coastline and reveals information regarding coastal monitoring programs (where available). Moreover, it provides a thorough description of potential coastal sites in need of protection.

Furthermore, hydrology trends and thematic maps displaying coastal defenses and potential sites to be protected along the coastline were constructed. Recommendations were suggested at the end to ensure the sustainability of the coastal area of Batroun and the implementation of sustainable tourism and the blue economy.

III. Coastal morpho-dynamics in Batroun

III.1. Overview

The coast of Batroun is dominated mainly by detrital and moderately consolidated materials (as illustrated in Deliverable #1, ID-PA6-01 entitled *Climate change and morphological stability in tourism areas in Batroun*), specifically the calcareous sandstone rocks and alluvial and fluvial deposits, which resulted in various shoreline features including terraces, sandy and rocky beaches, and rock detrital. In fact, these types of rocks create an irregular shoreline with wide abrasion platforms and host various biotopes (wide littoral platforms, small coves, *etc.*; Ramos-Esplá *et al.*, 2017). This coastal city is characterized by the presence of different types of habitats, supporting a diversity of marine life (MOE/UNDP/ECODIT, 2010), including vermetid platforms that are risking disappearance due to anthropogenic pressure, mainly the chaotic urbanization (UNEP – ERML, 2012). Batroun also comprises an ancient city located above the rocky promontory, with its western side bordered by the solid sandstone Phoenician Sea Wall (220 meters long with a mean width of 1-2 meters and a maximum height of 5 meters) south of the old harbor (Figure 1).

In addition, Batroun is characterized by several cultural, archaeological, and natural landscapes that require protection including the valley of Al-Jawz River and Msaylha fortress which is threatened by quarrying activities and construction works (MOE/UNDP, 2011).



Figure 1. The ancient Phoenician Sea Wall.

III.2. Physical characteristics and trends

Like many coastal regions worldwide, Batroun is under the influence of climate change acting as a natural pressure, as well as well pronounced anthropogenic ones, such as sea filling, chaotic urbanization, *etc.* As a result of the changing climate, salinity, and sea surface temperature (SST), as indicators, are slowly altered.

When coastal habitats and ecosystems (acting as coastal defense structures) are damaged, the adaptive capacity of coastal communities becomes low. Climate change in the long term can alter sea-surface temperature (SST) locally, and cause sea level to

rise globally. Moreover, a rise in SST, influenced by global warming, can be linked to an increase in storm frequency and intensity. On the other hand, sea level rise increased coastal flooding from rainstorms and can cause shoreline erosion and coastal mass movement, especially when combined with wind-driven waves, as well as saltwater intrusion.

III.2.1. Sea surface temperature and salinity

Trends in sea surface temperature (SST) were recorded in the Batroun Maritime region. According to Abboud Abi-Saab and Ouba (2021), who monitored two stations in Batroun for thirteen years, an increasing trend in sea surface temperature was recorded. The warmest year was 2014, displaying temperatures of 24.52 ± 3.65 °C and 24.35 ± 3.54 °C at the inshore and offshore stations; respectively. Sea surface salinity (SSS) also showed an increasing trend over the years with a minimum record in 2004 (38.32 ± 1.2 PSU and 38.62 ± 1.38 PSU at the inshore and offshore stations, respectively) and a maximum record in 2014 (39.29 ± 0.16 PSU and 39.36 ± 0.18 PSU at the inshore and offshore stations; respectively; Figure 2).

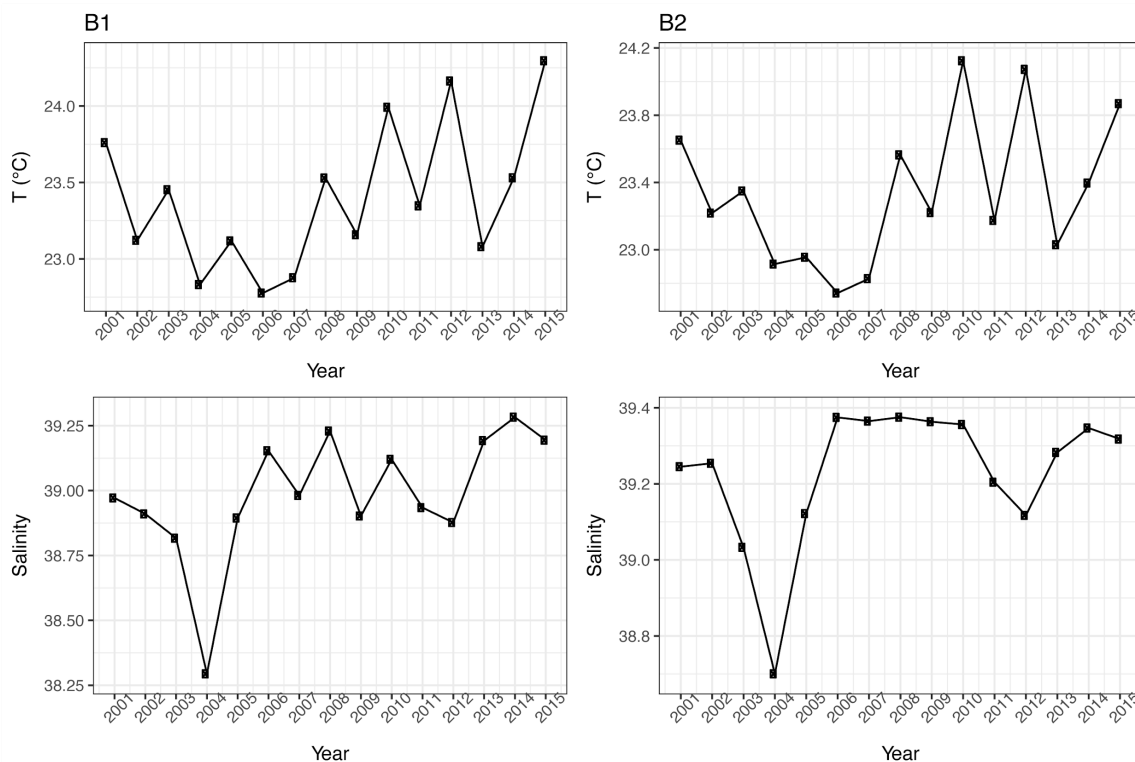


Figure 2. Interannual variations of the mean and standard deviation of the SST and SSS at the inshore (left) and offshore (right) between 2002 and 2014 in the Batroun marine waters (Abboud Abi-Saab and Ouba, 2021).

III.2.2. Coastal evolution

A study analyzing the evolution of the North Lebanon shoreline from Madfoun to Aarida between 1962 and 2007 revealed the general change in the coastline. Aerial photographs and satellite imagery were processed for the years 1963, 1970, 1994, and 2007. The shorelines in the photographs were digitized and revealed surface erosion, accretion, and sea-filled areas (Figure 3).

For instance, following the field observation implemented in March 2022, preliminary observations revealed several sea-filled sites in Batroun (Figure 4). Sea filling is often practiced by the private sector, namely the tourism one, to expand land surface area for building resorts and marine piers (UNEP – ERML, 2012).

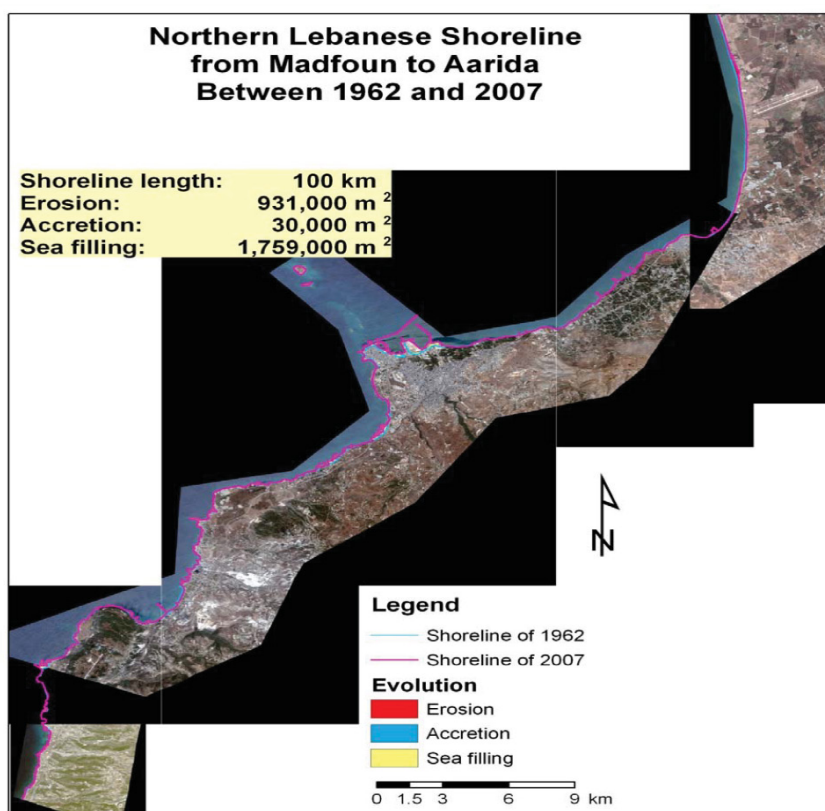


Figure 3. Evolution of the shoreline of the North Lebanon Coastal zone between 1963 and 2007 (University of Balamand, 2013).



Figure 4. Sea filling near the fishing harbor (left) and San Stefano resort (right) in Batroun.

Down-scaling to the coast of Batroun City and, comparing the coastal stretch between 1963 and 2021, coastal erosion and aggregation were evident, namely in Bahsa Bay and along the Phoenician wall (Figure 5).

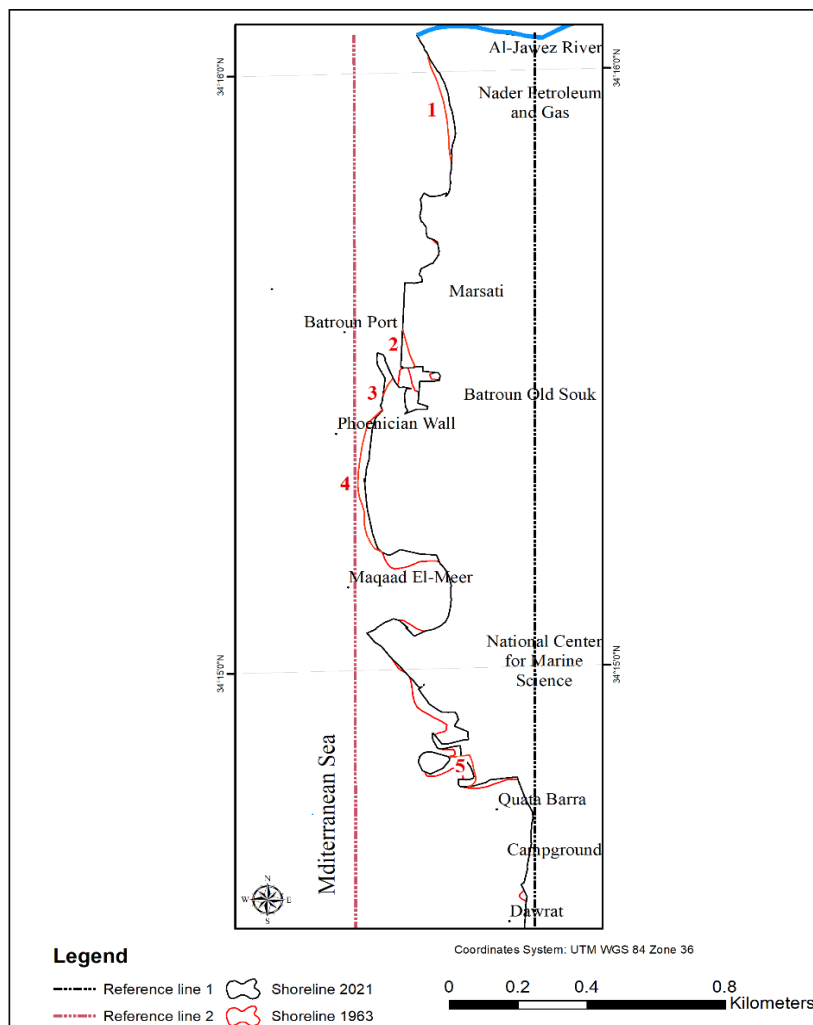


Figure 5. The shoreline of Batroun City in 1963 (from topographic maps) and 2021.

IV. Coastal protection planning and management in touristic areas

IV.1. Coastal protection plans

Valuing the importance of coastal zone sustainability, especially for exploited and vulnerable areas, the Lebanese government represented by the Ministry of Environment (MoE) has launched several projects targeting coastal protection for entire Lebanon in collaboration with national and international entities (MoE, 2017). Refer to Annex 1 for further details.

IV.1.1. Monitoring programs

The official and continuous monitoring program in Lebanon has been conducted by the National Centre for Marine Sciences (NCMS) - National Council for Scientific Research in Lebanon (CNRS-L) along the Lebanese coastal zone since 1972. It comprises two stations in Batroun: one located in Bahsa Bay and the other one in the proximity of the Sel'aata Chemical Plant (Figure 6). The NCMS measures the physicochemical parameters and the bacteriological status of the seawater in these stations monthly. As a result, annual reports are issued to reflect the quality of bathing water and any alteration in the environmental status of Batroun coastal waters. Besides, the station at Bahsa Bay has always been considered a reference point among the least polluted stations in Lebanon; nevertheless, the station at Sel'aata is not bacteriologically polluted but has unfavorable chemical pollution. This Monitoring program helps in the development of monitoring plans for pollution and marine litter in the Batroun area.

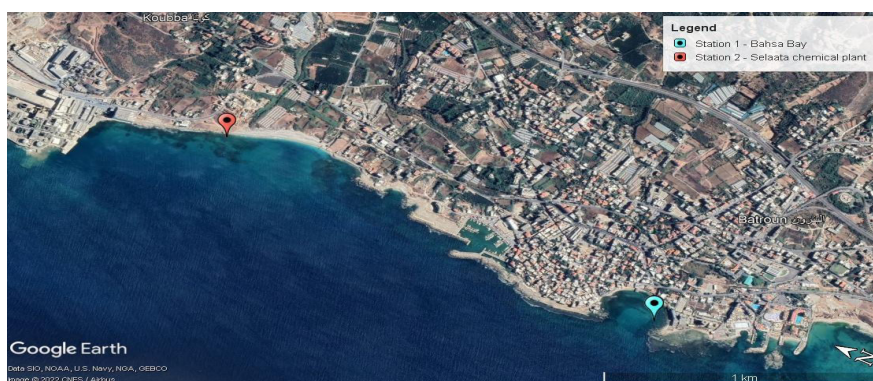


Figure 6. NCMS monitoring stations along Batroun coastline.

IV.1.2. Coastal zone management

As a part of the Lebanese coast, the Batroun coastline is accounted for in several developmental projects for the coastal area of Lebanon. For instance, the Remote Sensing Centre (RSC) of the CNRS-L is performing environmental monitoring in various sectors related to watershed management, forestry, urban settlements, archaeology,

integrated coastal zone management, public participation, natural hazards, and natural resources (water, soil, biodiversity; CNRS-L, 2021).

Moreover, the University of Balamand in Lebanon and its local and international partners have also been involved in coastal zone management, specifically to improve the coast of northern Lebanon, emphasizing the touristic zones. The project elaborated by the University of Balamand aimed to establish the process of Integrated Coastal Zone Management (ICZM) as a tool to develop a structural strategy in cooperation with local stakeholders to manage the Lebanese coast including the coast of Batroun (University of Balamand, 2019).

IV.1.3. Legal and administrative framework for Batroun coastal area

There are many legislations related to the conservation and protection of marine and coastal habitats, as well as biodiversity in Lebanon. Commonly apply to the Batroun coastal area. In addition, the Batroun coastal area and its surrounding area are also subject to several regional and international conventions targeting the protection and conservation of its coastal biodiversity and ecosystems. Refer to [Annex 2](#) for further details on national legislation and regional conventions.

IV.1.4. Potential protected areas in Batroun

A study conducted by the UNEP – ERML (2012), revealing sensitive and high-priority areas to be protected along the Lebanese coast mentioned the presence of three main sites in the Batroun coastal area having high ecological and cultural values (Figure 7).

- Site 1 (Red zone in Figure 7): Hima El Batrounis declared a Hima with no conservation plan following the Ministry of Agriculture (MoA) decision No. 129 of 1991.
- Site 2 (Blue zone in Figure 7): Historical Center and Fishing Harbor of Batroun under the supervision of the Ministry of Culture (MoC).
- Site 3 (Green zone in Figure 7): Al-Jawz River is declared a reserve following the Ministry of Environment (MoE) decision No. 22 of 1998.



Figure 7. Potential sites to be protected along Batroun coastline (UNEP – ERML, 2012).

The sites were also prioritized according to their importance in terms of cultural and ecological criteria, where the fishing harbor and historical center displayed the highest priority (Table 1).

Table 1. The three potential marine conservation sites in addition to their conservation value, performance, and priority (UNEP – ERML, 2012).

Site	Conservation value and sensitivity	Performance	Priority
Historical Center and Fishing Harbor of Batroun	Cultural	Good - Very Good	High
Batroun National Marine Hima at the Marine Sciences Center	Ecological	Fair – Good	Medium
El Jawz River estuary	Ecological	Fair – Good	Medium

Moreover, through the project entitled “*Towards an ecologically representative and efficiently managed network of Mediterranean Marine Protected Areas (MedMPA Network Project, 2017)*” an ecological characterization of marine areas of conservation interest including Batroun was carried out aiming to declare them as new Marine Protected Areas in Lebanon (Ramos-Esplá *et al.*, 2017).

IV.2. Coastal threats and adaptation measures

Coastal erosion, accretion, sea fillings, pollution problems, as well as climate change impacts such as sea-level rise, storm surge, and saltwater intrusion, are considered major threats to cities that thrive in coastal areas.

Technical coastal adaptation measures are implemented along the Batroun shoreline. Many types of coastal structures are involved in coastal defense mechanisms to mitigate erosion, potential flooding, or any other catastrophic events in vulnerable areas (Figure 8).

Based on a field survey carried out by the authors of this report along the shoreline of Batroun City, the following technical measures have been reported:

- Rock-based embankment: These are protection measures usually constructed with defined engineering dimensions. They are composed of large, massive rocks accumulated and compacted at a right angle from the landslide and an acute angle from the seaside (Figure 8).
- Sea defense boulders: These are large and massive rocks and boulders dumped on the coast for protecting the coast from waves. The dumping of these boulders usually follows no engineering methods, but it is done with the chaotic dumping of these boulders along the coast (Figure 8).
- Retaining walls: These are elongated concrete walls constructed parallel to the coast with a few meters in height and less than 0.5 m in width (Figure 8).
- Coastal concrete blocks: These are consolidated protection measures usually applied in highly coastal risk shorelines. They are composed of concrete blocks dumped from the seaside and supported by retaining walls from the landside (Figure 8).
- Traditional protection measures: These are small-scale measures done by locals to protect their properties (Figure 8). They are usually composed either of limited dimensions retaining walls or accumulated rock with no engineering specifications. Some of these measures were found with small dimensions and they were not accounted for in this report.

Along the 4.53 km shoreline of Batroun City, there are 18 protection measures reported from the applied field surveys and from the processing of satellite images to identify their dimensions (Table 2 and Figure 9). In this respect, Quick-bird (0.60 m spatial resolution and 5 spectral bands) satellite images were processed using ERDAS Imagine software. Hence, several digital applications were performed to reach precise measurements.

The existing technical protection measures have been established either by the public sector or by locals depending on land ownership, level of coastal damage, and the dimensions of the required measures. Other than the traditional protection measures and some retaining walls, all remaining measures show acceptable results in protecting the coast.

Some parts of the shoreline, which have no technical protection measures, show many forms of unfavorable degradation, notably where sand terraces and beach sand materials are located. Therefore, the exact location and dimensions of the identified protection measures along the coast of Batroun City were listed in Table 2. In addition, the feasibility of the applied measures has also been appraised.

The total length of the protected coast along Batroun City is about 1,855 m, which is equivalent to about 41% of the entire coast (4.53 km). Hence, the sea defense boulders occupy the most common aspect of technical measures where they extend over 830 m (about 18% of the city coast and 41% of the protected coast). This relatively high percentage of the sea defense boulder can be attributed to the fact that the dumping of boulders and rocks mass in an easy rework ability approach with least coast. However, the relatively high percentage (*i.e.*, 45%) of the technical measures, along the Batroun City coast, has a considerable impact on the ecosystem of the marine environment as well as on the natural landscape of the coast. In addition, the existing measures are almost established without any integrated management plan, and that is why they have different forms and dimensions.



Rock-based embankment



Sea defense boulders



Retaining wall



Coastal concrete blocks

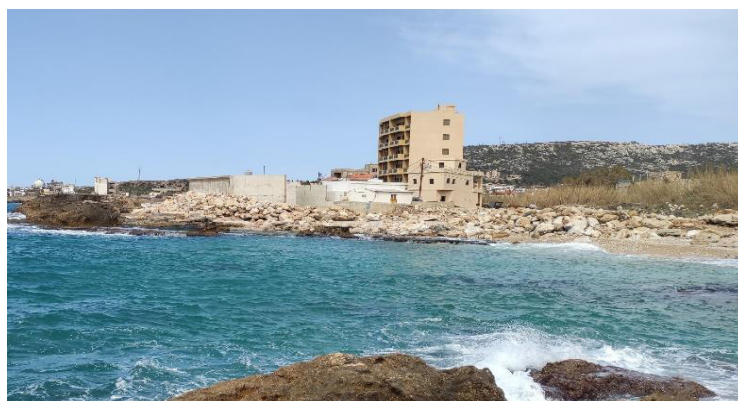


Figure 8. Examples of the applied technical protection measures along the Batroun Coast (Photos by the authors).

Table 2. Technical protection measures along Batroun City coast.

#	Protection measure type	Coordinates		Length (km)	Feasibility
		Latitude	Longitude		
1	Rock-based embankment	34°15'52"N	35°39'30"E	125	These measures show good feasibility in protecting the coast and the adjacent properties.
		34°15'48"N	35°39'29"E		
2		34°15'08"N	35°39'29"E	95	
		34°15'05"N	35°39'27"E		
3		34°14'58"N	35°39'25"E	65	
		34°14'55"N	35°39'28"E		
4	Sea defense boulders	34°15'47"N	35°39'27"E	150	These measures are partially feasible, and sometime with good feasibility, in protecting the coast. However, they create a distortion in the landscape of the coast.
		34°15'43"N	35°39'27"E		
5		34°15'40"N	35°39'27"E	75	
		34°15'39"N	35°39'27"E		
6		34°15'27"N	35°39'23"E	165	
		34°15'22"N	35°39'21"E		
7		34°15'03"N	35°39'24"E	145	
		34°15'02"N	35°39'29"E		
8		34°14'48"N	35°39'29"E	160	
		34°14'49"N	35°39'35"E		
9		34°14'34"N	35°39'36"E	135	
		34°14'30"N	35°39'35"E		
10	Retaining walls	34°15'09"N	35°39'29"E	60	The feasibility of these measures is always limited, especially when these walls are applied with relatively small dimensions (e.g., height and width).
		34°15'07"N	35°39'29"E		
11		34°15'02"N	35°39'24"E	80	
		34°15'00"N	35°39'26"E		
12		34°14'53"N	35°39'26"E	50	
		34°14'52"N	35°39'27"E		
13		34°14'35"N	35°39'37"E	30	
		34°14'34"N	35°39'36"E		
14	Coastal concrete blocks	34°15'38"N	35°39'25"E	265	Excellent protection measures applied surrounding Batroun Port.
		34°15'30"N	35°39'25"E		
15		34°15'31"N	35°39'21"E	120	
		34°15'28"N	35°39'22"E		
16	Traditional protection measures	34°15'54"N	35°39'31"E	20	Minimal protection has been reported from these measures.
		34°15'54"N	35°39'30"E		
17		34°15'44"N	35°39'27"E	60	
		34°15'43"N	35°39'29"E		
18		34°15'12"N	35°39'21"E	75	
		34°15'12"N	35°39'22"E		

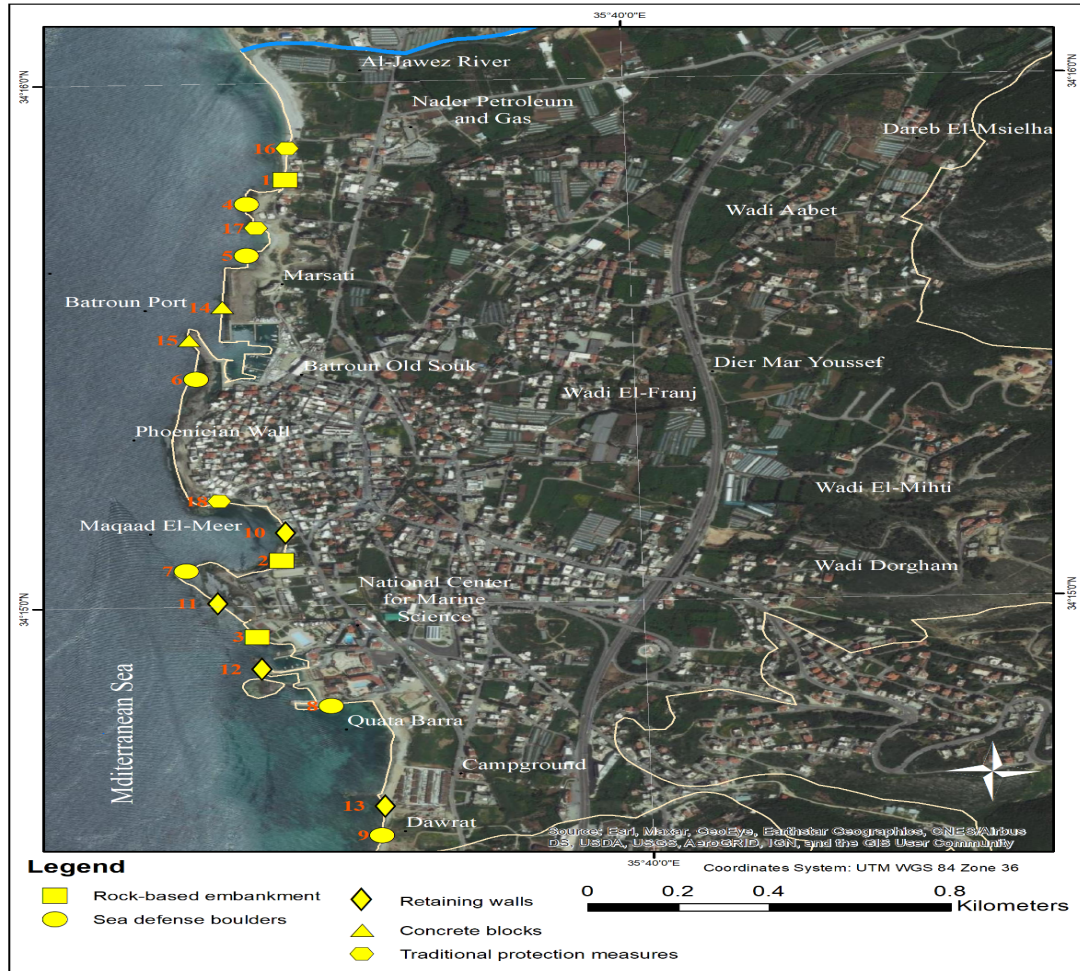


Figure 9. Location and types of the coastal defense structures along the coast of Batroun.

V. Coastal and maritime tourism development

Batroun has always been known as a main tourist attraction site in Lebanon continuously subject to rapid and uncontrolled touristic development. Such an increase in tourism has induced negative effects on the coastal area, increasing environmental degradation risk (Zahedi, 2008). The uncontrolled construction of coastal resorts, as well as sea fillings for the same purpose, have resulted in negative coastal exploitation, beach erosion, as well as land and ecosystem degradation. Additional negative consequences of the tourism flux in Batroun are listed below:

- Overcrowding.
- Poor sewage disposal.
- Boat-generated waste.
- Beach erosion.
- Destruction of wildlife habitats.
- Degradation of the environmental quality.
- Increase greenhouse gas emissions and contribute to global warming.
- Marine litter.
- Excessive use of energy and water.

On the other hand, tourism may positively contribute to the Batroun community and the conservation of the coastal environment:

- Generate local income.
- Incentives to promote natural resources and biodiversity.
- Improvement in waste management.
- Increase citizen awareness.

Furthermore, the coastal defense and protection measures adopted in Batroun increase security and encourage tourists to visit the city.

VI. Sustainable tourism and coastal protection

Considering the sustainability of coastal zones, factors affecting them should be efficiently addressed. Tourism, especially in attractive coastal areas, is one factor that can negatively influence coastal stability. Therefore, it is indispensable to integrate tourism in ensuring the sustainability of coastal areas maintaining environmental and socio-cultural balance. This can increase the social and economic benefits of tourism and decrease its adverse effects on the coastal and marine environment (Yunis, 2001). In this context, the following recommendations should be taken into consideration to maintain the sustainability of the Batroun coastal area considering an increasing touristic flux:

- Involvement of local community and tourism stakeholders in managing coastal resources using the best environmental practices. For instance, encouraging citizen science among locals and increasing awareness of the local community regarding the protection and conservation of the coastal area. This can be implemented through regular awareness meetings and workshops as well as field campaigns.
- Support local tourist resorts, restaurants, communities, and economies for implementing environmentally friendly measures that help sustain the coastal area, such as the use of recyclable products and reduction of plastic use.
- Establishing legislation and institutional framework that promotes sustainable tourism. In addition, policies and actions at the local and sectoral levels must be harmonized to ensure efficient sustainable tourism policies.
- Buy souvenirs from local stores: Local sustainable handcrafts must be encouraged. Tourists must also be encouraged to buy local hand-manufactured and environmentally friendly items.
- Reducing over-consumption and waste generation: Local rules must be strict to ban any illegal and harmful waste disposal in the coastal area.
- Consulting stakeholders and the public: Stakeholders in Batroun must be regularly consulted and updated about all the activities implemented, as well as decision-making processes to ensure their compliance to conserve the coastal environment considering heavy touristic fluxes.
- Marketing tourism responsible: Responsible tourism should be promoted in the Batroun coastal area by installing instructions signs, as well as explaining to tourists the best practices to keep the coastal environment safe.
- Charging penalties for damages: Policies must be issued to penalize tourists for any damaging activities affecting the environmental sustainability of tourism in the coastal area.

V. Conclusions

Batroun Has always been a leading touristic destination in the Lebanese coastal zone. However, coastal areas are nowadays threatened by several anthropogenic and natural processes affecting their stability and leading to their alteration. Therefore, coastal protection measures are indispensable for protection from natural and hazardous events that may negatively impact tourism in the area. Along the coast of Batroun City, defense measures mainly consist of rock-based embankments, sea defense boulders, retaining walls, coastal concrete blocks, and traditional protection measures. Finally, the illustrated recommendations should be followed to attain sustainable tourism considering coastal protection.

VI. References

Abboud Abi-Saab, M., Ouba, A., 2021. Seasonal and Interannual changes in abundance and community structure of tintinnids in the Levantine Sea in relation to hydrographic conditions from 2002 to 2014. *Regional Studies in Marine Science Journal*. 47.

CNRS-L, 2021. National Center for Remote Sensing. Retrieved 22 June 2021, from <http://www.cnrs.edu.lb/>

MOE/UNDP/ECODIT, 2010. 2011 State and trends of the Lebanese environment. Retrieved from Beirut, Lebanon.

MOE/UNDP, 2011. Climate change vulnerability and adaptation indicators - Coastal Zones. Retrieved from <http://www.circle-med.net/doc/ETCTechpaperCCVAindic.pdf>

MoE, 2017. Projects. Retrieved 22 June 2021, from <http://www.moe.gov.lb/>

Ramos-Esplá, A.A., Bitar, G., Forcada, A., Valle, C., Ocaña, O., Sghaier, Y.R., A.L., 2017. Ecological characterization of potential new Marine Protected Areas in Lebanon: Batroun, Medfoun and Byblos. Retrieved from MedMPA Network Project, Tunis.

UNEP – ERML, 2012. Improved Understanding, Management and Monitoring in the Coastal Zone.

University of Balamand, 2013. North Lebanon Coastal Zone (NLCZ) in North Lebanon Coastal Forum A concept note. Retrieved from http://www.vliz.be/projects/pegaso/images/stories/WP5/D5.1_CASEs_reporting_and_evaluation_report_UNIVE_compressed_3_a.pdf

University of Balamand, 2019. Projects. Retrieved from <http://www.balamand.edu.lb/IOE/Pages/Projects.aspx>

Yunis, E., 2001. Sustainable development and management of tourism in Coastal Areas. Sustainable Tourism CRC. Retrieved from Madrid.

Zahedi, S., 2008. Tourism impact on coastal environment. *WIT Transactions on the Built Environment*. 99: 45-57.

Annex 1

Table 1. Coastal protection projects implemented by the MoE.

Project Name	Starting date	Status
Market Policy and Legislative Development for Mainstreaming the Sustainable Management of Marine and Coastal Ecosystems in Lebanon	November 2013	Ongoing
Supporting the Management of Important Marine Habitats and Species in Lebanon	January 2012	Ongoing
Mainstreaming Conservation of Migratory Soaring Birds into Key Productive Sectors along the Rift Valley/Red Sea Flyway	June 2008	Ongoing
Conservation of Wetlands and Coastal Zones in the Mediterranean	March 2002	Accomplished
Coastal Area Management Program	September 2001	Accomplished

Annex 2

• National legislations

- Law no. 444/02 (Environment Act) is the most indispensable framework for the Lebanese environmental legislation. It specifies that environmental monitoring should be abided with to prevent pollution. It also specifies, under Chapter VIII, the protection, conservation and management of nature and biodiversity.
- Law no. 690 dated 26/8/2005 organizing the MoE and defining its mandate. It states that the MoE is responsible for the establishment, protection and management of protected areas.
- Law no. 214 dated 2/4/1993 (Establishment of the Ministry of Transport) and its amendments (Law no. 247 dated 7/8/2000) state that the Ministry of Public Works and Transport (MoPWT) is mandated to control the implementation of the legislation and rules related to transport and marine public properties.
- Law no. 708/98 declaring the Tyre Coast Nature Reserve on November 5, 1998.
- Law no. 121/92 declaring the Palm Islands Nature Reserve on March 9, 1992.
- Law no. 508/04 (hunting law) aims to regulate and control hunting in terms of season, type of protected birds forbidden for hunting, amount, and type of game birds along with a permit system based on hunting exams.
- The law, issued as decision no. 2775 dated 1929, relating to the control of marine and coastal fishing and its amendments.
- Decree no. 31 dated 18/1/1955, defining the mandate of the Ministry of Agriculture (MoA), states that the MoA is responsible for implementing the legislation related to fisheries and fishing activities.
- Decree no. 22 dated 22/1/1981 (Organization of the Army) states that the Marine Forces in the Army are responsible for coast defense. Therefore, the Ministry of Defense/ Lebanese Army is in charge of patrolling the sea and keeping its activities in order.
- Decree no. 8213 dated 24/5/2012 relating to the “Strategic Environmental Assessment for Proposed Policies and Plans and Programs in the Public Sector” or SEA decree. This decree is relevant for the national monitoring program, as it requires that environmental management plans must include environmental monitoring plans.
- Decree no. 8633 dated 7/8/2012 relating to the “Fundamentals of Environmental Impact Assessment” or EIA decree. According to this decree, all major development, infrastructure, and industrial projects are subject to EIA or Initial Environmental Examination (IEE) studies including their effects on biodiversity, in

order to promote conservation activities and prevent the damage of the surrounding environment by these projects before receiving approval.

- Ministerial Order no. 216 dated 08/04/1993 pertaining to standards for bathing water quality.
- Ministerial Order no. 1/52 dated 12/09/1996 pertaining to standards for reducing air, water, and soil pollution.
- Decree no. 17614 of MoPWT dated 1964 pertaining to the exploitation of the public maritime domain.
- Decree no. 4810 of MoPWT dated 1966 pertaining to regulating the occupation of the maritime public domain.
- Ministerial decision no. 69/2004 dated 2/7/2004: “Establishment of a permanent inter-ministerial committee to implement the agreement ACCOBAMS “.
- Ministerial decision no. 524 of the General Secretary of Ministers Council dated 10/5/2005: “Designation of the NCMS – CNRS/L as the focal point of the ACCOBAMS agreement”.
- Ministerial decision no. 1154, pertaining to the general conditions for the protection of marine mammals (whales, dolphins, and seals).
- Ministerial decision of MoA no. 125/1 dated 23/9/1999 banning the fishing of marine turtles, monk seals and whales as well as selling, use or trade of any derivatives from the mentioned species.
- Ministerial decision of MoA no. 1/385, dated 26/1/1997, stating that fishing activities are prohibited in all estuaries all year round. The protected area involved extends over 500 m on each side of the estuary, 500 m inside the river and two kilometers seawards. All human activities are banned except for those of scientists and the coast guard.
- Ministerial decision of MoA no. 202/1 dated 14/4/1997 for organizing underwater spearfishing.
- Ministerial decision of MoA no. 93/1 dated 14/3/2008 regulating scuba-diving industry including permitting procedures and safety measures and scuba-diving fishing.
- Ministerial decision of MoA no. 346/1 dated 15/7/2010 regulating and identifying fishing types and equipment and banning the use of small mesh sizes and trawling nets and fishing using scuba diving equipment.
- Ministerial decision of MoA no. 676/1 dated 27/7/2011 to forbid the fishing, transportation, selling and consumption of some types of fish.

- Ministerial decision of MoA no. 8/1 dated 4/1/2012 organizing and defining some fishing gears and materials.
- Ministerial decision of MoA no. 1160/1 dated 25/11/2014 for the general conditions of shark fishing.
- MoA decisions banning dynamite fishing.

- **Regional and international conventions**

- The multilateral environmental agreements ratified by the Lebanese government are represented in the table below.

Table 2. Multilateral environmental agreements ratified by the government of Lebanon (MOE/UNDP, 2011)

Year	Convention, Treaty or Protocol	Details
1954	International Convention for the Prevention of Pollution of the Sea by Oil-London	Adhesion; Law No. 68/66 16/11/1966
1963	Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and in Underwater	Ratification; Law No. 59/64 30/12/1964
1969	International Convention on Civil Liability for Oil Pollution Damage- Brussels	Ratification; Law No. 28/73 12/10/1973
1969	International Convention relating to Intervention on the High Seas in cases of Oil Pollution Casualties-Brussels	Ratification; Decree No. 9226 12/10/1974
1971	Treaty on the Prohibition of the Emplacement of nuclear weapons and other Weapons of Mass Destruction on the Seabed and the Ocean floor and in the Subsoil-London-Moscow-Washington	Ratification; Decree No. 9133 07/10/1974
1972	UNESCO Convention on the Protection of Cultural & Natural Heritage	Adhesion; Law No. 19 30/10/1990
1973	International Convention for the Prevention of Pollution from Ships- London	Adhesion; Law No. 13 28/05/1983
1975	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Law No. 233 – 22/10/2012
1976	Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft-Barcelona	Signature 16/02/1976; Accession – Decree Law No. 126 30/06/1977
1976	Convention for the Protection of the Mediterranean Sea against Pollution-Barcelona	Signature: 16/02/1976; Accession – Decree Law No. 126 30/06/1977
1976	Protocol Concerning Cooperation in Combating Pollution of the Mediterranean Sea by Oil and Other Harmful Substances in Cases of Emergency-Barcelona	Signature: 16/02/1976; Accession – Decree Law No. 126 30/06/1977
1979	Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention)	State party on the 01/06/2019

1980	Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources-Athens	Adhesion; Law No. 292 22/02/1994
1982	Convention of the Sea (Mont –Diego Bay) – Jamaica	Adhesion; Law No. 295 22/02/1994
1982	Protocol Concerning Mediterranean Specially Protected Areas-Geneva	Adhesion; Law No. 292 22/02/1994
1992	Convention on Biological Diversity-Rio de Janeiro	Ratification; Law No. 360 11/08/1994
1992	United Nations Framework Convention on Climate Change-Rio de Janeiro	Ratification; Law No. 359 11/08/1994
1994	United Nations Convention to Combat Desertification-Paris	Ratification; Law No. 469 21/12/1995
1999	Convention on Wetlands of International Importance especially as Waterfowl Habitat-RAMSAR	Adhesion; Law No. 23 01/03/1999
2002	Agreement on the Conservation of African-Eurasian Migratory Water Birds (AEWA)	Adhesion; Law No. 412 13/06/2002
2004	Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic Area-ACCOBAMS	Adhesion; Law No. 571 05/02/2004
2005	Kyoto Protocol to the United Nations Framework Convention on Climate Change aiming to fight Global Warming	Adhesion; Law No. 738 15/05/2006
2008	Amendments to Barcelona Convention	Adhesion; Law No. 34 16/10/2008
2008	Protocol on Integrated Coastal Zone Management in the Mediterranean	Ratification; Decree No. 639 18/09/2014
2010	Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization under the Convention on Biological Diversity	Law No. 3 03/02/2017

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