

Conflict/Synergy Among Different Uses on Land and at Sea and Land-Sea Interaction in Touristic Areas

Batroun Scale, Lebanon



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

Conflict/Synergy among different uses on land and at sea and land- sea interaction in touristic areas

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OVERVIEW

The present document was produced within the framework of **Co-Evolve4BG** project “*Co-Evolution of Coastal Human Activities & Med Natural Systems for Sustainable Tourism & Blue Growth in the Mediterranean*” with regards to the Threats and Enabling Factors for maritime and coastal tourism development on a national scale” co-funded by ENI CBC MED Program (Grant Agreement A_B.4.4_0075).

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REVIEW

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List of Abbreviations

USAID	US Agency for International Development
UNEP	United Nations Environment Program
MoE	Ministry of Environment - Lebanon
MoA	Ministry of Agriculture - Lebanon
SOER	State of the Environment Report
MARSATI	Maritime Sciences and Technology Institute - Lebanon
NCMS	National Center for Marine Sciences - Lebanon
CDR	Council for Development and Reconstruction - Lebanon
CNRS	National Council for Scientific Research - Lebanon
MSFD	EU Marine Strategy Framework Directive
KTC	Knowledge Transfer Center
INSPIRE	Infrastructure for Spatial Information in Europe
ICZM	Integrated Coastal Zone Management
EcAp	Ecosystem Approach
MSP	Marine Spatial Planning

Abstract

The current report is going to highlight the Conflict/Synergy among the different land and sea uses and their impact on Sustainable Coastal/Maritime tourism development in Batroun. The intensive urban development in Batroun is intrigued by touristic and commercial activities. The Lebanese coast is characterized by chaotic urban expansion, unregulated building of coastal resorts and illegal violation of the maritime public domain following extensive privatization of the coastline, beach erosion, as well as land and ecosystem degradation. Batroun is not only a touristic city, but it is also the origin of more than 6 wine terroirs producing organic wines. Small businesses and famous brands are multiplying in Batroun, especially in the hospitality, food, and beverage sectors.

The presence of attractions and monuments in Batroun such as the Phoenician Sea wall, the old city center with its historical churches and old buildings, as well as sea-related activities such as swimming, fishing, making an excursion on a boat, seafood, and the famous lemonade, bring more people to visit and revisit Batroun. The impact of irresponsible human activities on marine ecosystem services and tourism is going to be analyzed. Land-based activities precondition the flow of material, energy or organism and the quality of coastal sediment and water and affect the marine biota through effects on ecological processes such as reproduction, richness, growth, and mortality. Destructive demersal fishing is detrimental to the aesthetics and protection of the coastline.

The Batroun coastal area can benefit from various fisheries and commercial activities, including aquaculture, that can provide ecosystem services. Attention must be paid to the hazards posed by the Cargo boats carrying phosphate raw material to the plant located at the North and ejecting the washed residues into the open sea and fume from the dumped ballast at the South of the city, at Ras Eddeh location, which can both pollutes the air and the quality of groundwater.

The report also calls for controlling any accidental sewage water spills and to maintain the observed good swimming water quality in the coastal Batroun. It is suggested to focus on dynamic process in urban biodiversity conservation to reestablish natural processes in cities through potential re-wilding of inactive industrial areas, infrastructural corridors, abandoned orchards and grasslands in suburban lands that can be conceptualized as wilderness, even in a managed or unmanaged coastal landscape.

For the prognosis of the cumulative hazards from human activities in Batroun city and risks on the coastal zone, the coast of Batroun was classified into five main land uses: 1. Agriculture, Urban, Harbor with motorized tourism, organized tourism, and wild unmanaged beach. Each driving force was analyzed, and technical and policy recommendations provided for sustainable land-sea interactions, marine spatial planning, and integrated coastal zone management.

I. Introduction

The main objective of this report is to highlight the Conflict/Synergy between the different uses on land and at sea and their impact on Sustainable Coastal/Maritime tourism development in Batroun. The nature of relationships between on land and at sea is mainly chaotic, dominated by private sector and business concepts. One of the major components of land sea interaction is fishing which is totally absent from the traditional/classical Lebanese tourism that has had a destructive impact on the surrounding coastal and marine environments including resources of economic value (USAID, 2021).

One of the main causes of the intensive urban development along the Lebanese coastal zone is the tourism sector. Most of land uses and urban expansion at sea and along the Lebanese coast are oriented toward commerce and marine resorts and related touristic activities, yachting, and swimming. There are 486 hotels on the Lebanese territory with 71% located on the coast in addition to 68 beach resorts (UNEP/MoE, 2013). The Lebanese coast is characterized by unregulated building of coastal resorts and illegal violation of the maritime public domain following the large coastal privatization, beach erosion, and land and ecosystem degradation (SOER, 2020). This traditional trend of the Lebanese growing urban and tourism sector that is mainly based on activities within urban structures such as hotels, beach resorts, restaurants and country clubs might have a destructive impact on the environment. This is due to the observed chaotic urban sprawl observed on the coast which puts additional pressure on vulnerable coastal ecosystem. It is also related to the reported violation of the maritime public domain through unregulated construction of coastal resorts and coastal privatization, beach erosion, and land and ecosystem degradation.

Fortunately, local community and organizations such as the Batroun Municipality, the Maritime Sciences and Technology Institute - Batroun (MARSATI), affiliated to the ministry of public works and transport, the National Center for Marine Sciences (NCMS), affiliated to the National Council for Scientific Research are caring about the human and touristic values of Batroun.

II. Different Coastal and Maritime activities in Batroun

Batroun is a dynamic touristic city stretching along the northern Lebanese coast between Nahr Aljawz and Dawrat (Figure 1). After 2000, tourism in Batroun converted from an existing complementary activity to a dominant local economy. The expansion of touristic resorts and restaurants has attracted Lebanese tourists from other cities in the country, notably during the weekend, when it is difficult to find a vacant table or place in a restaurant or hotel.

The total number of hotels in Batroun and surroundings is 275 hotels, houses, and apartments, among which 11 hotels are rated 4-5 stars (Table 1). The summer tourism flow in Batroun can be estimated at 1,000 people during the weekdays to 2,500 people during the weekend. The marine touristic resorts have been developing at the South of the city and covering a large area of the coast, estimated at 140,000 m² (Figure 2).

One of the indicators of tourists' flow to Batroun is the impossible car parking within the city during the weekend. Such flow brings about periodic increase of domestic waste and sewerage water which must be properly treated, disposed, or potentially reused to promote sustainable tourism and limit its impact on sea water quality.

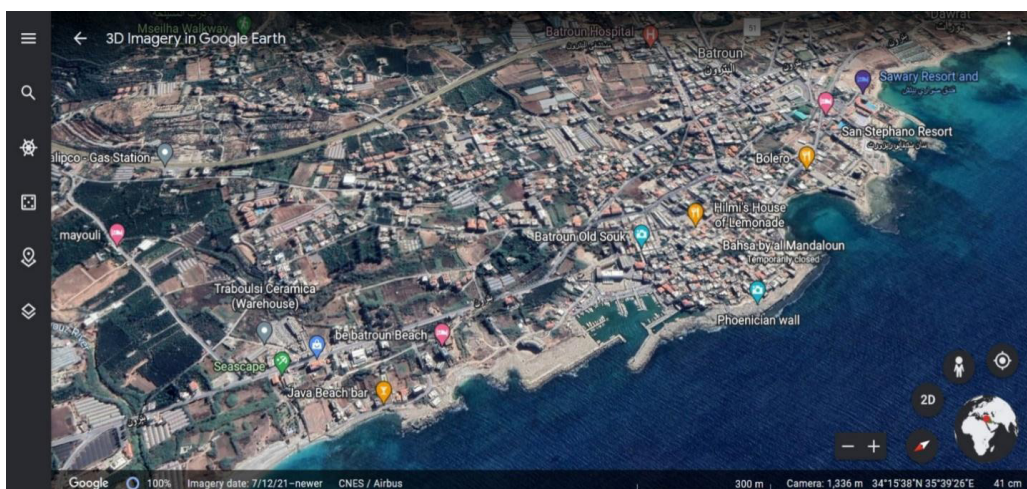


Figure 1. Google Earth 3D view of Batroun city from the sky at elevation of 1,336 m showing agricultural lands to the North of the city.

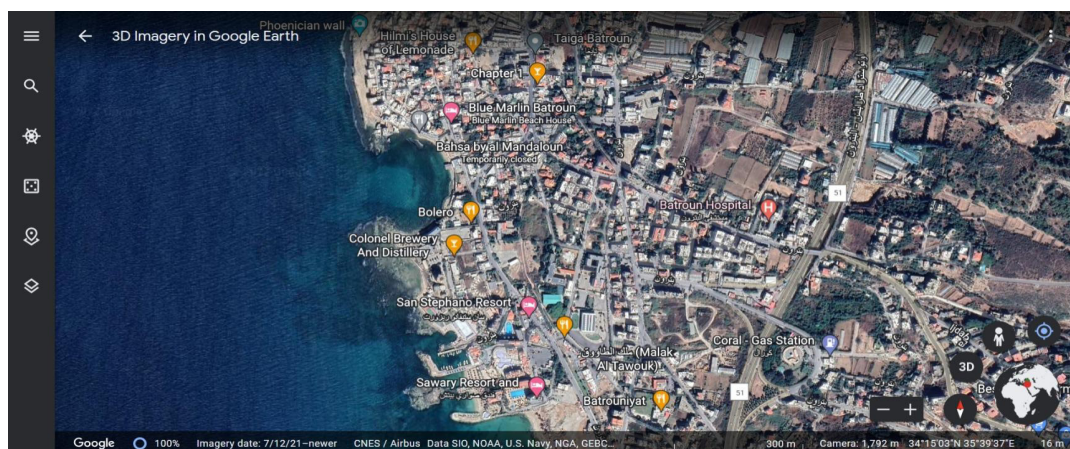


Figure 2. Batroun from 1,800 m height with focus on resorts in the southern part of the city (Web capture: Eearth.google.com).

Table 1. Main rated Hotels in Batroun.

Hotel name	Rating From the Web	Distance from Beirut, km	Phone N. +961	Website and/or Direction	Indicators of excellence
Sea View Hotel Batroun	4.4(94)	43.6	76 000 966	https://www.expedia.com/Batroun-Hotels-Seaview-Hotel-By-Hansa.h24261970.Hotel-Information	0.75 km from Batroun harbor and 2 km from the city center. 27 standard, premium, and deluxe rooms with 24-hour service. Has pool and beach, airport transportation, free Wi-Fi, air conditioning, refrigerator, rooftop pool, free parking, restaurant, and children's activities.
L'Auberge de la Mer	4.5(96)	43.0	06 740 825	WEBSITE	160 m from the city center. 9 guest rooms, pool, Marina, Near the beach. Restaurant and bar/lounge, Spa tub.
Nazel Saada Boutique Hotel	4.6(18)	43.0	71 052 456	https://www.airbnb.com/rooms/38101362?source=impression&id=p3_1649938636_FSS52OfYqNvImHBD	Old Home in the city center with 5 bedrooms, 11 guests, 10 beds and 5 bathrooms.
Blue Marlin Batroun	4.5(68)	42.7	79 157 468	WEBSITE	10-minute walk from the sea and city center. 3 Bedrooms, One Mezzanine, Two Living Rooms, One Terrace, <u>One Kitchen</u> , <u>2.5 Bathrooms</u> . 8 guests.

Batroun Guesthouse	4.4(40)	43.4	03 064 895	https://lebanonuntravelled.com/beit-al-batroun-guesthouse-thoum/	0.2 km from city center. 5 double rooms, accommodates: 8 people swimming pool, free wireless internet, private bathrooms, kitchen garden and fruit trees, sea view
Old Town Guest Houses	5.0(25)	43.0	03 081 007	WEBSITE	0.2 km from the city center. freshly renovated 6 guest houses in a modern and cozy style along the beach.
Modern Phoenician Guesthouse	4.5(25)	43.4	03 064 895	https://www.readytotrip.com/hotels/Lebanon/North%20Governorate/Batro%C3%BBn/old-town-guesthouses/#rooms	1 km from the city center and Phoenician wall. 4 rooms with all amenities.
be Batroun Beach Hotel	4.3(13)	43.6	06 642 942	WEBSITE	1 km from city center. 8 executives and 20 standard rooms with all amenities and pool.
Villa Paradiso Batroun	4.4(161)	43.0	06 740 927	WEBSITE DIRECTIONS	Old villa with elegant indoor space on the first floor backed up by a professional kitchen and a lovely 520m ² garden. The upper floor houses the fully renovated six bedroom and breakfast area guesthouse. Sea and town view spacious terraces and roof bar.
Batroun Bahsa Bay (BBB)	3.7(15)	42.6	03 919 703	https://www.expedia.com/Batroun-Hotels-Batroun-Bahsa-Bay.h36238566.Hotel-Information	800 meters from the city center. 5 rooms with different area and views. On the beach with all amenities.
San Stephano Resort	8/10	40	06 740 366 3 13 15 13	HTTP://WWW.SANSTEPHANO.COM/	1 km from city center. All amenities, marina, pools, and beach. Air conditioning and satellite LCD TVs. Kitchenette with a microwave. 2 restaurants, 5 cafes and a beach bar.
Sawary Beach Hotel	7.3/10	45	06 642 100	https://www.readytotrip.com/hotels/Lebanon/North%20Governorate/Batro%C3%BBn/sawary-beach-hotel/#descriptions	0.5 km from city center. 18 rooms will all amenities and pools.

In addition to the city's tourist attractions such as the Phoenician Wall, Makaad El Meer (Figure 3) the Mseilha Citadel (Figure 4), the Cedar Forest of Jaj, and old churches, the old city represents a unique ancient architecture with sandy stony buildings and narrow streets with shops, restaurants, and pubs (Figure 5).

However, civilization is invading all aspects of modern life and threatens old, traditional, calm quarters and traditional lifestyles. The urban expansion along the coastal Batroun between 2000 and 2020 showed an increase in densely built-up areas by 41% from 479,100m² to 676,500 m². Batroun's wastewater treatment plant was reported by CDR to be completed in 2010 (Karam *et al.*, 2013).

Nevertheless, the sea water quality has been described as affected by the mismanagement of solid and liquid wastes in the country (NCMS-CNRS, 2021). The report published by this center in July 2021 showed the water quality of Batroun to vary between very good (bay facing the NCMS-CNRS Building and Makaad El Ameer: BAT-2 N34.25113° E35.65696°) to warning with moderate quality: BAT-1: N34.25317° E35.65696°, along the pebbly-rocky beach, North of the city).

While water samples from the first site contained 136 fecal coliforms/100 ml and 251 Fecal Streptococci/100ml, the second site contained 23 and 44 units/100 ml respectively, which is much below the standard for good and very good swimming water quality (Figure 5). Therefore, proper management of wastewater treatment is necessary to protect water quality in the coastal area of Batroun. However, high nutrient concentration and the predominance of eutrophic conditions near sewer outfalls located between Beirut and Batroun were reported by Abboud-Abi Saab and Hassoun (2017) with the presence of harmful toxic blooms near perturbed sites. Significant trace metal contamination was found at Beirut Port with moderate contamination at Tripoli Port (Merhaby *et al.*, 2018).



Figure 3. Makaad El-Meer (Seat of the Prince) in Batroun (Photo by the authors, 22/02/2022)



Figure 4. El Mseilha Citadel in Batroun (Photo by the authors, 22/02/2022)

The solid waste disposal sites and their functioning status can also affect sediment and water quality in the vicinity of Batroun. Given the main wind direction and the flow of sea currents from south to north, it is very important to safeguard the sea water quality in the South of Batroun. The State of the Environment Report (SOER, 2020) reported the updated state of Municipal Solid Waste Facilities along the Lebanese coast with several remaining in the state of proposed or under construction or non-operational (Figure 6).

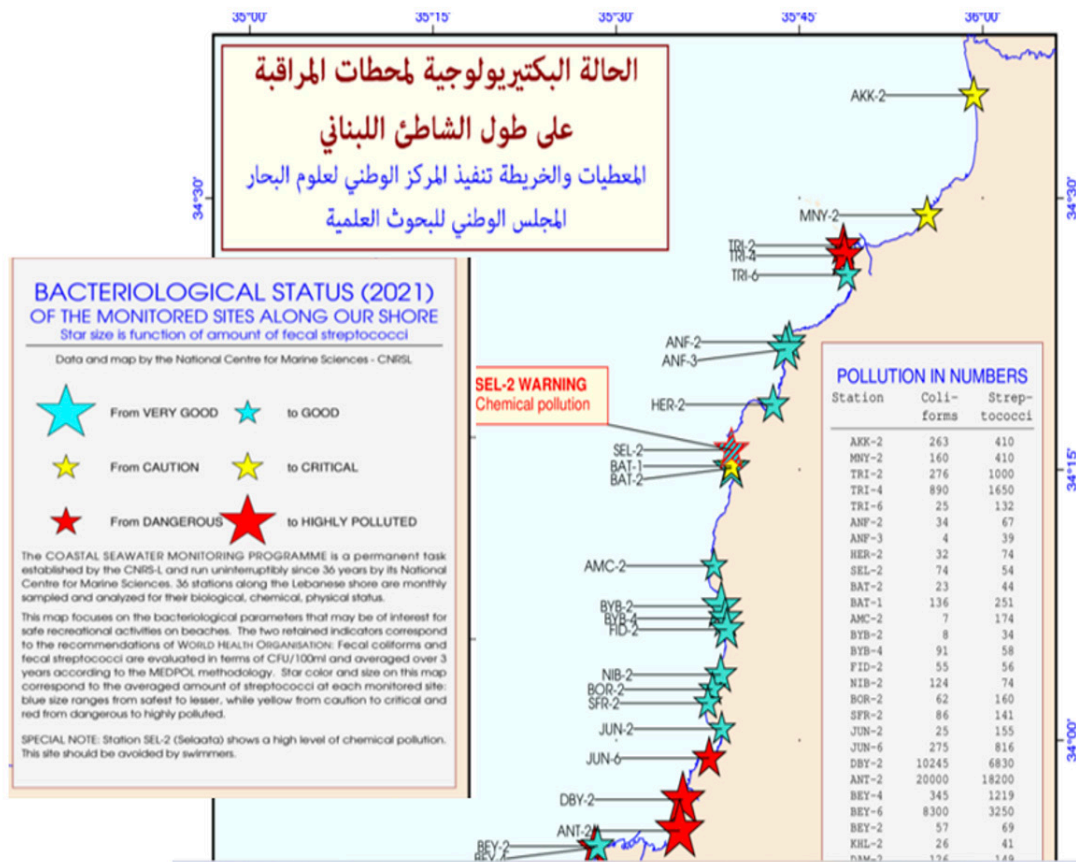


Figure 5. Water quality along the northern Lebanese coast (NCMS-CNRS, 2021).

The city of Batroun must consider the impact of the Cargo boats carrying phosphate raw material to the plant located at the North and ejecting the washed residues into the open sea (Figure 7), which reach the coast. Also, fumes from self-burning or intentional (arson) of the dumped ballast at the South of the city, at Ras Eddeh location, pollutes the air and the seeping residues can affect the quality of groundwater (Figure 8). The establishment and maintenance of solid waste sorting plant that segregates, composts, reuses and manages the residual fraction within a circular economy is a necessity to protect Batroun's ambient air and water quality.

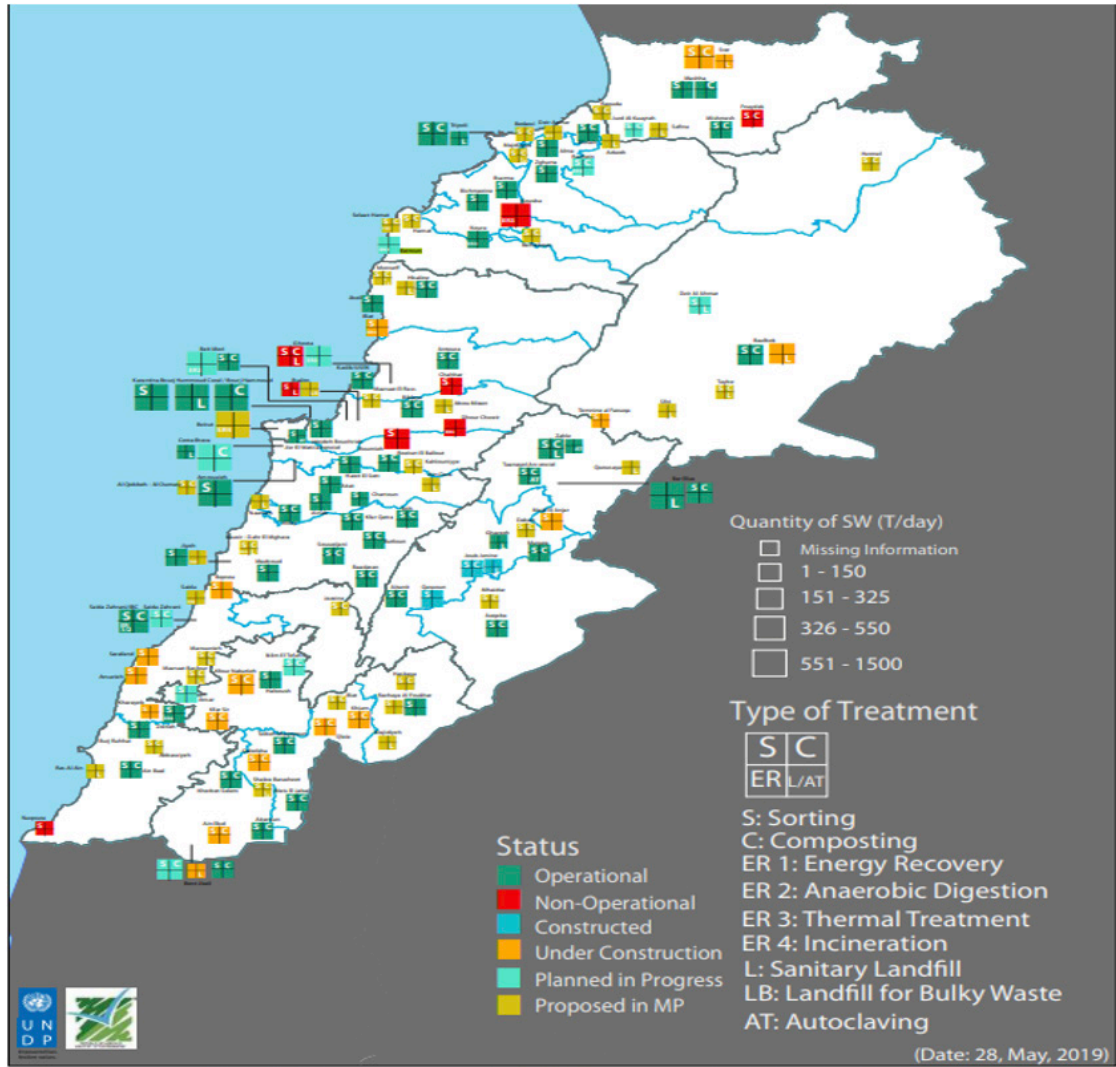


Figure 6. Lebanon Municipal Solid Waste Facilities (UNDP, MoE data, reported by SOER, 2020).



Figure 7. After loading the cargo at the Salaata Plant, boats wash the phosphate residues to the Mediterranean Sea. These chemical residues reach the coast on a regular basis (Photo by the authors, 21/03/2022).



Figure 8. Fire smoke from the city solid waste disposal site in Ras Eddeh area (Photo by Alber Hannouch).

III. Interactions of tourism with the other coastal and maritime activities

The presence of attractions and monuments in Batroun such as the Phoenician seawall (Figures 9 and 10), the old city center with its historical religious monuments, old churches, and historical buildings, as well as sea-related activities such as swimming, fishing, making an excursion on a boat, seafood and famous lemonade drink bring more people to visit and revisit Batroun. However, the recent economic crisis in the country has relatively affected the Batroun's flourishing tourism and has increased the noise and air pollution from private diesel generators providing electricity to the residents and resorts during most of the night and part of the day.

According to the *Mediterranean Observer* (2021), crowds stroll along Batroun's streets and visit its historical sites, old churches, and religious monuments (Figure 9), others sunbathe on beaches and many drink into the night despite the pandemic and their country's financial crisis dubbed by the World Bank as one of the deepest depressions of modern history. Small businesses and famous brands are multiplying in Batroun, especially in the hospitality, food, and beverage sectors.



Figure 9. Phoenician Sea Wall (Lebanon Untravelled).



Figure 10. The ancient Phoenician Wall is a 225-meter-long wall that was built by the Phoenicians for protection against sea storms and invaders (Tomasi Alessandro, 2021).

Batroun is not only a touristic city, but also but also the origin of more than 6 vineyards producing organic wines. The Mayor of the Batroun municipality (Mr. Marcelino al-Hark) stressed to the *Mediterranean Observer* that they knew the excellent touristic quality of their city and the current image of Batroun as main tourist destination is due to 22 years of continuous work.



Figure 11. Saint Stephano Church looking into the old harbor (Lebanon Untravelled).

However, the concept of zoning according to land suitability should be applied, and tourism and urban development should be supported along with food agriculture. Beside the traditional tourism related to marine activities, visits to natural sites and reserved areas, there is a need to promote organic agricultural production and attract people to alternative tourism related to ecotourism and agro-tourism, thus enhancing the livelihoods of farming communities, including the wine-growing areas of Batroun.

IV. Conflicts and synergies between coastal and Maritime activities

Coastal aesthetic and coastal protection are harmed from destructive demersal fishing (Table 2), pelagic high by-catch fishing, large port traffic, ports, marinas and harbors, small docks, ramps, wharfs, log dumping, handling, storage, sea dumping, industry, pulp and paper, onshore mining, human settlements, agriculture, sea temperature changes and UV changes (Singh *et al.*, 2020).

Table 2. Ecosystem services in coastal areas (Singh *et al.*, 2020).

Ecosystem Service	Human activity or stressor causing impact
Coastal Aesthetics	Demersal destructive fishing; demersal non-destructive low bycatch fishing. demersal non-destructive high bycatch fishing; pelagic low bycatch fishing. pelagic high bycatch fishing; recreational fishing; finfish aquaculture; shellfish aquaculture; large boat traffic; ports, marinas, and harbors; small docks, ramps, wharfs; log dumping, handling, storage; ocean dumping; industry; pulp and paper; onshore mining human settlements; agriculture.
Coastal Protection	Recreational fishing; large boat traffic; ports, marinas, and harbors; small docks, ramps, wharfs; log dumping, handling, storage; industry; pulp and paper. Onshore mining; human settlements; agriculture; sea level rise.
Benefits from Commercial Demersal Fishing	Demersal destructive fishing; demersal non-destructive low bycatch fishing. pelagic low bycatch fishing; pelagic high bycatch fishing; recreational fishing. finfish aquaculture; shellfish aquaculture; large boat traffic; ports, marinas, and harbors; small docks, ramps, wharfs; log dumping, handling, storage; ocean dumping; industry, pulp, and paper; onshore mining; human settlements. Agriculture: ocean acidification: sea temperature change; UV change.
Benefits from Commercial Pelagic Fishing	Demersal destructive fishing; demersal non-destructive low bycatch fishing. pelagic low bycatch fishing; pelagic high bycatch fishing; recreational fishing. finfish aquaculture; shellfish aquaculture; large boat traffic; ports, marinas, and harbors; small docks, ramps, wharfs; log dumping, handling, storage; ocean dumping; industry; pulp and paper; onshore mining; human settlements. Agriculture; ocean acidification: sea temperature change; UV change.
Coastal Recreation	Demersal destructive fishing; demersal non-destructive low bycatch fishing. demersal non-destructive high bycatch fishing; pelagic low bycatch fishing. pelagic high bycatch fishing; recreational fishing; finfish aquaculture; shellfish aquaculture; large boat traffic; ports, marinas, and harbors; small docks, ramps, wharfs; log dumping, handling, storage; ocean dumping; industry; pulp and paper; onshore mining; human settlements; agriculture; ocean acidification; sea level rise; sea temperature change; UV change.

Potential Energy Generation	Demersal destructive fishing; demersal non-destructive low bycatch fishing. demersal non-destructive high bycatch fishing; pelagic low bycatch fishing. pelagic high bycatch fishing; recreational fishing; large boat traffic; ports, marinas, and harbors; ocean dumping; industry.
Benefits from Finfish Aquaculture	Demersal destructive fishing; demersal non-destructive low bycatch fishing. pelagic low bycatch fishing; finfish aquaculture; large boat traffic; ports, marinas, and harbors; industry; pulp and paper; onshore mining; human settlements, ocean acidification; sea temperature change, UV Change.
Benefits from Shellfish Aquaculture	Demersal destructive fishing; demersal non-destructive IOW bycatch fishing. pelagic low bycatch fishing; shellfish aquaculture; large boat traffic; ports, marinas. and harbors; small docks, ramps, wharfs; pulp and paper; onshore mining; human settlements; ocean acidification; sea level rise; sea temperature change; UV change.

However, the Batroun coastal area can benefit from different fisheries and commercial activities, including aquaculture, that can provide ecosystem services. However, aquaculture is currently not existent on the Lebanese coast. The only experimental aquaculture sites developed by the MoA in the seventies is not functional anymore (Figure 12). It requires fundamental rehabilitation of infrastructure and continuous maintenance.

The links between land and sea are complicated and interactive and have a reverse nature. Connections between land and marine ecosystems occur through urbanization, energy consumption, transport vectors, disposal, and management of wastes with main influence from land to sea (Stoms *et al.*, 2005).

Land-based activities precondition the flow of material, energy or organism sediment and coastal water quality and affect marine biota through their effects on ecological processes such as reproduction, richness, growth, and mortality (Figure 13). Sea-land interactions of some typical maritime sectors such as aquaculture, desalination, fisheries, marine cables and pipelines, minerals and mining, ports and shipping, tourism and coastal recreation and offshore wind energy also need to be considered (Shipman *et al.*, 2018).

Regarding urban sprawl and its effects on biodiversity and wilderness, it is suggested to focus on dynamic process in urban biodiversity conservation, which becomes a means to reestablish natural processes in cities through potential re-wilding in inactive industrial areas, infrastructural corridors, abandoned orchards, and grasslands in suburban lands that can be conceptualized as wilderness, even in managed or unmanaged costal landscape (Figure 14). It is crucial to create an incentive system that can widen the current biodiversity management paradigm, and actively engage local stewardship associations in adaptive co-management processes of urban parks and surrounding green spaces (Barthel *et al.*, 2005).



Figure 12. Saint Stephano Church looking into the old harbor.

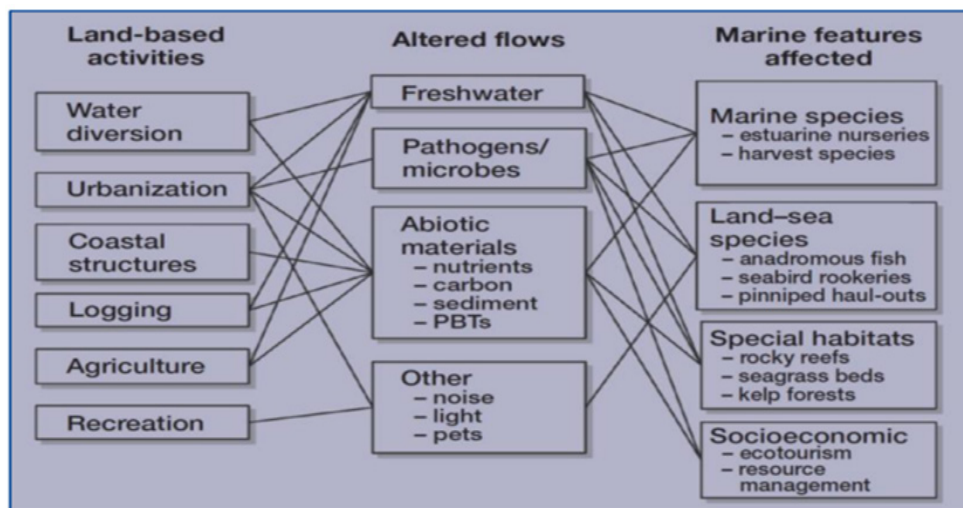


Figure 13. Land-based influences on marine structures (Stoms *et al.*, 2005).



Figure 14. Wild managed (left) and unmanaged (right) coast in North Batroun (Photos by the authors, 22/02/2022).

V. Cumulative Impact of Coastal and Maritime Activities on Tourism

To analyze the cumulative effect and impact of coastal and maritime activities on tourism in Batroun we must select the appropriate baseline for analysis and account all relevant impacts to better manage human activities that impact the coastal zone and the Mediterranean Sea. For instance, pollutants entering the coastal environment due to human activities affect marine mammals and compromise their immune systems making them increasingly sensitive to the impacts of limited food supply from overfishing (Stanford University, 2022).

A sustainable marine economy should be aware of environmental and socio-economic limits to growth and consider degrowth where appropriate (Österblom *et al.*, 2020). In this regard, the impact of access to municipal services and their quality on ecosystem functions, beside the potential impact of effluents from increased shipping on biophysical supply, has severe and diverse impact on ecosystem services, coastal/maritime activities, and tourism (Singh *et al.*, 2020). For example, agricultural inputs (chemicals, pesticides) contribute to coastal runoff and sedimentation, which affects the reduced biomass of shellfish harvested by people. It is worth mentioning that in Batroun, shipping lanes and aquaculture do not restrict fisheries.

Following the EU Marine Strategy Framework Directive (MSFD), land-based effluents and sediments that reach the sea from rivers and direct runoff from urbanized areas affect the sea water quality and ecosystem services (Table 3). In addition, carbon emissions from landward activities are a key cause of ocean acidification as they are transported over the oceans where they fall with rain into the sea.

Despite the positive role of the sea in absorbing carbon dioxide, this process acidifies the pH of the sea water. As a result, many, adapted to less acidic conditions, animals with shells or external skeletons, such as coral reefs, are affected (Kidd *et al.*, 2019). Therefore, the human-induced climate change driven by land-based activity has major consequences on marine ecosystems. Land use is directly affected by the increased storm activity and sea-level rise bringing coastal flooding and erosion. The natural range of species, notably those adapted to colder temperatures, is affected by rising sea temperatures. It is not surprising that invasive species from the Red Sea are reported in the Mediterranean Sea.

Along with global warming, the sea level will also change, resulting in a shift in coastal habitats, with a consequent reduction or loss in the extent of current intertidal habitats, which may be replaced by different habitats. Any landward activity contributing to global warming is affecting the sea because landward development can result in disturbance of critical coastal and marine habitats, which provide many services such as regulating coastal erosion, flood protection, food production and opportunities for recreation and leisure. Poorly planned coastal development can have direct, indirect, and unintentional impacts on natural functions and ecosystem services, the negative impacts of which can significantly outweigh the benefits of the original development.

MSFD Pressure Descriptor	Biodiversity	Non-Indigenous species	Commercial Fish & Shellfish	Foodwebs	Eutrophication	Seafloor Integrity	Hydrographic condition	Contamination (ENV)	Fish and Seafood Contaminants	Marine Litter	Energy introduction (incl. noise)
Abrasion (physical disturbance to habitats)	X			X		X		X			
Barrier to species movement	X		X	X							
Change in wave exposure (alteration of normal regime)	X		X	X		X	X				
Changes in Siltation (above natural levels)	X		X	X		X					
Electromagnetic changes	X		X	X			X				
Emergence regime changes (alteration of natural regime)	X			X		X	X				
Input of organic matter (above natural levels)	X		X	X	X	X			X		
Introduction of microbial pathogens (above natural levels)	X		X	X		X			X		
Introduction of Non-Indigenous Species and Translocations	X	X	X	X	X	X					
Introduction of Non-synthetic compounds (e.g. heavy metals, oils) (above natural levels)	X		X	X		X		X	X		
Introduction of Radionuclides (above natural levels)	X		X	X		X		X	X		
Introduction of Synthetic compounds (e.g. pesticides, pharmaceuticals)	X		X	X		X		X	X		
Introduction of Litter (all types)	X		X	X		X		X	X	X	
Nitrogen and phosphorus enrichment	X		X	X	X	X			X		
pH changes (alteration of normal pH regime)	X		X	X		X	X				
Salinity changes (alteration of normal salinity regime)	X		X	X		X	X				
Habitat change (due to sealing with new materials (e.g. concrete) or loss to land (land reclaim))	X		X	X		X					
Selective extraction of fauna and flora (e.g. due to fishing, collecting, recreational harvesting, loss on cooling inlets)	X		X	X		X					
Smothering of flora and/or fauna (due to addition of materials onto natural habitat where there is change in the properties of the habitat but the habitat is not lost)	X			X		X					
Thermal changes (alteration of natural temperature regime)	X		X	X	X	X	X				
Underwater noise (outside of natural levels of noise)	X		X	X							X
Water flow rate changes (alteration of normal water flow regime)	X		X	X	X	X	X				
Emissions (leading to changes in environmental drivers like temperature or acidity resulting from climate change)	X		X	X	X	X	X				

Table 3. Land-sea pressure impact* matrix (Kidd *et al.*, 2019, based on University of Liverpool, 2016).

* Cells highlighted in grey indicate major impact; white dashed cells point to minor impact. Void cells indicate no impact.

VI. Vulnerability Classification of Coastal Zones to Cumulative Pressures from Coastal and Maritime Activities

For the prognosis of the cumulative hazards of human activities in Batroun city and the risks on the coastal zone, the coastal Batroun was classified into five main land uses: Agriculture, Urban, Harbor with motorized tourism, Organized tourism, and unmanaged wild beach (Figure 13).

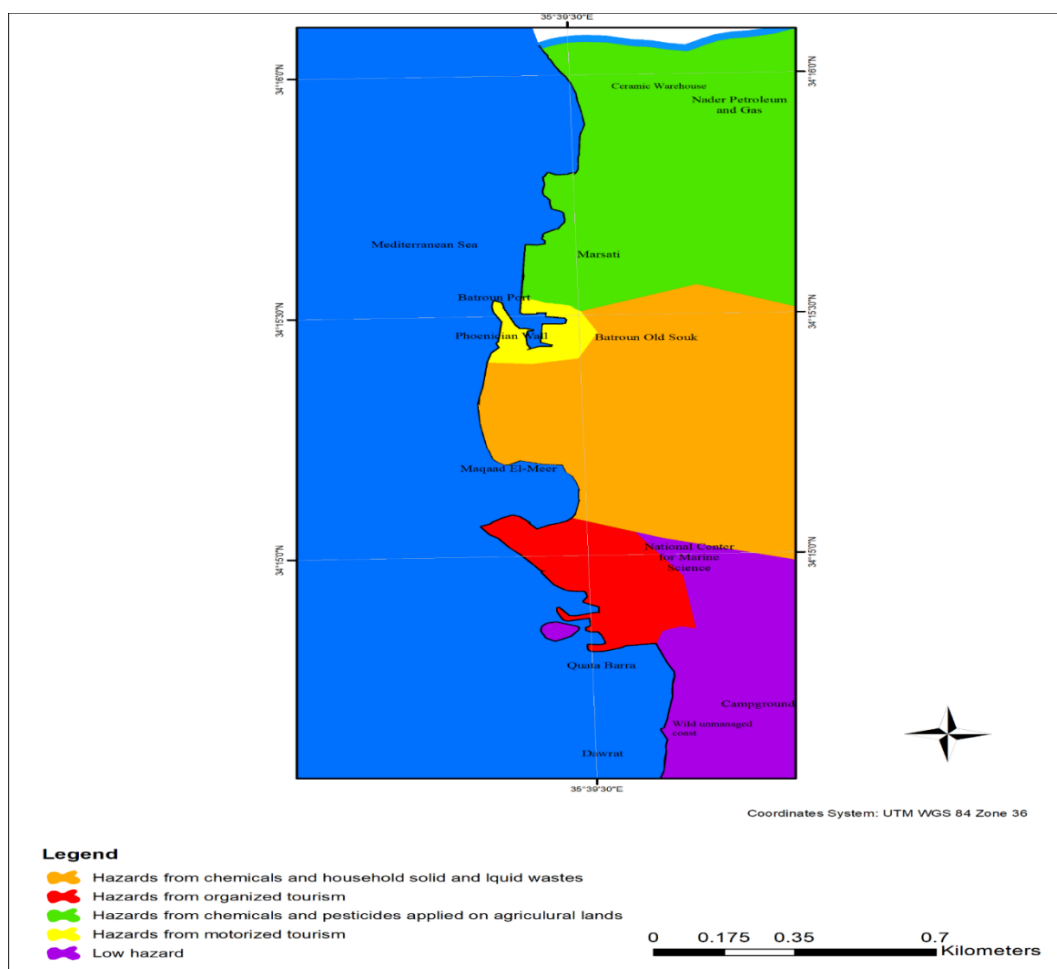


Figure 15. Hazards map from different land uses in Batroun on coastal maritime activities.

VI.1. Hazards from agriculture

Poor water and fertilizer management upstream and downstream impact the limited natural resources on the coastal area (Figure 16). Hazards are particularly emerged due to pollution from excessive use of fertilizers, chemicals, and pesticides (Darwish *et al.*, 2021). Farmers, both in the coastal areas and inland, often irrigate without guidelines on the quantity of water to be applied in one irrigation cycle and in the season depending on crop demands, climatic conditions, and soil properties (Darwish *et al.*, 2022).



Figure 16. Agricultural lands from the North of Batroun can be one of the sources of chemical contamination of the soil and water, notably with intensive urban agriculture. (Photos by the authors).

This, in addition to low fertilizer use efficiency, and in the absence of adequate extension services has caused nutrient build up in the soil under greenhouses (Atallah *et al.*, 1997) and soil salinization in the open fields especially in arid areas (Khatib *et al.*, 1998), and possible contamination of soil and groundwater with heavy metals (Darwish *et al.*, 2022). The assessment of potential hazards and risks caused by the modern, intensive, agricultural sector and monitoring the state of soil, water, and food contamination, are becoming increasingly important for public health and environmental safety.

VI.2. Hazards from industrial and urban expansion

Pollution problems by dumping industrial and domestic wastes and the discharge of untreated wastewater into rivers, dry wadi beds, sand pits and quarries has become a cumulative problem in Lebanon due to the absence or malfunctioning of treatment plants (Darwish *et al.*, 2021). This phenomenon is particularly observed in urban settlements, both on the coastal areas and inland, where solid wastes are dumped and often burned.

The Batroun coastal zone is very sensitive towards the solid waste accumulation which can affect the visual and quality of seawater (Figure 17). It is harmful to convert the northern part of the coast into dumping sites, which is in contradiction with the concept of land-sea integrity, sustainable marine tourism, and clean beaches. The northern part of the coast, near the ceramic warehouse can suffer from several disturbances and needs good management despite the ban of dogs' entry to the beach (Figure 18). The southern coast has limited effect on coastal maritime activities (Figure 19).



Figure 17. The Batroun coastal area, at the northern part of Batroun, is sensitive toward pulp, plastic, and paper (Photos by the authors, 22/02/2022).



Figure 18. A wild rocky beach North of the port of Batroun (Photo by the authors, 22/02/2022).



Figure 19. Wild pebble marine terrace, South of Batroun (Photo by the authors, 22/02/2022).

VI.3. Hazards from organized tourism

Organized tourism has low impact on the contamination of the coast, but it can affect the sea view and ecological continuity of the sandy beach that can harm sand accumulation and potential turtle's habitat. The only Lebanese reserve reported for turtles is the Tyre reserve in South Lebanon. Just the scanning of the sediment and coastal water quality done in 2021 by the NCMS-CNRS detecting medium quality and hazard imposes undertaking additional investigation to identify the sources and remedy-prevent further contamination of Batroun coast.

VI.4. Hazards from motorized tourism

Shipping in Lebanon has three major commercial seaports (Beirut, Tripoli, and Sidon), 20 fishing ports, among which 6 are used for recreational activities at the same time, and more than 10 private marinas used for recreational activities (USAID, 2021). A limited number of cruise ships were received only by Beirut port before its destruction in the August 4, 2020, explosion. A passenger ship line connecting Lebanon to the Izmir seaport in Turkey exists in the Tripoli seaport. In addition to the main Byblos and Tyr fishing/recreational seaports, Saida and Batroun seaports offer daily boat trips for tourists. Private marinas are used for private yachts and boats owned mainly by wealthy Lebanese. Therefore, a low hazard from motorized tourism can be expected in Batroun due to its limited extent.

VII. Policies, plans and programs to reduce conflicts

A participatory process facilitated by MedCities KTC Al Fayhaa has led to the identification of 12 priority actions and projects to promote tourism as a source of economic development in Batroun (MedCities, 2022).

Batroun region and immediate surrounding are famous for their touristic offer and cultural heritage (Figures 20 and 21), hosting several UNESCO Human Heritage sites. Both the city and the Union of Municipalities of Batroun are members of the MedCities network and have jointly pointed out the potential of the region's potential for the development of nature and religious tourism as one of the strategic priorities for the strategic priorities for the region's socio-economic growth.

In this context and with the support of the Catalan Agency for Development Cooperation and the Barcelona Metropolitan Area, the KTC Al Fayhaa facilitated the recruitment of a local expert, to develop a field study and a participatory work that has led to identify priority actions for the development of the tourist potential of the area within the framework of the Strategic Plan for the Development of the Batroun district and the Batroun Region. Wine route with focus on small wineries in Batroun was proposed as a focal area to support ecotourism in the area (USAID, 2021).

The participatory character of the diagnosis (SWOT) is especially valuable for Batroun and the Union of municipalities for several technical and strategic aspects. The analysis allowed the identification of 12 priority actions and projects which would guide further initiatives and technical assistance in the territory fostering its cohesion and economic development.

The government actions to develop touristic and natural sites in Batroun go back to the nineties of the last century. The MoA Decision 398/1 created in 1997 the Fishing and Fisheries Center at the Institute of Oceanography and Fisheries in Batroun- Northern Lebanon. By then, the Ras El Chakaa natural reserve was completed, but the Batroun natural reserve is awaiting the decision of the Municipal council. By the Decision 22, 1998, the Al Jawz River to sea outfall zone and the Decision 8, 2004 Baatara Sinkhole Batroun/ North Lebanon were announced as a natural site under the protection of the MoE. In addition, the famous Jaj Cedar forest (Batroun Kaza) was declared a protected forest area by decision 499/1 14/10/96.



Figure 20. The Caza of Batroun stretches from the Mediterranean Sea towards the high mountains with snow cover during winter (MedCities, 2022).



Figure 21. Cultural life in Batroun is another touristic attraction (MedCities, 2022).

VIII. MSP and ICZM as tools to address coastal and maritime activities

There is a growing impact of pressures related to land-based sources of pollution, in particular discharges from petrochemical and chemicals' industries, as well as the tourism sector. It is necessary to assess the environmental, economic, and social impacts of sea level rise and coastal risks, associated with climate change in coastal areas, with a view to ensure that land use planning and infrastructure take full account of relevant climate change scenarios and uncertainties (EU MSP Platform, 2018). A model called "Infrastructure for Spatial Information in Europe (INSPIRE)" has been suggested for the Maritime Spatial Planning and mapping maritime activities with the aim to integrate sea and land planning in an overview of cross-border planning for a given maritime region (Abramic *et al.*, 2018).

Effective Integrated Coastal Zone Management (ICZM) and Marine Spatial Planning (MSP) in the Mediterranean, in conjunction with sustainable consumption and production approaches, are crucial to promote sustainable and synergic uses of marine and coastal areas and resources. The ICZM and MSP are prerequisites to control and manage the increasing competition for the use of marine and coastal space and resources in the Mediterranean. They can promote the efforts to control and minimize the impacts associated with the uncontrolled expansion of the maritime sectors witnessing biologically unsustainable level of fishing resulting in the Mediterranean region having the lowest percentage (37.8%) of sustainable fish stocks worldwide. This picture is alarming knowing that only 8.9% of the surface of the Mediterranean Sea is under a legal designation or protection status.

Sustainable management and development of coastal-marine areas, sustainable use of natural resources, importance of stakeholder participation are some common principles shared by the ICZM and MSP. The EU MSP Directive (EU, 2019) is resumed in Table 4, which highlighted the principles of the ecosystem approach to marine spatial planning and integrated coastal zone management.

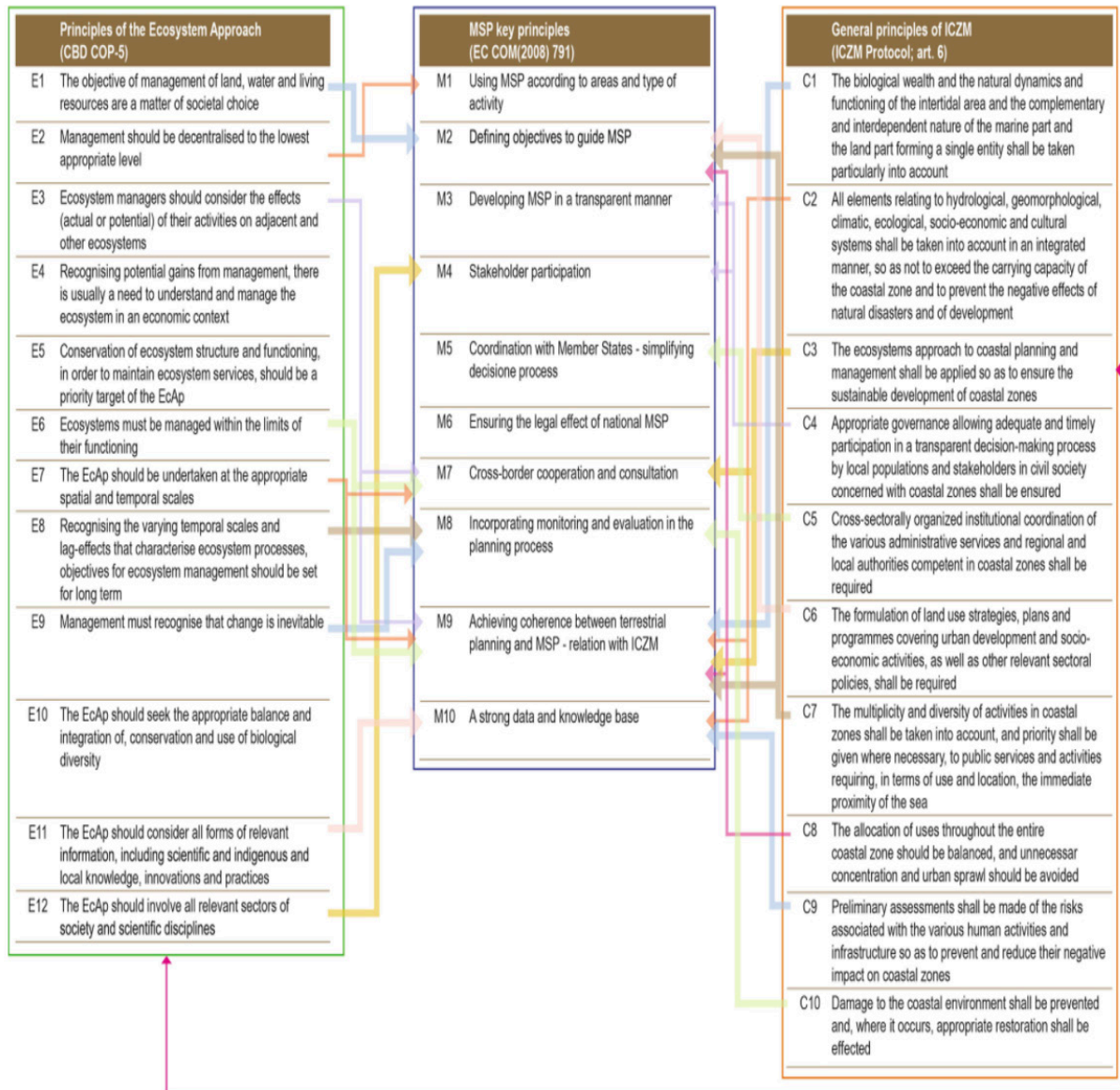


Table 4. Links among Ecosystem Approach (EcAp), Marine Spatial Planning (MSP) and Integrated Coastal Zone Management (ICZM) principles (Ramieri *et al.*, 2019 from UNEP(DEPI)/MED IG.23/23).

Regarding the coastal zones, it stressed the importance of adequate and timely participation of concerned stakeholders in a transparent decision-making process (principle C4), which is clearly in line with M3-Transparent development of the MSP and M4-Stakeholder participation.

The concept emphasizes the need for integration/cooperation among different governance bodies and policy sectors and stakeholders dealing with the coast and active in issues related to land sea interaction. The same can be applied to MSP as regards the sustainable management of marine areas. ICZM may result in strategies

and management plans and might lead to the allocation of space to specific activities (through spatial planning), in the way that MSP does for the sea. Currently, the MSP implementation in Lebanon is or will be mainly focused on the territorial sea, which is also part of the geographic scope of the ICZM Protocol. Maritime activities tend to concentrate in coastal waters, and leading and emerging maritime sectors in the basin (such as shipping and port activities, aquaculture, small scale fisheries and coastal tourism) have significant interactions with the land territory. Purely offshore activities in the Mediterranean are still limited but will extend on the Lebanese coast with the expected exploitation of gas and oil in Lebanon's offshore and onshore areas, including the Batroun region.

IX. Actions to foster Blue Growth

The urban and artificial land use (170 ha) occupies an almost equal share of the Batroun coastal zone as agriculture (172 ha), constituting 36% and 37% of the total area respectively (LB-PA6-02_LITTORAL_URBAN).

Natural and semi-natural landscapes are restricted to 16.5%. Haphazard replacement of natural and agricultural landscapes by an ever expanding urban, commercial, and financial footprint disrupts marine and terrestrial ecosystems, degrades natural and semi-natural habitats, and compromises coastal biodiversity (Makhzoumi *et al.*, 2012). Particular attention to urbanized land use must be paid to dense urban areas, where the sources of urban related contamination and pressure are high (Figure 22).

The less dense and rare urban agglomerations can be sustainably managed through a combination of urban with green space and gardens or the development of per-urban agriculture. Despite the presence of wild pebbly marine terraces to the South of the city which can create some open space and view into the sea (Figures 19 and 23), the incremental loss of open green, coastal landscapes, observed during the last twenty years is equally detrimental to the inhabitants of Batroun.

Public access to green areas is a prerequisite to community health, physical and emotional wellbeing. The World Health Organization (WHO) recommends 10 m² / capita. The open space green area in Batroun is 263,820 m² for 45,000 citizens, which means a green area of 5.84 m² per capita within the borders of the city.

Floral diversity in coastal Lebanese littorals is threatened by different land uses. The vacant spaces along the Batroun coast are replaced with buildings for restaurants and touristic resorts (Figures 24 and 25). This is associated with ramping over sandy beaches which disturb coastal sand accumulation and integrity.

Beside this, outlets of city rainwater pour directly into the sandy beaches that can bring about pollutants from traffic and energy use (Figures 26 and 27).

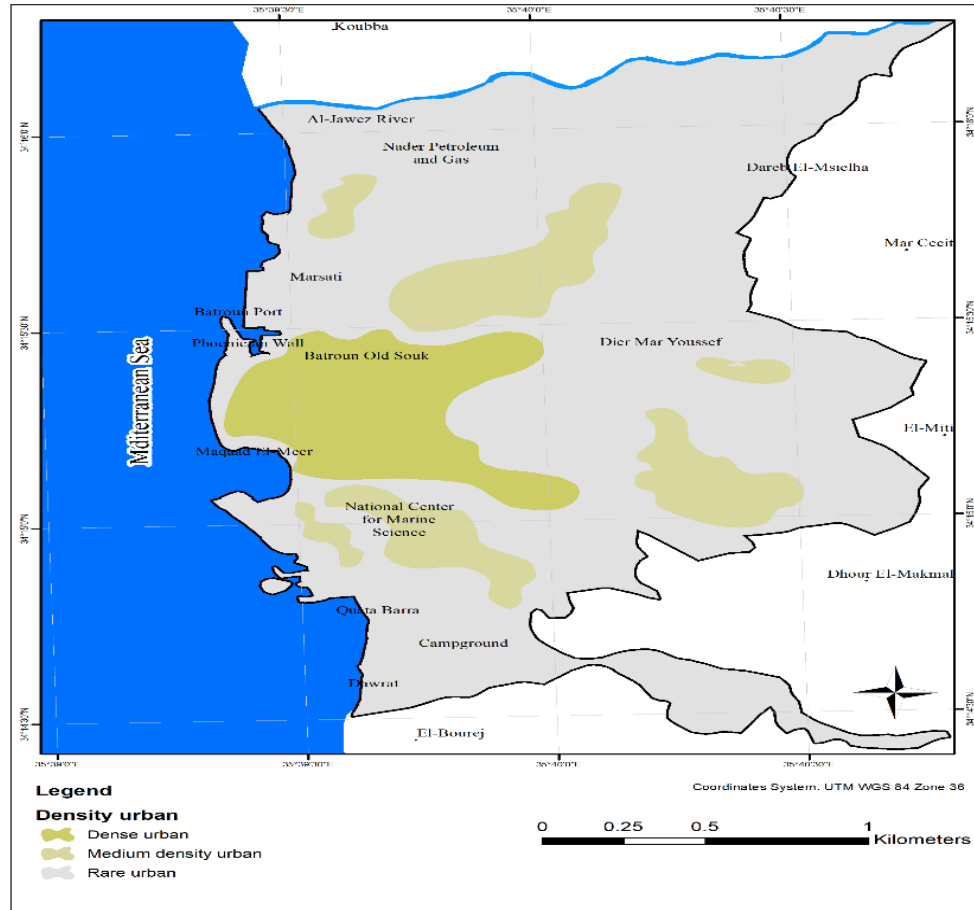


Figure 22. Urban density in Batroun.

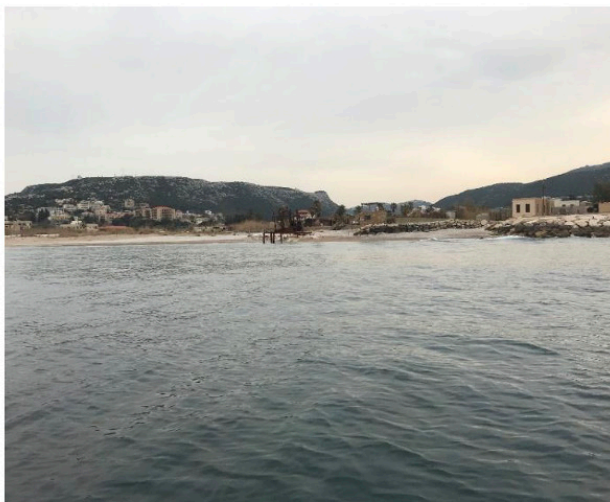


Figure 23. Gravelly beach affected by the river outlet and flooding.



Figure 24. Ramps on the sandy coastal beach belonging to organized marine tourism.



Figure 25. Touristic complex in Batroun (Photos by the authors, 22/02/2022).



Figure 26. Drainage water outlet pouring city drainage water directly into the sandy beach (Photo by the authors, 22/02/2022).

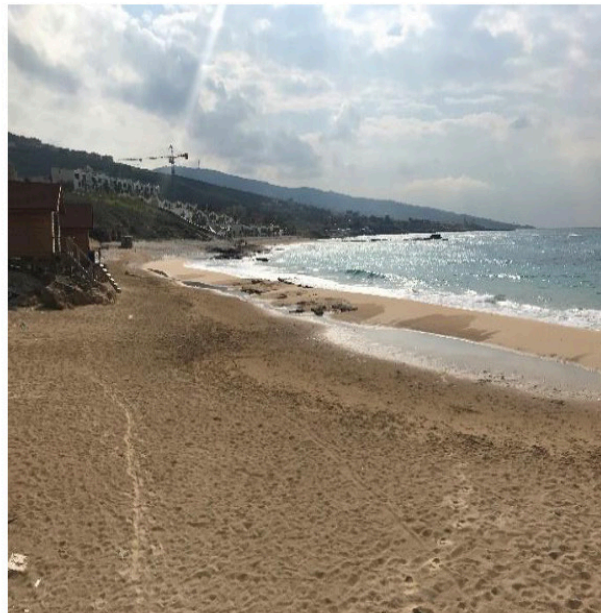


Figure 27. Sandy beach located south of Batroun receiving drainage water from the outlet (Photo by the authors, 22/02/2022).

A survey of the waterfront in Beirut showed that only 23 families, 81 species, survived compared to 63 families, 330 total species, listed in 1930s (Chmaitelly, 2009). Business parks, housing, roads, and waterways can enhance biodiversity and encourage species to colonize urban areas by creating ecological corridors and networks to evade obstacles, thereby providing access to favorable habitats. Special studies on natural vegetation richness and biodiversity must be undertaken in Batroun and surroundings. But, even in the more disturbed city like Beirut with considerable reduction in coastal floral diversity, the research findings indicated that in term of spatial distribution, rocky and sandy beaches, coastal cliffs, and vacant lots continued to serve as wildlife habitats (76%) in comparison to managed landscape (24%).

The highest floral diversities were recorded in coastal cliffs and fenced vacant plots respectively, 47 and 34 species (Chmaitelly, 2009). The absence of disturbance in these sites encouraged the establishment of mixed plant communities of native species and naturalized garden escapees. However, rising land values have been gradually leaving little open space for spontaneous plants to colonize, which will invariably destroy naturalized coastal habitats and alter the landscape character of the natural and managed waterfront.

To solve the conflict between tourism, city development landscape approach for the conservation of bio-cultural diversity, proposed by Makhzoumi *et al.*, (2012). A landscape framework for the conservation of bio-cultural diversity was proposed by Makhzoumi *et al.*, (2012). This approach serves well if used logistically and informatively to recognize and re-appropriate cultural values, for example the visual character and shared identity in a territory, as a value added in sustainable agriculture development (Zurayk and Sabra, 2009). Local self-reliance in food production, using nutrients accumulating in local cities, is increasingly regarded as an important aspect of sustainable urban development.

Together with initiatives on energy efficiency, high resource productivity and policies for containing sprawl, urban agriculture can contribute considerably towards greener future cities. In this regard, efficient nature conservation lies not in protecting isolated territorial pockets but by shifting the focus on spatial systems and by incorporating conservation into other territorial policies. One of the human interferences affecting the interaction between fresh water and sea water life and activities is the building of dams restricting the flow of fresh water and nutrient-enriched sediments to the Batroun sea (Figures 28 and 29).



Figure 28. Nahr Aljawz stream in February 2022 is extremely reduced (Photo by the authors, 22/02/2022).



Figure 29. Nahr Aljawz mouth into the Mediterranean Sea in February 2022 does not reach the Sea (Photo by the authors, 22/02/2022).

However, once the Msaylha dam reached its full capacity, the river flow reestablished into its usual normal discharge (Figure 30). It is necessary to maintain the environmental flow of water carrying sediments and nutrients to renew the fertility of the sea.



Figure 30. Aljawz river stream rejuvenated after the complete filling of the Msaylha Dam (Photos by the authors, 21/03/2022).

X. Conclusions

Batroun is endowed with multiple attractions including the nature and beauty of the water falls and Cedar Forest in Jaj at the upper, eastern, part of Batroun Caza, historic monuments like the Phoenician Wall, El Mseilha Citadel, Makaad El Meer, and old churches. The old city is unique with stony walls from local marine sandstone that integrates well the city with its sea surroundings. Batroun city possesses advanced touristic infrastructure and a large quantity of hotels, houses and apartments including eleven 4–5-star hotels and resorts. Sea resorts represent a very pleasant place to stay and swim but can represent some hazards for the integrity of the sandy beaches.

The marine port is large and very well equipped for individual and massive maritime activities. Among the hazards associated with coastal, urban expansion and the solid waste and sewage treatment can affect seawater quality as revealed by a recent assessment by the NCMS-CNRS. Other sources of impact on maritime activity and ecosystem are caused by the agricultural activities in the zone located at the northern and north-eastern part of Batroun.

The southern part of the city with its wild coastal strip represents low hazards for maritime city activities. To maintain the sustainability of the touristic sector and protect the harmony of land and sea, it is important to join the efforts of the public and private sectors to protect the coastal marine activities from negative factors like chaotic urban expansion, contamination by solid and liquid wastes, chemicals and pesticides from agriculture, energy consumption and motorized marine activities. We must follow the concept what you eject into the sea returns to you with health and environmental invoice to pay sooner or later. The Arabic Jargon that says, “do well and throw into the sea” must be changed into “do well and do not throw into the sea”.

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