Climagine Sustainability Indicators - Inception Report

Integrated Coastal Zone Management (ICZM) Strategy and Law for Lebanon
GEF MedProgramme, Child Project 2.1.

2.1
Mediterranean
Coastal Zones Climate
Resilience Water Security
and Habitat Protection"

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List of Acronyms

AfED – Arab Forum for Environment and Development

CAMP – Coastal Area Management Program

CBD – Convention on Biological Diversity

CBO – Community-Based Organization

CEPF – Critical Ecosystem Partnership Fund

CNRS-L – National Council for Scientific Research - Lebanon

DAR – Delimitation of the Administrative Reach

DGUP – Directorate General of Urban Planning

DPSIR – Drivers, Pressures, State, Impact, Response

EEZ – Exclusive Economic Zone

EIA – Environmental Impact Assessment

EU – European Union

FAO – Food and Agriculture Organization of the United Nations

GEF – Global Environment Facility

GFCM – General Fisheries Commission for the Mediterranean

GWP – Global Water Partnership

ICZM – Integrated Coastal Zone Management

IMAC – Integrated Management of East Mediterranean Coastlines

INDC – Intended Nationally Determined Contribution

IPCC – Intergovernmental Panel on Climate Change

ISWM – Integrated Solid Waste Management

IUCN – International Union for Conservation of Nature

LRA – Litani River Authority

LARI – Lebanese Agricultural Research Institute

MAP – Mediterranean Action Plan (UNEP)

MAR – Mediterranean Assessment Report

MoA – Ministry of Agriculture

MoE – Ministry of Environment

MoEW – Ministry of Energy and Water

MoI – Ministry of Industry

MoPWT – Ministry of Public Works and Transport

MPAs – Marine Protected Areas

NAPA – National Adaptation Program of Action

NBSAP – National Biodiversity Strategy and Action Plan

NGO – Non-Governmental Organization

PAP/RAC – Priority Actions Program / Regional Activity Centre

PPP – Public-Private Partnership

RAC/SPA – Regional Activity Centre for Specially Protected Areas

RAMSAR – Ramsar Convention on Wetlands

SDGs – Sustainable Development Goals

SOER – State of the Environment Report

SPA – Specially Protected Areas

UNCLOS – United Nations Convention on the Law of the Sea

UNDP – United Nations Development Program

UNEP – United Nations Environment Program

UNEP/MAP – United Nations Environment Program / Mediterranean Action Plan

UNESCO – United Nations Educational, Scientific and Cultural Organization

UN-ESCWA – United Nations Economic and Social Commission for Western Asia

UNFCCC – United Nations Framework Convention on Climate Change

WWTP - Wastewater Treatment Plant

Executive Summary

Lebanon's coastal zone faces increasing environmental pressures, including artificialization, urban sprawl, pollution, unsustainable resource use, and degradation of marine ecosystems. Consequently, the complexity and interdependence of Lebanon's coastal socio-ecological systems necessitates a structured and integrative management approach. Integrated Coastal Zone Management (ICZM) provides such a framework, seeking to harmonize environmental protection with economic development, social equity, and spatial governance. Effective ICZM is grounded in a participatory, cross-sectoral approach. It engages governmental agencies, municipalities, scientific and technical institutions, civil society organizations, and private-sector actors in decision-making and implementation processes. Furthermore, adaptive management tools, foresight methodologies, and the application of sustainability indicators additionally support its flexibility in responding to evolving risks—including pollution, climate impacts, and population growth.

This document endeavours to assess these challenges while proposing realistic indicators and entry points for implementation of the ICZM Protocol that are responsive to national realities, policy gaps, and monitoring capacity. In this context, it is the product of an exhaustive review of extant literature, national reports, and preceding project deliverables, including:

- The National Physical Master Plan (2005),
- The CAMP Damour project (2004) and subsequent PAP/RAC technical documents,
- Environmental reports such as SOER 2020,
- Policy frameworks such as Law 444/2002,
- The Fisheries Law,
- The ICZM Strategy (2015),
- Lebanon accession to the ICZM Protocol (Decree 637/2014).

Through the integration of legal, institutional, participatory, and scientific tools, a more resilient and inclusive coastal governance model can hopefully be achieved. Within the Lebanese context, where overlapping jurisdictions, fragmented policies, and rapid urban expansion challenge effective governance, ICZM offers a pathway toward coherent planning and sustainable development. Accordingly, this document provides an analytical overview of selected priority sectors and associated indicators to support the implementation of the ICZM process in Lebanon. It builds upon and contributes to the national ICZM Strategy and ongoing Mediterranean initiatives under the Barcelona Convention and its Protocol on Integrated Coastal Zone Management in the Mediterranean (2008). Ultimately, the long-term sustainability of its coastal zone will depend on the country's capacity to implement these approaches at scale while empowering local communities to act as stewards of coastal ecosystems.

1. Introduction: Lebanon's Coastal Zone Value and Management Challenges

1.1. BACKGROUND & PURPOSE OF THIS WORK

This document forms part of Lebanon's ongoing efforts to implement the Protocol on Integrated Coastal Zone Management (ICZM) in the Mediterranean, to which the country acceded in 2017[1]. Indeed, Lebanon ratified the ICZM Protocol of the Barcelona Convention through Decree No. 637 on 18 September 2014. This legally binds the country to sustainable coastal governance principles, inter-sectoral planning, and measures against urban sprawl. The decree paves the way for harmonizing coastal legislation with regional Mediterranean frameworks. As such, as one of the Protocol's Contracting Parties, Lebanon is expected to harmonize its national coastal zone governance, planning, and development strategies with the objectives and principles laid out in the ICZM Protocol of the Barcelona Convention. These include ensuring the sustainable use of coastal zones, protecting coastal ecosystems, promoting participatory governance, and integrating marine and terrestrial planning.

With respect to past efforts, past initiatives have already laid critical groundwork. The Coastal Area Management Program (CAMP) for Damour and the Integrated Management of East Mediterranean Coastlines (IMAC) project notably identified key environmental pressures and underscored the urgent need for stronger legal instruments, clearer institutional mandates, and inter-ministerial coordination. At the same time, they also highlighted persistent gaps in enforcement, weak data-sharing mechanisms, and limited local stakeholder engagement (PAP/RAC, 2004).

A major step forward was achieved through the MedProgramme Child Project 2.1, implemented under the Global Environment Facility (GEF) and led regionally by UNEP/MAP. In particular, in Lebanon, the project focuses on supporting ICZM implementation through integrated planning and capacity development. It delivered essential technical inputs, including the review of legal and institutional frameworks, indicator baselines, and monitoring dashboards. Moreover, the project also contributed to the mobilization of national and local actors in support of cross-sectoral ICZM objectives and strengthened the alignment between national planning processes and Barcelona Convention commitments.

Currently, a key milestone underway is the development of the Delimitation of the Administrative Reach (DAR) for Lebanon's coastal zone. Led by the Ministry of Environment (MoE), with technical guidance from PAP/RAC under the MedProgramme Child Project 2.1, the DAR aims to establish a legally recognized spatial boundary for the application of ICZM principles. This effort is central to operationalizing Decree 637/2014 and resolving persistent jurisdictional overlaps among national entities such as the Council for Development and Reconstruction (CDR), the Ministry of Public Works and Transport (MoPWT), the Directorate General of Urban Planning (DGUP), and various coastal municipalities. Once finalized, the DAR will serve as a statutory reference for environmental permitting, land-use planning, and enforcement of coastal protection measures in line with Lebanon's commitments under the Barcelona Convention.

In light of the ongoing participatory foresight efforts led by Plan Bleu through the Climagine process, new tools are being introduced to enhance stakeholder engagement and integrate scenario-building into coastal planning. This approach is playing an instrumental role in shaping Lebanon's forthcoming ICZM Strategy and draft Law by identifying priority sectors and highlighting systemic challenges to be addressed through participatory governance and evidence-based monitoring.

In parallel, the MedProgramme, funded by the Global Environment Facility (GEF), is supporting Lebanon and other Mediterranean countries in strengthening their ICZM frameworks. Specifically in Lebanon, the programme focuses on the development of coastal and marine sustainability indicators, institutional alignment, and ecosystem restoration—providing both technical assistance and regional cooperation mechanisms.

[1] UNEP/MAP - Barcelona Convention, "Status of Signatures and Ratifications of the ICZM Protocol", updated 2024.

1.2. SCOPE & METHODOLOGY

The purpose of this report is to support the ongoing development of Lebanon's new national Integrated Coastal Zone Management (ICZM) Strategy and draft Law within the framework of the GEF MedProgramme. Drawing on existing national strategies, the local context, and regional best practices, the report identifies priority sectors for Lebanon's coastline and proposes an initial set of sustainability indicators consistent with the provisions of the ICZM Protocol. This foundational work will guide and inform the first *Climagine* workshop, which seeks to engage stakeholders through a participatory foresight process to co-develop Lebanon's coastal governance framework.

This report was prepared through a combination of desk research, stakeholder engagement, and review of national and regional documents. Key sources include the draft National ICZM Strategy (2015), the updated State of the Environment Report (UNEP/MAP and Plan Bleu, 2020), the National Physical Master Plan for the Lebanese Territory (2005), the Mediterranean Action Plan (MAP) protocols and strategic documents such as the NBSAP and United Nations Framework Convention on Climate Change (UNFCCC) indicator development frameworks currently being updated with UNDP support.

In alignment with regional efforts, this report also considers the Integrated Monitoring and Assessment Programme (IMAP) under the Barcelona Convention, thereby ensuring that the proposed sustainability indicators correspond with key Mediterranean ecological objectives, particularly EO7 (Alteration of Hydrographic Conditions) and EO8 (Coastal Ecosystems and Landscapes). Despite some existing gaps in national data—specifically regarding IMAP Common Indicators CI15, CI16, and CI25—embedding these indicators supports coherence with the ongoing MED Quality Status Report (MED QSR) and enhances comparability of Lebanon's coastal status with regional assessments (UNEP/MAP, 2024). Indeed, the integration of IMAP's framework strengthens Lebanon's ICZM strategy by promoting the use of standardized monitoring approaches and indicators that capture hydrographic alterations, coastline modifications, and land use changes. This alignment facilitates regional collaboration and supports Lebanon's contribution to the shared objective of achieving Good Environmental Status (GES) across the Mediterranean, while enabling targeted management responses to the most pressing coastal pressures.

The adopted methodology includes reviewing sectoral relevance to coastal sustainability, identifying gaps in governance and monitoring, and proposing quantifiable and manageable indicators using the RACER criteria, with a particular focus on relevance and monitoring feasibility across past (2015), present (2023–2025), and foresight (2030–2050) horizons. Moreover, the selection of priority sectors and their associated indicators was guided by a DPSIR-informed logic. This approach allowed us to trace pathways from systemic pressures to impacts, and to identify strategic areas where policy interventions (Responses) can produce measurable change. For each sector, indicators focus on either key Pressures or States that can inform sustainable coastal management.

1.3. DEFINITION & EXTENT OF THE LEBANESE COASTAL ZONE

Lebanon's coast, extending approximately 220 kilometers from south to north along the east of the Mediterranean Sea, constitutes alternating land stretches of sedimentary rocks, loose sands, and gravel. The coastal zone has always been considered vital to the nation's economic prosperity, home to Lebanon's oldest settlements and largest cities, making it the most densely populated region of the country. It includes urban, peri-urban, and agricultural areas, alongside a rich diversity of biological and geological ecosystems. The coastal areas, of which three are considered Protected Areas (PA), consist of islands, marine ecosystems, sandy beaches, rocky shores, and river deltas shaped by the nearby Jurassic mountain range. Economically, Lebanon's coastal zone is a hub of main activity, contributing to the nation's growth, supporting major trade ports, touristic summer resorts, and industrial facilities[2].

Under Article 2 of the ICZM Protocol, the coastal zone is defined as *"the geomorphologic area either side of the seashore in which the interaction between the marine and land parts occurs in the form of complex ecological and resource systems made up of biotic and abiotic components coexisting and interacting with human communities and relevant socio-economic activities"*. Additionally, also under the same article, ICZM is defined as: "*a dynamic process for the sustainable management and use of coastal zones, taking into account at the same time the fragility of coastal ecosystems and landscapes, the diversity of activities and uses, their interactions, the maritime orientation of certain activities and uses and their impact on both the marine and land parts"* (UNEP/MAP, 2008).

[2] PAP/RAC, CAMP Lebanon Final Report, 2004; National Plan for the Management and Protection of Lebanese Territory (NPMPLT), 2005; Centre National de Recherche Scientifique – Liban (CNRS-L), Coastal Monitoring Reports, 2019–2022

These definitions emphasize a land-sea continuum, not merely the terrestrial coastal fringe. As such, all references to activities, pressures, and governance challenges in this report address both land-based and marine-based dimensions, including territorial waters, Exclusive Economic Zones (EEZ), and maritime activities governed under national and regional frameworks. For Lebanon, while a formal national delineation of the coastal zone is still under development, existing planning tools such as the National Physical Master Plan and the CAMP Damour project (PAP/RAC, 2004) have suggested a coastal belt varying between 1 to 5 kilometers inland and up to the territorial waters (12 nautical miles offshore), depending on ecological, socioeconomic, and risk-based criteria.

The ICZM usually accounts for sea-to-land interactions, focusing on managing areas that include both marine ecosystems and adjacent land ecosystems. An integral part of this management is the "*source-to-sea*" approach, which extends the perspective upstream to encompass entire river basins and catchment areas that directly influence coastal and marine environments. While specific inland distances are not always provided, coastal management typically includes significant stretches inland that influence or are influenced by the marine environment, such as river basins and urban developments near the sea. Still, coastal stretches are often determined on a case-by-case basis, considering factors such as ecological sensitivity, development pressure, and socio-economic dynamics in the region. Further refinement or delineation may be further developed or specified in Lebanon's draft National ICZM Law, which is concurrently being updated.

1.4. THE VALUE OF LEBANON'S COASTAL ZONE

Lebanon’s coast is home to the majority of its population and economic activities. It includes the country’s major urban centers (Beirut, Tripoli, Saida), key ports, industrial zones, tourism facilities, and agricultural lands. Trading, fishing, leisure, cultural, and environmental tourism remain the most important economic activities for both the national scale and the local livelihoods.

1.4.1. HISTORICAL & CULTURAL VALUE

Lebanon’s coastal zone is deeply rooted in cultural and historical significance, boasting a heritage that spans millennia. Historically, this coastline has been a cradle for ancient civilizations, acting as a focal point for maritime trade and cultural exchange throughout the Mediterranean. Indeed, numerous archaeological sites pepper the coast, bearing witness to a long history of human settlement and interaction. Moreover, the cultural landscape is enriched by historic ports and maritime structures dating back to Phoenician, Roman, Muslim, Crusader, and Ottoman periods, which collectively illustrate the coast’s role as a pivotal hub for trade, defense, and cultural interchange between East and West. For instance, coastal cities like Beirut, with its iconic Corniche and Ottoman-era architecture, highlight the dynamic interplay between archaeological heritage and modern urban life along Lebanon’s shores.

One of its most prominent historical landmarks is the ancient city of Byblos, internationally recognized as one of the oldest continuously inhabited cities in the world. Byblos was a major trading hub for the Phoenicians, who were skilled sailors and traders, and it still retains remnants of ancient temples, amphitheaters, and a Crusader castle. Similarly, Sidon and Tyre boast historical significance as powerful Phoenician city-states, with Tyre being particularly famous for its UNESCO World Heritage Site designation, housing ancient ruins such as the Roman Hippodrome and the Al-Bass archaeological site (Abu-Hilal et Al-Najjar, 2008).

One of the lesser-known, yet historically important, activities along Lebanon’s coastline is salt extraction. For centuries, salt production has taken place in Anfeh, a coastal town north of Tripoli. Some of these salt flats of Anfeh and Shiekh-Zanad are still in operation today, with artisanal craft with limited economic benefits to the local population. This traditional craft, handed down through generations, not only embodies an important facet of Lebanon’s coastal heritage but also holds potential as an attraction for cultural tourism.

1.4.2. SOCIO-ECONOMIC VALUE

Lebanon’s coastal zone holds considerable socio-economic significance, serving as a key contributor to the national economy, particularly in trade, fishing, and tourism.

Historically, Lebanon’s coastal ports have historically served as critical arteries for economic resilience through maritime trade. Indeed, the Port of Beirut and Port of Tripoli, which handle over 90% of national maritime traffic, serve as key logistic hubs for Lebanon’s exports, and particularly for essential imports such as food, fuel, and construction materials. The Port of Beirut, prior to its partial destruction in August 2020, was the nation’s principal maritime

gateway, accounting for more than 70% of imports and exports (World Bank, 2020). Moreover, its strategic significance extended beyond commercial logistics: the Beirut Wheat Silos, located within the port compound, stored a large portion of Lebanon's subsidized wheat reserves, playing a vital role in national food security and price stabilization. Parallel to this, smaller ports such as those in Tripoli, Saida, and Tyre support local economies through fishing, small-scale shipping, and artisanal trade. Nevertheless, these facilities remain underdeveloped and lack the capacity to absorb large-scale national trade volumes. It should also be noted that various coastal industries, including cement factories, oil storage terminals, and chemical processors, are clustered near these maritime hubs.

Turning to the tourism sector, it constitutes another major economic pillar, with Lebanon's coastline featuring popular beaches, resorts, and summer residences. Cities like Batroun, Byblos, and Jounieh are particularly well known for attracting both domestic and international tourists. In this regard, coastal tourism contributes significantly to employment, providing jobs in hospitality, food services, and recreational activities like diving and water sports. Indeed, the coastal zone hosts a dense concentration of competing private businesses—including beach resorts, luxury hotels, marinas, restaurants, and informal commercial chalets—many of which are located on public maritime property or ecologically sensitive areas.

Furthermore, many coastal populations rely heavily on the health of marine and coastal ecosystems for their livelihoods. Fishing, in particular, constitutes a primary economic activity in coastal towns such as Tripoli, Sidon, and Tyre, where small-scale commercial fishing operations sustain numerous families. While overfishing and pollution have posed serious challenges to fish stocks, considerations for sustainable fishing practices are increasingly gaining attention.

Lebanon's coastline is also dotted with numerous freshwater springs, many of which emerge from the karstic limestone mountains that stretch close to the coast and are mostly used to irrigate coastal farmlands, supporting the production of fruits and vegetables. Coastal agriculture in areas such as Akkar or Damour and all the way to Saida and Tyre in the South, support local economies through farming monoculture cash-crops, mainly citrus, bananas, and more recently, avocados. This agricultural use benefits from a favorable temperate climate, reliable access to irrigation via coastal aquifers, and convenient logistics for exportation, thereby contributing importantly to food and water security in the water-scarce southern region. Additionally, some springs like the abundant Ras el Ain in the South have been tapped to supply drinking water to nearby towns, reducing dependence on other less reliable sources.

Finally, the Lebanese coast appears to have significant potential for oil and gas development in both coastal and offshore areas. Lebanon has advanced exploratory steps toward offshore oil and gas development, particularly in the Exclusive Economic Zone (EEZ) through licensing blocks for hydrocarbon exploration[3].

1.4.3. ECOLOGICAL VALUE

Lebanon's coastal zone is highly valuable from an ecological standpoint, providing essential ecological services and serving as a biodiversity hotspot with multiple protected areas dedicated to safeguarding critical habitats. Among these, the Palm Islands Nature Reserve off the coast of Tripoli is a prominent marine protected area, home to endangered species such as the loggerhead sea turtle and various migratory birds. Furthermore, it encompasses unique ecosystems including coastal dunes, wetlands, and seagrass beds, all of which are vital for biodiversity conservation. Similarly, the Tyre Coast Nature Reserve, recognized as a RAMSAR site, comprises sandy beaches, freshwater springs, and distinctive plant species. This reserve, in particular, provides important habitat for marine and coastal wildlife and is well known for its sea turtle nesting grounds, especially those of the green sea turtle. It also serves as a sanctuary for over 200 species of migratory birds. Complementing these two, the Al-Abassiyeh coastal zone in South Lebanon represents a third key protected area within the coastal zone. It is formally designated for conservation due to its sensitive habitats and ecological significance. Together, these three protected sites—the Palm Islands Nature Reserve, the Tyre Coast Nature Reserve, and the Al-Abassiyeh coastal zone—are important components of Lebanon's coastal ecological network and are highly relevant to integrated coastal zone management efforts (UNDP, 2020).

Beyond protected reserves, Lebanon's geomorphology of coastal cliffs and karst formations host unique cave ecosystems, notably in Ras Chekaa and Naqoura, that shelter bat colonies and may historically have supported monk seals (*Monachus monachus*). These habitats, however, are extremely sensitive and are rarely included in conservation

[3] Lebanese Petroleum Administration, "Block 9 Exploration Activities," 2023; TotalEnergies, "Lebanon: Block 9 Offshore Exploration," Press Release, August 2023.

planning. Their protection aligns with ICZM by ensuring terrestrial-marine ecological continuity (CNRS-Lebanon, 2019-2022). Moreover, inland coastal springs like those feeding Jeita Grotto, Ras el Ain, and Nahr el Kalb contribute to the biodiversity of the coastal region and play a crucial role, both ecologically and economically. It is also worth noting that several underwater coastal springs along the Lebanese shoreline are considered remarkable geomorphic and ecological features, supporting unique brackish water ecosystems that host localized marine species. Similarly, estuaries where rivers like Damour, Litani, and Awali discharge into the sea serve as important transitional ecosystems, which deserve focused attention due to their high biological productivity and function as biodiversity corridors. The Damour River, in particular, is considered part of a Key Biodiversity Area (KBA), and an international corridor for migratory birds (CEPF, 2024).

In this regard, Lebanon's coastal zones may also contribute to climate resilience by acting as natural buffers against coastal erosion and flooding. Although limited in occurrence and often degraded, blue-carbon ecosystems such as seagrass meadows, coastal wetlands, and salt marshes offer potential for carbon sequestration if these habitats are actively restored.

1.5. KEY CHALLENGES IN LEBANON'S COASTAL ZONE

1.5.1. WEAK GOVERNANCE OF PUBLIC SECTOR POLICY

Historically, many coastal communities in Lebanon have and still rely on marine and coastal resources for their livelihoods, namely through trade, fishing, tourism, and agriculture. Notwithstanding the various and recurring periods of political turmoil and economic instability, Lebanon's governance and management of its natural resources have always been overshadowed by corruption, nepotism, legal loopholes, and ad-hoc (season-to-season) survival strategies in favor of short-term commercial gains. Thus, little regard was given to long-term public welfare and the development (or implementation) of sustainable coastal zone policies and resource conservation management. This has facilitated unregulated urban expansion, a rise in pollution levels, and detrimental anthropogenic practices, including over-abstraction and unlawful land encroachment. There is consequently clear evidence of ongoing marine habitat degradation and the erosion of coastal cultural heritage across numerous coastal areas, resulting in adverse socio-economic consequences on both local and national scales (MoE/UNDP/ECODIT, 2011; Public Works Studio, 2024).

Moreover, along nearly the entire 220 km of Lebanon's coastline, public spaces have increasingly become privatized. According to a study by the Lebanese Ministry of Public Works and Transport (2018), only "*1 or 2 percent of Lebanon's population may currently own more than 90 percent of its beaches*," as private developments dominate the seashore and limit communal access. It should be noted that Decree No. 144/S (1925) defined the maritime public domain as inalienable, stretching up to the farthest point reached by winter waves. Yet, subsequent laws[4] introduced exceptions for "*public utility*" and tourism development, opening the door to widespread private appropriation. This has enabled luxury resorts, gated marinas, and privatized beaches to proliferate under the guise of national development. A study by Public Works Studio (2024) refers to this phenomenon as the "*manufacturing of landscapes of inequality*," where most citizens are now systemically denied access to the coast.

A striking example of this is Ramlet al-Baida, Beirut's last remaining public beach, which faced aggressive encroachment from the Eden Bay resort. Despite judicial rulings citing violations of EIA regulations under Law 444/2002 and setbacks defined in Decree 144/S, construction continued unabated. The municipality dismantled local food stalls and public toilets serving lower-income users, while simultaneously leaving the luxury project untouched—revealing an uneven application of law that reinforced social and spatial exclusion (Al Jazeera, 2019). Indeed, according to the Business & Human Rights Resource Centre (2023), violations of public access along Lebanon's coastline have become so widespread that up to 80 percent of the coast is now inaccessible to the public, fenced off by private resorts or illegally constructed facilities. Moreover, these infringements extend beyond environmental mismanagement; they constitute a systematic seizure of public space legitimized through weak governance and political patronage.

Turning to the fishery sub-sector, Lebanon's Mediterranean coastline has historically supported small-scale artisanal fishing, yet the sector remains underdeveloped, largely informal, and increasingly endangered. Despite long-standing proposals, the absence of a comprehensive Fisheries and Aquaculture Law has perpetuated fragmented governance, limited investment, and poor enforcement of sustainable practices. Noted that, fisheries in Lebanon are regulated under Law No. 2775 (1929), which remains the foundational legal text for marine resource governance. It establishes licensing procedures, seasonal and spatial restrictions, and gear limitations. Supplementary decrees, such as Ministry

[4] Lebanon, Decree 4810 of 1966; Law 402 of 1995.

of Agriculture Decision 346/1 (2010), have updated its provisions to include bans on trawling and scuba fishing. Currently, Lebanon's fisheries are thus governed by outdated decrees (e.g., Decree 742/2008 on fishing gear and licensing) and administrative decisions under the Ministry of Agriculture's Directorate of Fisheries and Wildlife, but lack the legal and institutional infrastructure to support sustainable sector growth or modern aquaculture initiatives (UNDP, 2020; FAO, 2022).

One key bottleneck is institutional inertia and political deadlock, which has stalled the passage of a comprehensive fisheries law for over a decade. A draft law developed with technical assistance from FAO in 2014 was never ratified by Parliament. This gap leaves the sector without binding national strategies on fisheries management, marine spatial planning, aquaculture licensing, or protection of breeding zones. Furthermore, local resistance from informal fishing syndicates, conflicts over marine space use, and security concerns along certain coastlines (e.g., proximity to ports, energy infrastructure, and military zones) further complicate policy implementation.

It is also important to mention that Lebanon still lacks a fully operational oil spill contingency plan, and, despite the very likely potential of becoming an energy source, the legal-regulatory framework for offshore environmental impact assessments remains incomplete. The ICZM Protocol mandates heightened scrutiny for such high-risk activities, especially in proximity to marine protected areas, fishing zones, and tourism corridors. Therefore, the implementation of Strategic Environmental Assessments (SEAs) combined with marine spatial planning is urgently needed to inform decision-making and minimize detrimental long-term socio-ecological trade-offs.

Finally, if managed at all, water resources such as springs, rivers, and coastal zone aquifers are often treated and managed in isolation, ignoring the interconnected nature of ecosystems and the interdependencies between these elements. Such a fragmented approach is at odds with the principles of Integrated Water Resources Management (IWRM), which are highlighted in Lebanon's national water strategy and newly enacted water law. IWRM seeks to address the interlinkages between social and ecological zones — for instance, by factoring in the downstream effects of upstream activities on riparian systems and coastal environments.

1.5.2. SOCIO-ECONOMIC CHALLENGES

The economic value of Lebanon's coastal areas extends well beyond fisheries and tourism revenues, notably encompassing the highly prized real estate sector concentrated along the shoreline. In many municipalities, prime coastal land has been privatized or leased for commercial and touristic ventures, generating considerable private income through resorts, high-end residences, and hospitality developments. However, this capitalization of coastal land has not always translated into equitable public revenues or robust regulatory oversight. Indeed, despite the fact that all beaches in Lebanon are legally considered public property under Decree-Law No. 144/S in 1925, construction permits have frequently been issued in violation of zoning laws and building setbacks[5]. While some land-use regulations exist at the municipal or sectoral level, there is an evident lack of an integrated, national-level zoning system for coastal plots, which complicates effective spatial planning and enforcement. This regulatory gap contributes to fragmented and often conflicting uses of the coastline. As a result, large swaths of the coast have been enclosed by private enterprises, obstructing public access and eroding communal rights to the littoral zone[6].

Moreover, taxation schemes on coastal property remain underdeveloped and poorly enforced. Many seafront developments pay disproportionately low taxes relative to the market value of the land and its generated income. The absence of differentiated taxation between ecologically sensitive and heavily built-up coastal areas further exacerbates unplanned urban expansion and discourages environmentally responsible investment (UN-Habitat 2021). Furthermore, land-use planning tools like strategic environmental assessments, coastal land valuation schemes, or protective zoning are either lacking or inconsistently implemented. This misalignment between fiscal measures and spatial planning instruments fosters an economic model that privileges short-term private gain over long-term public benefit and sustainability. In this regard, this approach places additional strain on coastal ecosystems and critical infrastructure, undermining the ecological goods and services these areas provide (UNEP/MAP, 2020).

1.5.3. AGRICULTURE & AQUACULTURE

Coastal agriculture, especially in lowland areas such as Damour, Zahrani, and Akkar, contributes substantially to marine pollution via agrochemical runoff. Fertilizers containing nitrogen and phosphorus leach into surface and subsurface

[5] Despite the fact that all beaches in Lebanon are legally considered public property under Decree-Law No. 144/S of 1925, construction permits have frequently been issued in violation of this law and of coastal zoning included in the masterplans of the Ministry of Public Works.
[6] Lebanese Law No. 64/2017 regulating investment in the maritime public domain.

drainage systems and are carried by rivers to the Mediterranean. The mouths of the Litani, Damour, and Nahr el-Kalb Rivers have shown high levels of nutrient loading and suspended solids during winter runoff events (MoE/UNDP/ECODIT, 2011). This process often coincides with algal blooms and declining water quality in estuarine and coastal habitats (UN-ESCWA, 2013). ICZM must therefore integrate upstream river basins and agricultural water management strategies to reduce coastal eutrophication.

Despite Lebanon's proximity to rich Mediterranean waters, local fish production falls significantly short of meeting national demand. As a result, the country depends heavily on fish imports to satisfy consumption needs, with domestic production estimated to cover only 25 to 30 percent of total demand (FAO, 2022). Contrary to the assumption of direct competition with imported fish, small-scale coastal fishers in Lebanon face far more acute pressures from environmental and operational challenges. These include the degradation of marine habitats due to coastal development, pollution, and overfishing, as well as the proliferation of Non-Indigenous Species (NIS), such as invasive pufferfish, which threaten native stocks and gear safety (Bariche, 2012; UNEP/MAP-SPA/RAC, 2022). Additionally, rising fuel prices and the high cost of fishing equipment have further strained the economic viability of artisanal fishing communities (Ministry of Agriculture, 2020). These issues compound the vulnerability of coastal livelihoods and necessitate targeted policy responses grounded in environmental recovery and socioeconomic resilience, rather than market liberalization alone. The decline of Lebanon’s small-scale fishing communities and desert-like maritime ecology are stark symptomatic reflections of dwindling resources due to the pressures exerted on marine productive habitats and increasing prices of energy, leading to falling incomes and livelihoods.

1.5.4. WATER & WASTEWATER MANAGEMENT

Lebanon’s coastal aquifers, particularly in regions like Beirut, Damour, Chekka, and Tripoli, are under increasing threat due to overextraction, seawater intrusion, and reduced recharge caused by urban sprawl. These aquifers, largely composed of Quaternary and Upper Cretaceous formations, extend a few kilometers inland and are critical for domestic and agricultural water supply in coastal areas. However, poor groundwater governance, unregulated well drilling, and salinization due to proximity to the sea and pumping pressure have led to serious degradation in water quality (Margane and Toll, 2011). This situation is exacerbated by the absence of proper monitoring systems and effective enforcement of groundwater abstraction regulations.

More critically, inadequate or absent wastewater treatment or management poses a major challenge in Lebanon’s coastal zone. Municipal, industrial, and agricultural wastewater—often untreated or poorly treated—is discharged into rivers and coastal waters, contributing to high marine pollution and public health risks at outfall locations. A significant number of Lebanon’s coastal wastewater treatment plants (WWTPs) either lack sufficient treatment stages or discharge their effluents at short distances from the shoreline. Facilities in Saida, Tripoli, and Tyre have been identified as discharging partially treated or untreated wastewater within several hundred meters of the coast, creating hotspots of marine pollution. Although the Ghadir WWTP near Beirut was designed with a marine outfall extending approximately 2.5 km into the sea, incomplete treatment and operational limitations have reduced its effectiveness (MOE/UNDP/ECODIT, 2011).

In many coastal municipalities, especially in Beirut and Saida, stormwater and wastewater collection systems remain combined, a legacy of outdated urban planning. During storm events, this configuration leads to combined sewer overflows, where untreated sewage and rainwater are discharged directly into the sea. These overflows bypass WWTPs entirely, contaminating marine waters and recreational beaches with pathogens, nutrients, and solid waste (MOE/UNDP/ECODIT, 2011). The absence of separate infrastructure remains a major infrastructure and public health challenge, underscoring the need for targeted investment and legislative reform under ICZM frameworks.

In addition, coastal agricultural runoff is often discharged into rivers or directly into the Mediterranean, leading to substantial pollution that degrades the marine environment and increases the incidence of disease on the coastal population. Frequent nutrient discharges into rivers empty into the coast, causing eutrophication and Harmful Algal Blooms (HABs) along Lebanon’s coast, especially near urban centers like Tripoli and Beirut. These blooms threaten fisheries, tourism, and biodiversity. Tracking HABs and limiting nutrient inflows is essential to ICZM, particularly through river basin and wastewater management integration.

Furthermore, solid waste management suffers the same status, with various sorts of waste remaining unregulated, improperly treated, inadequately landscaped, or illegally dumped, further harming the environment, health, and economy. These practices contribute directly to eutrophication, nutrient loading, and public health risks in nearshore marine ecosystems, contradicting the principles of sustainable coastal zone management.

1.5.5. ENVIRONMENTAL ASPECTS

a) Ecological Degradation

Lebanon's coastal zone is currently experiencing significant environmental degradation, primarily driven by pollution arising from ineffective wastewater treatment and solid waste mismanagement, as well as overfishing, climate change, and habitat destruction and fragmentation. More specifically, pollution, overpopulation in urban centers, habitat fragmentation, and the overexploitation of marine resources are key factors accelerating this degradation. According to the State of the Environment Report, these, in tandem with overfishing and unsustainable land use, have further exacerbated marine life degradation and biodiversity loss. Moreover, extensive sea-filling projects have drastically altered natural landscapes, reducing biodiversity and weakening ecosystems' natural defenses (UNEP/MAP and Plan Bleu, 2020). Importantly, these ecosystems not only support marine biodiversity but also provide ecosystem services vital for local communities, such as fisheries and tourism. In addition, the accumulation of marine litter also threatens marine life and negatively impacts human health and economic activities, particularly tourism. Studies conducted by the University of Balamand and other field assessments similarly confirm these trends, highlighting the combined impacts of coastal erosion, urbanization, and pollution. In this regard, there is an urgent need for enhanced coordination among ministries and more rigorous enforcement of environmental legislation to effectively address these mounting threats.

Several species on the IUCN Red List, such as the Mediterranean monk seal and the loggerhead sea turtle, face critical endangerment due to habitat loss, pollution, and unsustainable fishing practices. Both species are classified as vulnerable according to the IUCN (2023). Moreover, recent biodiversity research has identified the Eurasian eel in the Damour River, underscoring the essential need to maintain ecological connectivity between inland freshwater and coastal marine ecosystems.

Several officially designated protected areas in Lebanon are directly linked to the coastal zone or lie within close proximity, making them highly relevant to ICZM. Among these sites are the Palm Islands Nature Reserve off Tripoli (marine and bird sanctuary)[7], the Tyre Coast Nature Reserve (a RAMSAR site with significant coastal wetland habitats and sea turtle nesting grounds)[8], and the Al-Abassiyeh coastal zone in South Lebanon, which is under formal conservation designation and hosts sensitive habitats[9]. Additionally, the Ras Chekka sea cliffs and Anfeh salt flats present high ecological value due to their biodiversity and unique geomorphology, despite lacking formal protection status. Nevertheless, these areas are exposed to various pressures and impacts that create vulnerabilities, including coastal erosion, illegal construction, tourism pressure, sand mining and dredging, as well as pollution originating from upstream river catchments (MoE/UNDP/GEF, 2016). Informal studies and field surveys also emphasize the importance of protecting coastal caves, which serve as habitats for bats and seals, along with rare dune systems near Ramlet el Bayda and Ouzai, both currently threatened by land-use changes and waste accumulation.

b) Climate Change Vulnerability

For generations, coastal dwellers passed down knowledge about sustainable resource use, fishing practices, and environmental stewardship. However, modern developments have caused much of this traditional knowledge to fade, diminishing the ability of these communities to effectively manage and protect their natural surroundings. Consequently, small-scale, sustainable fishing communities that were once integral to the coastal economy now receive little governmental attention. Rapid urbanization, industrial expansion, and shifting socio-economic priorities have increasingly alienated coastal populations from their natural environment. Without any subsidization, regulation, or protection, coastal fishers, artisans, and their communities are at the mercy of economic shocks and environmental disasters.

Lebanon's coastal areas are increasingly exposed to the impacts of climate change, including sea-level rise, stronger storm surges, and temperature shifts. Natural protective buffers—such as sand dunes, coastal wetlands, and seagrass beds—are being lost to urban encroachment and unregulated coastal development. These ecosystems provide essential services, including carbon sequestration and coastal stabilization, but they are facing increasing pressure. As a result, the decline of these habitats dramatically reduces the resilience of coastal communities and marine

[7] Lebanon, Law No. 121/1992.
[8] Lebanon, Law No. 708/1998.
[9] Lebanon, Law No. 170/2020.

biodiversity against climate shocks and invasive species. Indeed, unplanned and illegal development fragments these ecosystems further, undermining efforts towards sustainable coastal management.

Finally, Lebanon's coastal area is under immense urban pressure, with unregulated urban sprawl encroaching on vital habitats. Illegal construction and unauthorized coastal developments destroy natural buffers, such as sand dunes, vermetid reefs (formed by worm snails), and wetlands, which protect the coastline from natural disasters like storm surges and erosion. Lebanon's coastal zone is thus vulnerable to the effects of climate change, including sea-level rise, increased storm surges, and ocean acidification, which threaten the health of marine and coastal ecosystems. The added stress of climate change worsens challenges posed by invasive species, which outcompete native species and reduce native biodiversity.

2. Prioritizing Sustainability Indicators for Lebanon's Coastal Zone Management

2.1. PRIORITIZATION RATIONALE & TRANSITION TO SECTORAL FOCUS

The challenges outlined above underscore the complex and interdependent nature of pressures affecting Lebanon's coastal zone. From habitat loss and climate vulnerability to policy fragmentation and social disconnection, these stressors demand integrated, targeted, and adaptive responses. Effective ICZM requires strategic prioritization—identifying the sectors where interventions are most urgent, feasible, and capable of delivering systemic impact.

The prioritization approach adopted in this report draws from several key references, including Lebanon's Draft National ICZM Strategy (2015), outcomes of the Coastal Area Management Programme (CAMP) for Damour (PAP/RAC, 2004), findings from the updated State of the Environment Report (UNEP/MAP and Plan Bleu, 2020), and the draft National Biodiversity Strategy and Action Plan (2024). Guidance from the MedProgramme and the UNEP/MAP system further helped align sectoral focus areas with broader Mediterranean ICZM priorities[10].

In addition, the *Climagine* foresight methodology, based on participatory workshops engaging national and local stakeholders, identifies areas of perceived risk, opportunity, and priority for intervention. This ongoing process reveals widespread concerns regarding unregulated urban growth, institutional fragmentation, declining resilience of coastal communities, and the degradation of cultural and natural assets—factors that inform the identification of priority sectors within the ICZM framework.

A multi-criteria rationale guided the prioritization of sectors, based on:

- The magnitude and urgency of environmental and socio-economic challenges;
- The systemic relevance of sectors across ecological, economic, and institutional dimensions;
- The vulnerability of ecosystems and communities to degradation and external pressures;
- The feasibility of intervention, considering institutional readiness and data availability;
- Alignment with national development strategies (including SDGs) and international ICZM obligations.

The result is a concise list of six priority sectors, each detailed in the following chapter. For each sector, a contextual narrative is provided, along with an overview of major pressures, associated risks, key stakeholders, and a short list of sustainability indicators assessed using the RACER criteria, focusing on *Relevance* and *Ease of Monitoring*.

2.2. PRIORITY SECTORS: TARGETED ACTION IN LEBANON'S COASTAL ZONE

The selected priority sectors represent the operational core of Lebanon's ICZM Strategy. They reflect immediate policy and management needs while contributing to long-term coastal resilience and integrated planning under the ICZM Protocol.

2.2.1. URBAN-SPATIAL PLANNING & LAND USE

Urban-spatial planning and land use in Lebanon's coastal zone have evolved in a largely fragmented and reactive manner, mostly driven by political interests, population pressure, and weak regulatory enforcement (Plan Bleu, 2019). Indeed, with over 60% of Lebanon's population residing in coastal areas and urban sprawl expanding rapidly along the shore, critical ecosystems, including river mouths, coastal plains, and agricultural lands, have been converted into built environments, often without adequate zoning or environmental impact assessment (UN-HABITAT, 2011). Moreover, reclamation of coastal land, informal settlements, and unregulated private developments have further reduced public access to the sea and increased exposure to natural hazards, such as coastal flooding and erosion (PAP/RAC, 2004; PAP/RAC, 2023). Planning decisions are typically centralized, but their implementation is uneven and disconnected from local realities, especially due to limited capacity within municipalities and overlapping institutional mandates.

[10] ICZM Protocol Decree 637/2014; UNEP/MAP, MSSD and IMAP Ecological Objectives 7 & 8; MedECC, 2020.

In this regard, the ICZM approach provides a pathway for reform by promoting integrative spatial planning and governance across sectors and jurisdictions. Specifically, through mechanisms such as Marine Spatial Planning (MSP), development of coastal land-use plans, enforcement of building setback regulations, and the use of new planning tools such as the Delimitation of the Administrative Reach (DAR) of the Lebanese coastal zone, ICZM supports more coherent urban development that balances growth with environmental protection and resilience objectives. Furthermore, ICZM can serve as a coordination platform to harmonize the interests of urban planners, municipalities, and environmental authorities, thereby mitigating land-use conflicts and promoting long-term sustainability.

a) Key Challenges and Risks

- Rapid and unregulated urban sprawl along the coastline
- Encroachment on maritime public domain and natural buffers
- Land reclamations over maritime sea areas
- Weak enforcement of building codes and coastal setback zones
- Fragmented and overlapping institutional mandates
- Lack of local urban plans aligned with coastal ecosystem protection
- Increased flood risk and pressure on transport and infrastructure systems

2.2.2. NATURAL RESOURCE MANAGEMENT

Lebanon's coastal zone hosts a rich mosaic of ecosystems—including wetlands, estuaries, dunes, and forests—that provide essential services such as water filtration, biodiversity refugia, shoreline stabilization, and carbon storage (MoE/UNDP/GEF, 2011; CNRS-L, 2023). However, these natural assets have been increasingly degraded due to unregulated land-use change, over-abstraction of groundwater, declining river flows, salinization of aquifers, and weak enforcement of environmental protection laws. In addition, biodiversity hotspots, including several coastal nature reserves and Important Bird Areas (IBAs), are under growing pressure from illegal hunting, invasive species, fires, and encroachment (Plan Bleu, 2019). Meanwhile, water resources are subject to multiple competing demands from agriculture, urban consumption, and industry, with climate change exacerbating both drought and flood risks (PAP/RAC, 2023).

Indeed, integrated management of natural resources—particularly water and ecosystems—forms a cornerstone of ICZM in Lebanon. It provides an operational framework for implementing ecosystem-based management, connecting upstream river basin management (RBM) with coastal resilience and pollution control (Plan Bleu, 2019). ICZM also supports the mainstreaming of biodiversity protection, environmental flow regimes, and sustainable groundwater management into planning and investment decisions at both national and local levels. Regional Water Establishments (WEs), alongside the Litani River Authority (LRA), are mandated to oversee water provision and quality control in their respective jurisdictions, making their involvement in coastal watershed and aquifer protection strategies essential. Consequently, coordinated monitoring, rehabilitation of degraded areas, and participatory conservation strategies are key to reversing degradation trends and restoring ecological functionality along the coast.

b) Key Challenges and Risks

- Degradation of sensitive habitats and wetlands due to urban expansion and pollution
- Groundwater depletion and saltwater intrusion in coastal aquifers
- Fragmented water governance across agencies
- Absence of ecosystem valuation in decision-making
- Data gaps on biodiversity status and natural resource flows
- Inadequate enforcement of conservation regulations

2.2.3. COASTAL RISKS & CLIMATE CHANGE

Lebanon's coastline is increasingly vulnerable to the compound effects of climate change, unsustainable land use, and institutional inaction. Specifically, sea-level rise threatens to submerge low-lying areas, erode beaches, and salinize freshwater aquifers, while extreme weather events—such as storms and floods—have become more frequent and damaging (MoE/UNDP/GEF, 2011; PAP/RAC, 2023). At the same time, informal development in floodplains, estuaries, and river mouths has undermined the natural resilience of coastal systems, while compromising public safety and

increasing disaster risk (Plan Bleu, 2020). Coastal defense infrastructure, where it exists, is often outdated or ecologically harmful, and urban sprawl continues to encroach on climate-buffer zones like dunes and wetlands.

In this context, climate adaptation in coastal zones is a core priority of Integrated Coastal Zone Management (ICZM). It requires coordinated planning across sectors—urban development, water, biodiversity, and disaster risk reduction—and across scales, linking municipal resilience plans to national adaptation strategies (MoE/UNDP/GEF, 2022; PAP/RAC, 2023). Moreover, ICZM encourages nature-based solutions such as dune restoration, wetland rehabilitation, and managed retreat as viable alternatives to hard infrastructure, while also supporting spatial planning tools that account for future climate risks. Lebanon's National Adaptation Plan (NAP) and updated NDCs (2021) identify coastal zones as priority areas for investment and protection, yet implementation remains limited due to institutional fragmentation and resource gaps. Therefore, a proactive ICZM framework can help bridge these efforts by mainstreaming risk-informed planning and resilience metrics into coastal governance.

a) Key Challenges and Risks

- Sea-level rise and erosion of beaches and protective coastal landforms
- Increased frequency of extreme climate events (floods, heatwaves, droughts)
- Lack of updated coastal flood risk maps and hazard zoning
- Absence of integrated disaster risk reduction planning at the coastal scale
- Unregulated construction in flood-prone and high-risk coastal areas
- Weak link between national climate policy and local resilience actions

2.2.4. WASTE & POLLUTION MANAGEMENT

Waste and pollution continue to pose some of the most pressing threats to Lebanon's coastal ecosystems and public health. Indeed, the failure of successive national waste strategies has left many coastal municipalities without adequate solid waste or wastewater management systems. Untreated sewage is discharged into the sea in over 150 locations (MoE/UNDP/GEF, 2011), while coastal dumpsites—many of them illegal or inadequately managed—similarly leach into soil, aquifers, and marine environments (PAP/RAC, 2023). Industrial wastewater from key sectors such as food processing (dairy processing, butcheries, tanneries, and oil mills), power plant facilities, and gas stations often goes unmonitored or unregulated, despite the presence of national discharge standards set by the MoE and the Lebanese Standards Institution (LIBNOR).

In light of this, the ICZM approach addresses pollution by linking land-based and marine pollution sources, promoting circular economy models, and integrating pollution control into coastal land-use planning. Key instruments include Environmental Impact Assessments (EIAs), Integrated Solid Waste Management (ISWM) frameworks, and permitting systems for discharge and landfill siting, all of which require stronger enforcement. ICZM also supports the principle of subsidiarity in waste governance, emphasizing the role of municipalities and decentralized service models. Efforts under the EU-funded projects and the MedProgramme have pushed for integrated pollution monitoring and the application of the Polluter-Pays Principle, though practical implementation remains weak (UNEP/MAP, 2022).

Additionally, the revised Water Code (2018) and its pending implementation decrees open new avenues for regulating wastewater reuse, sludge valorization, and industrial effluent monitoring, all of which are relevant to coastal areas. Nevertheless, the effectiveness of these measures depends on cross-sectoral coordination, robust data collection, and local capacity, areas where ICZM can act as a catalytic governance tool.

Key Challenges and Risks

- Direct discharge of untreated wastewater into the sea
- Proliferation of uncontrolled coastal dumpsites
- Inadequate monitoring and regulation of industrial pollution
- Weak enforcement of national discharge and landfill standards
- Institutional fragmentation between MoE, MoI, MoEW, and municipalities
- Public resistance to infrastructure siting and recycling reforms

2.2.5. SUSTAINABLE DEVELOPMENT & BLUE ECONOMY

Lebanon's coastal economy has long been shaped by its ports, artisanal fisheries, tourism, and agro-food sectors. However, decades of unmanaged urbanization, weak planning, and economic crises have eroded the productivity and

sustainability of these activities. Specifically, artisanal fishers face declining catch volumes and resource depletion due to illegal fishing and habitat loss (FAO, 2021). Coastal tourism is highly concentrated and seasonal, with limited investment in ecotourism or heritage preservation (Plan Bleu, 2019). Meanwhile, informal livelihoods, ranging from fish vending to coastal crafts, remain vulnerable and largely unrecognized in development policies.

Within this perspective, the Blue Economy concept, as adopted by the Barcelona Convention and EU Neighborhood Policies, calls for balancing economic development with the health of marine and coastal ecosystems. In Lebanon, this involves promoting sustainable fisheries and aquaculture, improving value chains and certification systems, supporting community-based tourism models, and fostering entrepreneurship in circular blue industries (PAP/RAC, 2023). ICZM contributes to this shift by integrating spatial planning, investment regulation, and environmental safeguards into sector strategies, especially where infrastructure intersects with sensitive coastal areas.

Finally, new opportunities exist in inland aquaculture (e.g., integrated fish-vegetable systems), sustainable coastal agriculture, renewable energy (e.g., wave and solar pumping), and green tech services such as marine litter reuse or algae-based products. However, the success of these ventures depends on capacity-building, licensing reform, access to finance, and marine spatial planning; all of which are areas where ICZM-based governance can align policy and investment.

a) Key Challenges and Risks

- Overfishing and non-compliance with sustainable practices
- Decline in traditional livelihoods due to pollution and access restrictions
- Unequal distribution of tourism revenues and infrastructure pressure
- Lack of investment in sustainable aquaculture and fisheries reform
- Absence of an integrated marine spatial planning framework
- Marginalization of informal actors and community enterprises

2.2.6. GOVERNANCE, INSTITUTIONS, & ENABLING ENVIRONMENT

Effective coastal governance in Lebanon is fragmented across multiple ministries and agencies, with overlapping mandates and often conflicting objectives. Despite early efforts to mainstream ICZM (notably through the draft ICZM Law of 2012 and the National ICZM Strategy of 2015), progress stalled due to institutional inertia, lack of coordination mechanisms, and limited political will (PAP/RAC, 2023). Moreover, the absence of legally binding spatial plans or a centralized marine governance body has left coastal development projects largely unchecked, with environmental and social safeguards inconsistently applied.

In practice, responsibilities for coastal governance are spread across ministries such as the Ministry of Environment (MoE), Ministry of Public Works and Transport (MoPWT), Ministry of Interior and Municipalities (MoIM), Ministry of Finance (MoF), and Ministry of Justice (MoJ). While several municipalities have tried to incorporate coastal concerns into their local development plans, most lack the expertise, resources, or legal authority to do so effectively. The role of Lebanon's four regional Water Establishments (Beirut & Mount Lebanon, South, North, and Bekaa) remains under-integrated into coastal zone planning, although they are crucial for freshwater management, wastewater services, and infrastructure resilience—especially in coastal catchments.

Against this background, ICZM offers an institutional framework for overcoming these challenges by fostering vertical and horizontal integration. This includes enhancing coordination between central and local government actors, establishing dedicated coastal governance bodies or councils, and introducing participatory mechanisms such as public consultations and inter-ministerial platforms. It also supports enabling conditions through legal reform, budget allocation, monitoring systems, and access to spatial and environmental data (Plan Bleu, 2019; PAP/RAC, 2023).

Ultimately, the ICZM Strategy's success will depend on addressing regulatory gaps, reinforcing mandates, and ensuring inclusive participation, especially in light of Lebanon's fragile political context and financial constraints.

a) Key Challenges and Risks

- Lack of a binding legal framework for ICZM and MSP
- Overlapping mandates and institutional fragmentation
- Weak enforcement of environmental and spatial regulations
- Poor integration of Water Establishments and local authorities in planning

- Absence of coordinated monitoring and reporting systems
- Limited transparency and public access to coastal data

2.2.7. STAKEHOLDER ROLES BY SECTOR

Below is a list of main stakeholders identified per priority sector:

Sector	Key Stakeholders & Roles
Urban-Spatial Planning & Land Use	MoPWT (planning), MoE (EIA enforcement), CNRS-L (land use data), Municipalities (local plans)
Natural Resource Management	MoE (biodiversity), CNRS-L (monitoring), LRA/MoEW (water), UNESCO MAB (protected areas), NGOs
Coastal Risks & Climate Change	MoE (adaptation), NDMA (risk), CNRS-L (risk mapping), UNDP (capacity), MoPWT (infrastructure)
Waste and Pollution Management	MoE (standards), MoI (industrial control), MoEW (WWTPs), OMSAR (projects), Municipalities (collection)
Sustainable Development & Blue Economy	MoA (fisheries), MoT (tourism), MoET (market access), NGOs (training), Cooperatives (value chains)
Governance & Enabling Environment	MoE (lead), MoPWT/MoIM (planning), MoJ (legal), Parliament (ICZM Law), PAP/RAC (support), Water Establishments

2.3. A RACER CRITERIA ASSESSMENT

Adopting a data-driven approach, this methodology supports the detection of emerging issues or gaps in addressing severe problems, allowing for prioritizing timely interventions and adaptive management strategies. Furthermore, these indicators facilitate the tracking of progress towards sustainability goals, providing clear benchmarks that help guide policy decisions and prioritize actions based on robust data.

Furthermore, to develop a comprehensive and useful dashboard for monitoring the sustainability of Lebanon's coastal zone, each proposed indicator needs to be assessed against the RACER criteria, which ensures each indicator considered is:

- ✓ **Relevant**: Does the indicator measure the right thing? Is it useful in helping to understand the current state and future development of the priority sector as a whole?
- ✓ **Acceptance**: While acceptance by staff and stakeholders is crucial, this aspect will be verified later, once we have shared the final list of indicators with the ICZM Committee and workshop participants.
- ✓ **Credibility with non-experts**: Although indicators should be unambiguous and easy to interpret, the credibility for non-experts will be confirmed during the workshop.
- ✓ **Ease of Monitoring**: This criterion is critical at this stage, and much needed to understand if data for each indicator is available at the national or coastal level.
- ✓ **Robust:** Or resistant to **manipulation, traceable, and reproducible**; We aim to address this by using publicly available data, ensuring that indicators are robust and reliable.

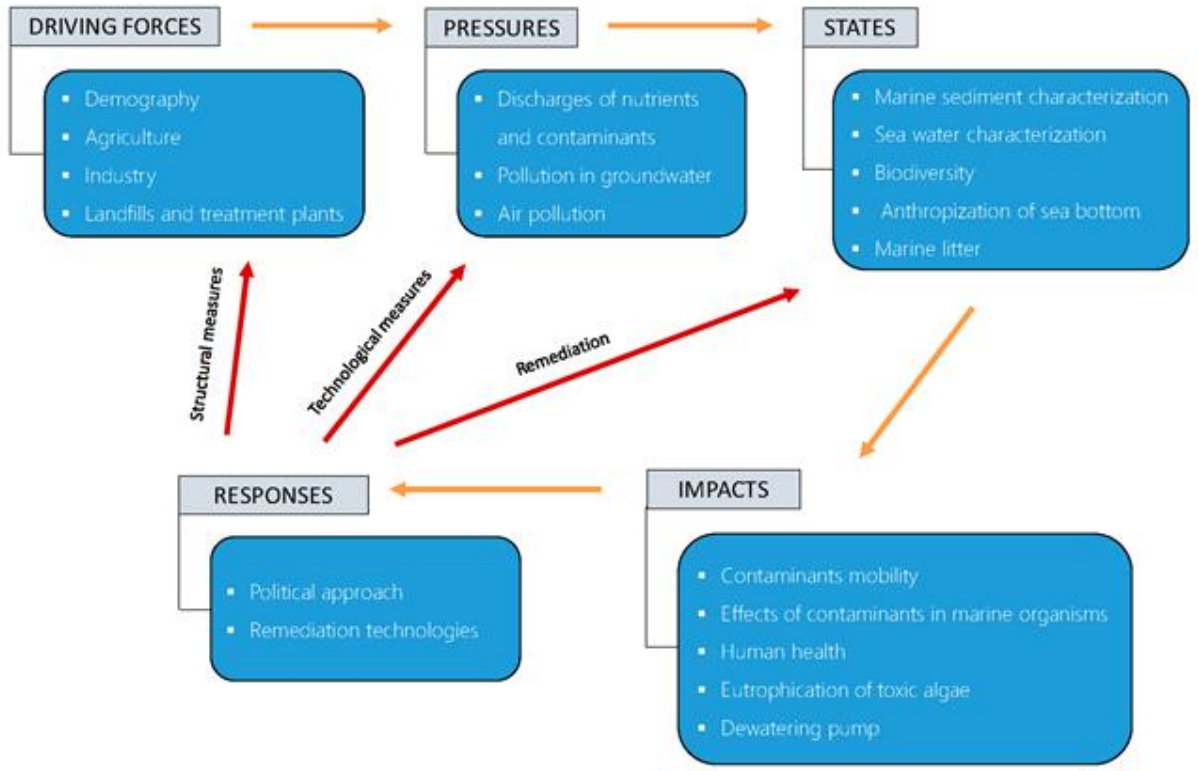
As part of the *Climagine* participatory process to support the development of Lebanon's ICZM Strategy and Law, an initial pool of possible sustainability indicators was prepared for review directly to the workshop participants.

However, in order to benefit the project as a whole and to avoid analysis paralysis while enabling efficient progress at this early stage, the focus was primarily on assessing criteria in terms of their relevance and ease of monitoring. Below is a table further detailing these two criteria for this critical stage, upon which the initial recommended selection of the five main indicators was performed:

Criterion	Definition (Adapted to Lebanese Context)	Sources Used
Relevance	Indicates how well the indicator captures critical pressures, risks, or trends affecting each priority sector and the coastal zone as a whole. Relevance also reflects whether the indicator helps guide strategic planning and supports ICZM implementation.	Final Updated ICZM Draft Strategy (2015) - CP2.1 and CP2.2 Baseline Review - Note on MedProgramme Interventions in Lebanon
Ease of Monitoring	Refers to the availability, accessibility, and continuity of data at the national or coastal level. It considers whether the indicator can be monitored using existing institutional mechanisms, and whether reliable sources or proxies exist.	Climagine Kickoff PPT (2024) - Climagine Guide (Plan Bleu, PAP/RAC) - CP2.1 and CP2.2 Baseline Reviews

In addition to the RACER evaluation, the DPSIR (Driving forces–Pressures–State–Impact–Response) framework was used to structure the logic behind indicator selection and prioritization.

Figure 1. DPSIR Framework Diagram



Source: Labianca et al.

The DPSIR framework in Figure 1 grounds causal links to be examined in relevancy to the Lebanese coastal zone context, between:

- **Driving Forces**: Socio-economic or institutional trends (e.g., urban growth, tourism demand);
- **Pressures**: Activities causing change (e.g., wastewater discharge, land-use change);
- **State**: Measurable environmental or socio-economic condition (e.g., water quality, coastal land use);
- **Impacts**: Effects on ecosystem services, public health, economy;
- **Responses**: Policy interventions or governance actions (existing or needed).

Therefore, indicators were also evaluated based on whether they represented a relevant key Pressure (relevance) or State (measurable) variable within the DPSIR framework, and whether they could consequently support effective Response mechanisms or practical adaptation pathways (see Annex 2).

3. Conclusion

Lebanon's coastal zone is facing a convergence of environmental, socio-economic, and institutional pressures that threaten the sustainability of its ecosystems, public assets, and livelihoods. Against this backdrop, and through an evidence-based and participatory approach, this report has outlined the rationale for prioritizing key sectors under the ICZM framework. By building on national strategies, honoring regional commitments, and engaging a wide range of stakeholders—particularly through the Climagine process—this assessment offers a practical and actionable foundation for future coastal planning.

The six priority sectors identified—Urban-Spatial Planning and Land Use; Natural Resource Management; Coastal Risks and Climate Change; Waste and Pollution Management; Sustainable Blue Economy and Socioeconomic Development; and Governance, Institutions, and Enabling Environment—reflect some of Lebanon's most urgent coastal challenges and opportunities. For each sector, relevant indicators were selected and screened based on their Relevance and Ease of Monitoring, paving the way for the development of a streamlined dashboard to inform planning, implementation, and policy reform.

Moreover, this strategic prioritization is designed to enable integrated action across sectors, strengthen coordination between institutions, and reinforce Lebanon's commitments under the Barcelona Convention's ICZM Protocol. In practice, it not only provides a structured framework to monitor progress but also shapes the way resources and interventions can be directed to foster coastal resilience, improve public accountability, and safeguard Lebanon's marine and coastal heritage for future generations.

Looking ahead, this work will serve as a cornerstone for the upcoming national workshops. Here, the findings will play a key role as technical references—helping to guide stakeholder dialogues, validate the proposed priority areas, and sharpen the operational monitoring framework. The combination of detailed sector profiles, a refined shortlist of indicators, and a clear methodological approach will help structure productive discussions around practical next steps. Importantly, it will support the identification of data and capacity gaps, while ensuring a shared and actionable understanding of how the ICZM framework can successfully transition from planning to on-the-ground implementation.

4. Annex

4.1. ANNEX 1 - ROLE OF STAKEHOLDER IN MONITORING INDICATORS

Institution	Monitoring Domain	Type of Monitoring	Legal Mandate or Framework	Key Gaps or Challenges
Ministry of Environment (MoE)	Air quality, marine water, emissions	Nationwide air sensors, coastal water testing	Law 444/2002; Environmental Monitoring Guidelines	Incomplete coverage, irregular reporting, outdated equipment
Ministry of Energy & Water (MoEW)	River flow, groundwater, national water plans	River discharge gauges, aquifer mapping	Water Law 192/2020; National Water Sector Strategy (NWSS)	Weak enforcement, data inconsistency
Litani River Authority (LRA)	Litani Basin – water quality and quantity	Surface water sampling, flow meters	Litani River Authority Law (1954)	Partial coverage outside Litani basin
Council for Scientific Research (CNRS-L)	Marine environment, biodiversity	Coastal surveys, vessel-based sampling	CNRS Mandate; funded monitoring projects	Limited institutional support, funding-dependent
Lebanese Agricultural Research Institute (LARI)	Soil, pesticide runoff, agricultural pollution	Field sampling, remote sensing	Under MoA mandate	Gaps in coastal farming zones monitoring
Ministry of Public Health (MoPH)	Health impacts from contaminated water	Epidemiological data, outbreak tracking	MoPH mandate; joint alerts with MoE	Data siloing; slow integration with environmental datasets
Municipalities	Waste management, public health, enforcement	On-ground inspections, complaints	Municipal Law 118/1977	Resource constraints, poor coordination
Ministry of Industry (MoI)	Industrial wastewater discharges	Permitting, compliance checks	Industrial Permitting Framework	Lack of real-time monitoring; weak enforcement
LIBNOR	Environmental standards (air, water, WW reuse)	Standard-setting, certification	LIBNOR Guidelines (e.g., NL EN standards)	Delays in updating standards; limited implementation

4.2. ANNEX 2 - POOL OF INDICATORS IDENTIFIED

(for further consideration / re-evaluation)

4.2.1. URBAN-SPATIAL PLANNING AND LAND USE

Indicator	Unit	Suggested Source	Rationale	DPSIR Link
Rate of urban expansion in coastal zones	km²/year	CDR, CNRS-L	Reflects pressure of land transformation on ecosystems	Pressure
Rate of land reclamation	km²/year	CDR, CNRS-L	Critical for assessing change in coastline and marine habitats	Pressure
Proportion of public infrastructure projects aligned with ICZM	%	MoPWT, MoE	Shows ICZM integration in spatial development plans	Response
Number of unauthorized coastal constructions removed per year	Count/year	MoIM, MoE	Indicates law enforcement and regulatory capacity	Response
Ratio of green/public space to urban built-up area	%	CDR, CNRS-L	Reflects urban liveability and environmental equity	State
Length of coastline with enforced building setback regulations	km	MoPWT, MoE	Captures enforcement of spatial regulatory instruments	Response
Percentage of zoned plots along the shoreline	%	CDR, CNRS-L	Indicates spatial planning coverage and specificity	Response
Proportion of low elevation occupations in coastal zones	%	CDR, CNRS-L	Denotes risk exposure, planning needs	Pressure
Number of approved EIA/SEA for new establishments	Count/year	MoE, CNRS-L	Indicates compliance with impact assessment requirements	Response

4.2.2. NATURAL RESOURCE MANAGEMENT (BIODIVERSITY, ECOSYSTEMS, WATER)

Indicator	Unit	Suggested Source	Rationale	DPSIR Link
Average river flow at key gauging stations per basin	m³/s	MoEW, CNRS-L	Reflects water availability and seasonal variability	State
Annual abstraction volume vs. recharge in coastal aquifers	Ratio	MoEW, LRA	Key for groundwater sustainability and intrusion risk	Pressure
Groundwater level trends in coastal aquifers	cm/year	MoEW, CNRS-L	Assesses aquifer health and extraction impacts	State
Percentage of rivers with continuous water quality monitoring	%	MoEW, CNRS-L	Tracks water quality data availability and system robustness	Response
Incidence of saltwater intrusion in monitored wells	Count/year	MoEW, CNRS-L	Highlights over-extraction/sea-level rise impacts	Impact
Rate of coastal land-use change from natural to built-up areas	ha/year	CNRS-L, CDR	Indicates habitat loss and ecological degradation	Pressure

Number of biodiversity hotspots under formal protection status	Count	MoE, UNESCO MAB	Monitors conservation and legal designations	Response
Number of air quality monitoring stations in coastal urban zones	Count	MoE, CNRS-L	Measures coverage for pollution tracking	Response
Annual exceedance rate of PM2.5 and NOx limits	%	MoE	Indicates pressure from transport/industry emissions	Pressure

4.2.3. COASTAL RISKS AND CLIMATE CHANGE

Indicator	Unit	Suggested Source	Rationale	DPSIR Link
Average annual sea surface temperature deviation	°C	CNRS-L, NOAA	Key for climate change impacts on marine ecosystems	State
Number of coastal protection infrastructure projects	Count	MoPWT, MoE	Indicates adaptation and resilience investment	Response
Occurrence rate of climate-related disasters	Events/year	NDMA, MoE	Shows vulnerability to climate risks	Impact
Coastal flood risk maps updated in last 5 years	Yes/No	MoE, UNDRR	Tracks preparedness and up-to-date data	Response
Percentage of mangroves, dunes or wetlands lost	%	MoE, CNRS-L	Monitors ecological losses due to climate/urban pressure	Impact

4.2.4. WASTE AND POLLUTION MANAGEMENT

Indicator	Unit	Suggested Source	Rationale	DPSIR Link
Proportion of coastal municipalities with functional waste systems	%	MoE, OMSAR	Reflects service coverage in critical areas	Response
Percentage of solid waste safely disposed in engineered landfills	%	MoE, SWEEPNET	Indicates practices reducing coastal pollution	Response
Percentage of solid waste recycled annually in coastal areas	%	Municipal Reports, MoE	Measures adoption of circular economy	Response
Number of illegal dumpsites identified and remediated per year	Count/year	MoE, UNDP	Captures enforcement and cleanup activities	Response
Frequency of public reporting or complaints on waste	Reports/year	Municipal Portals, NGOs	Reflects public awareness and gaps	Pressure
Oil spill occurrence	Incidents/yr	MoE, Port Authorities	Measures acute marine contamination events	Impact
Number of safe public places for swimming	Count	MoH, Municipalities	Indicates coastal water quality and public benefit	State
Number of clean areas for safe fishing	Count	MoA, Fisheries	Reflects ecological condition and resource quality	State

4.2.5. SUSTAINABLE BLUE ECONOMY AND SOCIOECONOMIC DEVELOPMENT

Indicator	Unit	Suggested Source	Rationale	DPSIR Link
Percentage of coastal population employed in local sectors	%	CAS, MoL	Shows economic dependency on marine sectors	State
Number of registered artisanal salt producers	Count	MoA, Cooperatives	Captures traditional livelihoods and value chains	State
Annual catch volume by small-scale fisheries	tons/year	MoA, FAO	Reflects resource dependency and productivity	Pressure
Average household income in fishing communities	USD/year	CAS, NGOs	Indicates socioeconomic resilience	State
Number of micro-enterprises formally registered in coastal zones	Count	MoE, MoET	Captures entrepreneurship and job creation	State
Number of cultural heritage sites under conservation	Count	MoT, DGA	Reflects protection of historic assets	Response
Annual number of tourists visiting coastal heritage sites	Visitors/yr	MoT, Syndicates	Indicates tourism pressure and opportunity	Pressure
Number of ecotourism initiatives meeting sustainability criteria	Count	MoT, NGOs	Tracks sustainable tourism and green jobs	Response
Length of publicly accessible beaches	km	MoPWT, CNRS-L	Indicates equity and public benefit	State
Proportion of tourism investments complying with ICZM	%	MoT, MoE	Captures sectoral alignment	Response
Number of licensed aquaculture farms in coastal zones	Count	MoA	Reflects formal sector development	State
Volume of annual aquaculture production	tons/year	MoA, FAO	Tracks sector growth and intensification	Pressure
Compliance rate of fisheries with regulations	%	MoA, Coast Guard	Reflects sustainable practices enforcement	Response
Ratio of sustainable to total fishing practices	Ratio	MoA, FAO	Measures sustainability of marine harvest	State
Number of aquaculture farms adopting best practices	Count	MoA	Captures sustainability in the sector	Response

4.2.6. GOVERNANCE, INSTITUTIONS, ENABLING ENVIRONMENT

Indicator	Unit	Suggested Source	Rationale	DPSIR Link
Number of laws/decrees amended or adopted for ICZM	Count	MoE, MoJ	Captures progress in legal reform	Response
Existence of adopted ICZM strategy or action plan	Yes/No	MoE, PAP/RAC	Measures policy commitment	Response
Number of coastal governance coordination meetings/year	Count/year	MoE, MoPWT	Tracks institutional coordination	Response
Number of public consultations on coastal issues	Count/year	MoE, Municipalities	Captures stakeholder engagement in decision making	Response
Number of institutions with clear coastal mandates	Count	MoE, MoPWT	Reflects institutional clarity and responsibility	State
Number of municipalities integrating ICZM in local plans	Count	MoIM, MoE	Indicates mainstreaming of ICZM	Response
Frequency of updates to national marine spatial plans	Updates/yr	MoPWT, CNRS-L	Captures spatial governance dynamism	Response
Existence of a public coastal data platform	Yes/No	CNRS-L, MoE	Enables transparency and informed decisions	Response
Number of capacity-building trainings/year	Count/year	MoE, PAP/RAC	Reflects institutional and stakeholder capacity	Response
Ratio of budget/funding allocated to ICZM	%	MoF, EU Delegation	Measures financing of ICZM as a national priority	Response
Number of fines against illegal occupation/activities	Count/year	MoE, MoJ, Judiciary	Indicates enforcement of coastal regulations	Response
Number of successful court cases against illegal activities	Count/year	MoJ, Judiciary	Reflects effectiveness of judicial enforcement	Response

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