

Ecosystem Protection Measures Pilot Area Scale

Batroun, Lebanon





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

Ecosystem protection measures Pilot area scale

Batroun scale, Lebanon



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OVERVIEW

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REVIEW

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Index

Index	iv
List of figures	v
List of tables	vi
Abstract	vii
I. Introduction	1
II. Materials and methods	2
III. Coastal ecosystems	3
III.1. Overview	3
III.2. Threats and risks	3
IV. Ecosystem services and coastal tourism	7
V. Towards a coastal ecosystem sustainability	8
V.1. Policies, plans, and monitoring programs	8
V.2. Blue Economy in light of sustainable tourism	10
VI. Conclusions	12

List of figures

Figure 1. Construction of beach resorts and hotels	4
Figure 2. Land reclamation in two locations along the Batroun coast	4
Figure 3. A municipal waste pipeline exits at the sandy beach of the Batroun coastal area	5
Figure 4. Beach litter in the southern area of the Batroun coast	5
Figure 5. <i>Ulva lactuca</i> in the southern area of the Batroun coast	6
Figure 6. Monitoring stations along Batroun coastline	8

List of tables

Table 1. Ecosystem services provided by the Batroun coastal area	7
Table 2. The evolution of Fecal coliforms and streptococci in the Batroun coastal region from 2019 to 2021	9
Table 3. Monitoring and assessment tools: pressures and ecosystem indicators	10

Abstract

Ecosystem protection is a crucial measure that should be implemented not only by the local coastal community in Batroun, but also by tourists visiting the area. This report aims to review the ecosystem protection measures considering tourism in the Batroun coastal area. In this context, field visits were implemented in March 2022, to survey and document the area, by photographing the coastal ecosystem threats in the Batroun coastal area. In addition, published data about the annual bacteriological concentrations in the Batroun area was compiled from the National Center for Marine Sciences NCMS - CNRS-L. The coastal ecosystem and tourism are inter-related fields, where the problems of one can negatively affect the efficiency of the other. Therefore, several recommendations were issued at the end of the report to promote sustainable tourism considering ecosystem protection.

I. Introduction

This report represents deliverable ID-PA6-11: Enabling factors for sustainable co-evolution in touristic areas -Pilot area Batroun: Ecosystem protection measures.

This deliverable describes the existing strategies and measures adapted along the Batroun coast to face the relevant threats to ecosystems. Pressures and key quality indicators to estimate the cumulative impacts of ecosystem threats and to support decision-making are identified. In addition, examples of ecosystem services in terms of ecosystem protection and tourism sustainability, are also mentioned to issue recommendations and guidelines to involve tourists in ecosystem protection and the sustainable development of the Batroun coastal area.

The Lebanese coastal ecosystems, including Batroun, are facing several anthropogenic pressures including habitat degradation, marine pollution, climate change, and invasive species. Therefore, monitoring the coastal ecosystems is indispensable to assess their ecological quality and help various stakeholders (scientists, decision-makers, and managers) take the appropriate measures to ensure their protection (Badreddine, 2018).

Ensuring the sustainability of the coastal ecosystem in Batroun can in turn contribute to the provision of ecosystem services that can be beneficial to the touristic sector. For instance, ecosystems support recreational activities that contribute to their economy and provide potential economic, social, and cultural benefits (El Shaer *et al.*, 2012).

The Batroun region is considered a hotspot for tourism in Lebanon. Besides, the Lebanese tourism industry is proven to be the pillar of the local economy and constitutes an important source of revenue. Thus, tourism destination managers should prioritize the sustainability of the area and the involvement of residents in ecosystem protection (Owaygen, 2015).

II. Materials and methods

The information and data obtained to construct this report targeting ecosystem protection measures in Batroun, relied on field observations and available monitoring data, as well as on published reports and articles regarding ecosystem protection in Batroun coastal area. Maps were built using Google Earth software.

This report focuses on ecosystem protection programs existing in Batroun coastal area, namely coastal monitoring programs (where available). Threats to the Batroun coastal ecosystem, as well as gaps in sustainable protection were evaluated. Furthermore, coastal management and monitoring strategies were assessed to develop guideline frameworks, to face threats and promote sustainable coastal tourism. At the end of the report, recommendations are proposed to ensure the sustainability of the Batroun coastal ecosystems, considering sustainable tourism and a blue economy.

III. Coastal ecosystems

III.1. Overview

The Batroun coastal area is characterized by rocky beaches with one sandy beach in the southernmost area. The rocky shore is irregular and comprises characteristic vermetid reefs, wide littoral platforms, and a bay near the NCMS-CNRS-L (Ramos-Esplá *et al.*, 2017).

The Batroun coastal city comprises both a historical center and an artisanal fishing harbor consisting of a small-scale fishing fleet. In addition, the Batroun historical center is bordered by the archeological Phoenician wall on its western side. The combination of history, archeology, and aesthetic aspects makes this coastal city a tourist attraction. Therefore, having a high flux of visitors to this coastal area, especially after the COVID-19 pandemic, an important anthropogenic pressure has started to be exerted on its ecosystem. According to Ramos-Esplá *et al.*, (2017), the Batroun coastal city has had a high value of the conservation index associated with a high habitat index, the presence of several species of interest, and an important commercial fish biomass. On the other hand, this important ecological value is threatened by high urbanization and artisanal fishery, as well as the large chemical industrial area of Sel'aata.

III.2. Threats and risks

- **Coastal habitat destruction in Batroun**

Habitat destruction or fragmentation can mainly be caused by pressure from recreational activities. Such activities can be harmful to the coastal environment and biodiversity, especially if there are no adequate protection measures implemented (MoE/UNEP/GEF, 2016). Tourism promotes the practice of recreational activities that can lead to the following:

- Construction of beach resorts and hotels (Figure 1).
- Land reclamation, mainly from the sea (Figure 2).
- Beach camping and outdoor activities leading to marine litter.
- Sand extraction from shores for construction purposes.
- Port establishment.
- The amplified demographic pressure due to the increase in Syrian refugees.
- Uncontrolled urban sprawl (sea filling).
- Increased privatization of the shorefront.



Figure 1. Construction of beach resorts and hotels.



Figure 2. Land reclamation in two locations along the Batroun coast.
(Photos by the authors)

- **Marine pollution in Batroun**

The Batroun coastal area is subject to many sources of pollution including:

Municipal wastes (liquid and solid) are caused by the absence of waste management, infrastructure, and wastewater treatment (Figure 3).

- Industrial wastes near the Sel'aata chemical plant.
- Agricultural waste disposal: This issue is often observed in Bahsa Bay and its proximal vermetid reef. This runoff is sometimes flagrant by the off smell.
- Recreational activities cause an increase in beach and marine litter, especially on the public sandy beach (Figure 4), and subsequently a decrease in water and ecosystem quality.



Figure 3. A municipal waste pipeline exits at the sandy beach of the Batroun coastal area.



Figure 4. Beach litter in the southern area of the Batroun coast.
(Photos by the authors)

- **Climate change and invasive species in Batroun**

The effect on the Batroun coastal ecosystems is evident through an increase in seawater temperature and salinity, as well as the colonization of invasive species (Ramos-Esplá *et al.*, 2017; Ouba, 2015). Besides, the invasive seaweed *Caulerpa taxifolia* has been observed on the sandy beach of the Batroun coastal area. In addition, the non-indigenous *Ulva lactuca* (Figure 5) was also observed in several areas along the Batroun coast during the field visits.

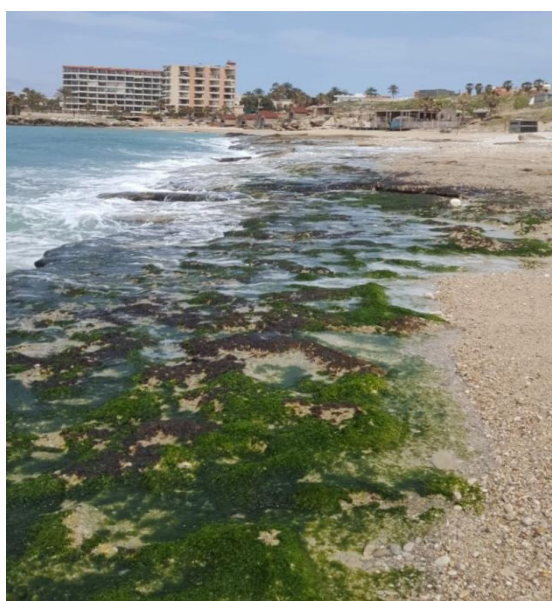


Figure 5. *Ulva lactuca* in the southern area of the Batroun coast.(Photo by the authors)

- **Overfishing**

The fishing sector in Batroun is artisanal, where small wooden vessels with sizes not exceeding 12 meters perform the fishing operations. All fishing activities are concentrated up to 6 nautical miles from shore. Therefore, this high fishing in the coastal area has led to the overexploitation of some coastal species and nursery grounds. In addition, the Batroun coastal areas also face overexploitation of marine resources due to spearfishing activities that target large fish individuals and interfere in the life cycle of several species.

IV. Ecosystem services and coastal tourism

Biodiversity conservation is the basis of a well-functioning ecosystem. This ecosystem equilibrium is crucial to maintaining life on Earth. As human beings, we depend on the components of the ecosystem (oxygen, water, soil) for thriving (MoE/UNEP/GEF, 2016). These components or necessities are considered ecosystem services. The Batroun coastal area is like any well-functioning ecosystem, providing ecosystem services to the surrounding community and visitors.

Some of these services are indispensable to human health. For instance, seafood provisioning, genetic diversity, ecosystem resilience, and aesthetic appreciation can provide both moral and physical benefits to the locals in the Batroun coastal area.

Furthermore, recreational activities and water sports attract tourists to the area. These tourists can benefit from various beach resorts in the area that can facilitate their stay. Besides, this tourist flux can contribute to the country's economy.

Many ecosystem services provided by the Batroun coastal area are summarized in Table 1 and are adapted from the MoE/UNEP/GEF, (2016) report.

Table 1. Ecosystem services provided by the Batroun coastal area.

Provisioning services	Regulating services	Supporting services	Cultural services
Food security (fisheries resources, ...)	Protection against natural disasters	Nutrient cycle	Recreation/ beach resorts
Medicines	Climate regulation	Pollination	Water sports
Agriculture			Spiritual well-being
Shelter			Cultural identity
Building material			Aesthetic value
Energy			Group activities

In addition, many natural structures in Batroun could be well and sustainably exploited to sustain their ecosystem services. For instance, the Jawz River may be exploited to provide irrigation, industrial, and potable water for the surrounding villages, as well as renewable energy through hydroelectricity.

V. Towards a coastal ecosystem sustainability

V.1. Policies, plans, and monitoring programs

To ensure the sustainability of the Batroun coastal area, two stations were chosen by the NCMS-CNRS-L for monitoring the coastal ecosystem. One of these stations is in Bahsa Bay, and the other in the proximity of the Sel'aata chemical plant (Figure 6).

Different physicochemical parameters are monthly measured in these stations, such as phosphates, nitrates, silicates, temperature, and salinity. In addition, the bacteriological status of the water represented by Fecal coliforms and streptococci, is also monthly measured in these stations.

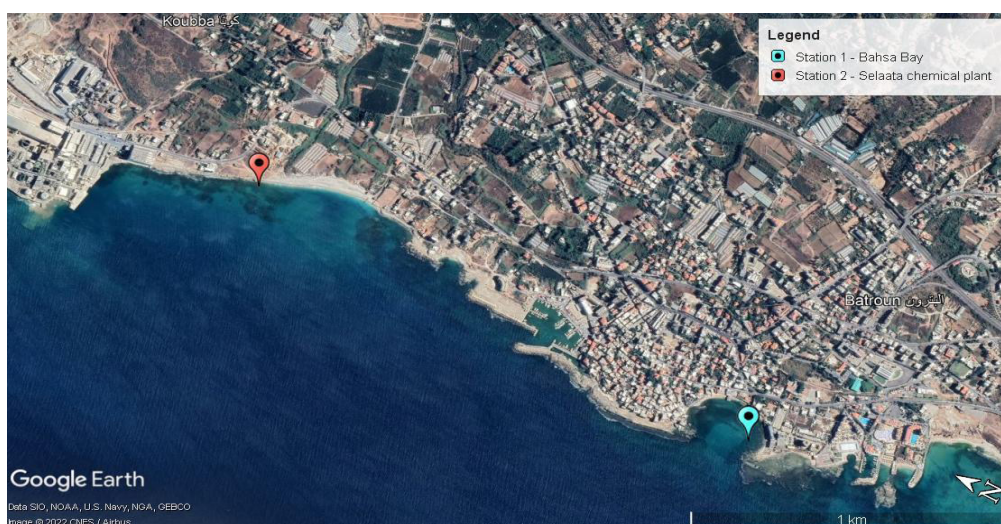


Figure 6. Monitoring stations along Batroun coastline. (Adapted from Google Earth).

The monitoring program in Batroun revealed a Fecal streptococci concentration below standard limit (less than 100 CFU/100 mL) for the past three years (from 2019 and 2021) in Bahsa Bay. On the other hand, Sel'aata showed higher concentrations exceeding 100 CFU/100mL in 2020 and 2021. This continuous monitoring showed that Bahsa Bay in Batroun can be considered a clean area that is suitable for swimming and recreational activities, as well as a suitable reference station (Table 2).

Therefore, along the Batroun coastal area, Bahsa Bay can be considered as a safe coastal zone for touristic activities.

Table 2. The evolution of fecal coliforms and streptococci in the Batroun coastal region from 2019 to 2021 (obtained from the CNRS-L annual beach quality press release).

	Fecal streptococci (CFU/100mL)			Fecal coliforms (CFU/100mL)		
	2019	2020	2021	2019	2020	2021
Batroun	19	41	42	22	24	23
Sel'aata	94	120	139	19	27	4

Besides, Lebanon has several environmental laws and regulations that apply to Batroun (UNEP – ERML, 2012). Some of the conservation laws related to marine and coastal areas, on which ecosystem protection strategies and guidelines are based, can be retrieved from the deliverable ecosystem protection measures at the national scale.

Furthermore, several entities are involved in the protection of the marine environment, including the Batroun coastal area. The Ministry of Environment (MoE) always cooperates with national administrations responsible for marine-related issues such as the Ministry of Agriculture MoA, Ministry of Public Works and Transport (MoPWT), Ministry of National Defense (MoD), and the Ministry of Interior and Municipalities (Mol). Besides, other main stakeholders play a crucial role in the Batroun coastal ecosystem protection, such as local non-governmental organizations (NGOs), fishermen syndicates, and local communities. A list of the national coastal ecosystem protection activities implemented may be also retrieved from the deliverable “ecosystem protection measures at the national scale”.

Moreover, several universities also participate in coastal ecosystem protection in the Batroun area. For instance, the University of Balamand implements related national and international projects in cooperation with various stakeholders (e.g., ministries, NGOs, international organizations).

Although a sea surface monitoring program is already being implemented in the Batroun coastal area, additional effort should be maintained to ensure thorough ecosystem protection in this fast-growing region in terms of tourism.

Several tools/indicators should be monitored to ensure the sustainability of the coastal region, as well as its resilience against the impacts of the high touristic flux. Table 3 presents some tools/indicators based on anthropogenic and/or natural pressures and ecosystem components (Hammar *et al.*, 2020) that should be monitored in the Batroun coastal area.

Table 3. Monitoring and assessment tools: pressures and ecosystem indicators.

	Indicator/tool	Parameters to monitor
Pressures	Eutrophication	Phosphorus; anoxia; nitrogen
	General pollution	Heavy metals; oil spill; toxins; bacteriological contamination
	Shipping	Noise; oil spill
	Coastal development	Habitat degradation and coastal erosion through land reclamation
	Recreation	Boating; bird hunt, spearfishing
	Fisheries	Artisanal catch and bycatch
	Industry	Port and industrial toxins
	Sand extraction	Habitat loss; turbidity
	Energy	Disturbance; noise; engine cooling
	Impact of tourism	Wastewater and marine litter
Ecosystem components	Birds	Coastal and migratory birds
	Fish	Pelagic and demersal species abundance, spawning, etc.
	Habitats	Soft and rocky bottoms; vermetid reefs; coralligenous formations, shorelines, etc.
	Marine mammals	Cetacean observation
	Marine turtles	Marine turtle habitats and nesting areas
	Marine flora	Phytoplankton, including toxic algae, macroflora monitoring
	Marine fauna	Zooplankton abundance; macrobenthic fauna monitoring
	Marine biotope	Sediment composition; water column analysis (e.g., SST, salinity, turbidity, etc.)

V.2. Blue Economy in light of sustainable tourism

Mass tourism, especially in coastal areas, can lead to the unsustainable exploitation of coastal ecosystem resources. Nevertheless, touristic activities can be sustainable and less devastating to coastal ecosystems. For example, ecotourism can be promoted in coastal areas, such as sea-bottom and marine habitat observations, by snorkeling or diving in Batroun. In addition, ecotourism must respect the social, economic, and environmental aspects in the area to be efficiently implemented.

Through ecotourism, the conservation and protection of the Batroun coastal area can be promoted, as well as environmental awareness, and an eco-friendly mentality can be spread among the local community and visitors.

Applying ecotourism can reduce the impact on natural coastal resources, in addition to the involvement of all stakeholders (individuals, local communities, ecotourists, tour operators, and government institutions; Patterson, 2002; Kiper, 2013).

The involvement of local communities in decision-making processes related to planning and management decisions, is crucial to ensure their utmost participation in the ecosystem protection process.

Ecotourism in Batroun may ensure ecosystem protection, where several opportunities are available to promote sustainable tourism due to the prevalence of outstanding natural and cultural landscapes along the coast.

Efficient ecotourism should abide by the following three principles:

- Environmental conservation
- Community participation
- Self-sustainability

The local community, local visitors, and tourists, should be encouraged to think in an eco-friendly manner, thus reducing the impact on the environment through these main recommendations (Ferrerhotels, 2021):

- Limit visitation to sensitive areas: group size limits and season limits.
- Orient the local community towards customer eco-friendly Tourism aspect.
- involve the local community by encouraging local supplies.
- Value nature during the touristic experience.
- Protect marine life and conserve biodiversity (limiting spearfishing that targets large individuals).
- Minimize waste.
- Encourage recycling.
- Avoid throwing litter.
- Encourage citizen science.

Citizen science mutually benefits researchers and citizens. For instance, through implementing citizen science, local citizens and tourists can stay in the loop and contribute to the collection of scientific and monitoring data, thus participating in research work. Citizen science activities consist in involving local citizens through training and interviews.

Besides, NGOs can promote citizen science and help protect the Batroun coastline and highlight threats, problems, and solutions through extensive media coverage and interest (Baalbaki *et al.*, 2019).

VI. Conclusions

Ecosystem protection is crucial to ensure the optimal ecosystem services provision and to increase its resilience as well. The coastal ecosystems well-being and prosperity are related to their sustainable protection and conservation. In this context, tourism is an important factor that may negatively impact the coastal ecosystem in Batroun if not sustainably practiced. Therefore, efficient and continuous monitoring programs, as well as proper regulations and guidelines should be implemented along the Batroun coastal area to ensure its sustainability and the conservation of its biodiversity in the light of a growing tourism sector.

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