

CLIMAGINE Workshop III Report

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

Crowne Plaza Beirut By IHG, Beirut, Lebanon - 3 – 5 February 2026



Mediterranean
Action Plan
Barcelona
Convention



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



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List of Acronyms and Abbreviations

BAU	- Business-as-Usual (scenario projecting continued trends without intervention)
BoE	- Band of Equilibrium (range of acceptable sustainability limits for indicators)
CAS	- Central Administration of Statistics (Lebanese national statistics body)
CBA	- Cost-Benefit Analysis (financial viability assessment for projects)
CDR	- Council for Development and Reconstruction (Lebanese public planning entity)
CNRS-L	- National Council for Scientific Research - Lebanon (research institution)
COED	- Cost of Environmental Degradation (economic impact metric)
CVI	- Coastal Vulnerability Index (risk assessment tool)
DGA	- Direction Générale de l'Aménagement (general directorate for urban planning)
DRR	- Disaster Risk Reduction (planning for hazard mitigation)
EbA	- Ecosystem-based Adaptation (nature-integrated climate strategies)
EIA	- Environmental Impact Assessment (project evaluation requirement)
GEF	- Global Environment Facility (funding mechanism for MedProgramme)
GII	- Gender Inequality Index (social equity metric)
ICZM	- Integrated Coastal Zone Management (core strategy and law framework)
IUU	- Illegal, Unreported, and Unregulated (fishing compliance index)
IWRM	- Integrated Water Resources Management (water governance approach)
KBA	- Key Biodiversity Area (protected ecological zone)
LARI	- Lebanese Agricultural Research Institute (agriculture research body)
LIBNOR	- Lebanese Standards Institution (standards and norms body)
MCA	- Multi-Criteria Analysis (decision-making evaluation tool)
MoA	- Ministry of Agriculture (government ministry)
MoE	- Ministry of Environment (government ministry)
MoEW	- Ministry of Energy and Water (government ministry)
Mol	- Ministry of Industry (government ministry)
MoIM	- Ministry of Interior and Municipalities (government ministry)
MoJ	- Ministry of Justice (government ministry, inferred from context)
MoL	- Ministry of Labor (government ministry)
MoPWT	- Ministry of Public Works and Transport (government ministry)
MoPH	- Ministry of Public Health (government ministry)
MPA	- Marine Protected Area (conservation zone coverage metric)
MPD	- Maritime Public Domain (public coastal space protection)
NbS	- Nature-based Solutions (ecosystem protective measures)
NIS	- Non-Indigenous Species (invasive species monitoring)
NPMPPLT	- National Physical Master Plan of the Lebanese Territory (spatial planning framework)
OMSAR	- Office of the Minister of State for Administrative Reform (administrative entity)
PAP/RAC	- Priority Actions Programme / Regional Activity Centre (UNEP/MAP component)
PM2.5	- Particulate Matter 2.5 (air quality metric in $\mu\text{g}/\text{m}^3$)
RAC	- Regional Activity Centre (UNEP/MAP structure, e.g., Plan Bleu/RAC)
RACER	- Relevant, Accepted, Credible, Easy, and Robust (indicator selection criteria)
SEA	- Strategic Environmental Assessment (planning evaluation tool)
TDS	- Total Dissolved Solids (groundwater salinity metric in mg/L)
UNEP/MAP	- United Nations Environment Programme / Mediterranean Action Plan (programme framework)
WEFE	- Water-Energy-Food-Ecosystems (nexus integration approach)
WWTP	- Wastewater Treatment Plant (e.g., Ghadir, Tripoli facilities)

1. Introduction

Under the framework of the [MedProgramme](#) Child Project 2.1, implemented by [Plan Bleu](#), [PAP/RAC](#), [GWP-Med](#) and [UNESCO-IHP](#) within the [United Nations Environment Programme Mediterranean Action Plan \(UNEP/MAP\)](#) system and funded by the [Global Environment Facility](#), the third Climagine workshop for the ICZM Law & Strategy was held on 3 February 2026. The meeting was the final step in the Climagine participatory process that brought together municipalities, institutions, and experts to collectively define a sustainable future for the coast. This report is primarily targeted at **policymakers, coastal planners, and technical experts involved in drafting and implementing the revised ICZM Strategy and Law for Lebanon**.

Building on the outcomes of the first two workshops, where key challenges were identified and a consolidated set of sustainability indicators was developed, this final session focused on translating these indicators into **practical decision-making tools**. The objective was no longer to diagnose problems, but to define what constitutes **acceptable conditions for the coastal zone and to establish a shared vision for its future**. To achieve this, the workshop introduced two central tools: the **Band of Equilibrium (BoE)** and the **Amoeba diagram**. Together, these tools enabled participants to move beyond abstract discussions and engage in defining concrete limits, targets, and priorities for action. In doing so, the workshop played a critical role in bridging the gap between analysis and implementation, providing direct input to the forthcoming ICZM Law & Strategy, which prioritizes **deep governance reform alongside specific sectoral improvements**.

The earlier workshops already established the central diagnosis, the main thematic domains, and the initial indicator architecture. **Workshop 1** introduced the **participatory and indicator-based logic** of the process and emphasized the use of RACER criteria to identify a manageable set of relevant, understandable, monitorable, and robust indicators for each thematic area. Workshop 2 then functioned as an intermediate technical step. It enriched the analytical base, refined the indicator logic, documented critical baselines, and highlighted persistent data gaps. In that sequence, workshop 3 value lies in **interpretation and roadmapping**. It translates the broader indicator framework into a prioritized analytical subset, applies threshold logic through the BoE, and uses Amoeba diagrams to make structural imbalances visible. **The resulting analysis suggests that Lebanon's coastal zone is characterized less by isolated sectoral failures than by cumulative structural imbalance**. Several domains display pressure in excess of acceptable ecological or social limits, while response systems remain weak, fragmented, or inconsistently implemented. This pattern amounts to a **dual unsustainability: unsustainability by excess and unsustainability by deficit**. The analytical findings point to five broad messages. First, **coastal land-use change, urbanization, and public-domain encroachment** remain among the most visible and structurally entrenched pressures. Second, pollution and environmental degradation continue to be sustained by **fundamental deficits in wastewater treatment, waste management, and environmental service performance**. Third, ecosystem integrity and water-resource sustainability remain tightly linked to upstream pressures, incomplete monitoring, and **weak Source-to-Sea integration**. Fourth, climate and coastal risk are not separate themes but **force multipliers that amplify existing spatial, ecological, and governance weaknesses**. Fifth, **governance itself remains the main cross-cutting constraint**. Without clearer coordination, stronger enforcement, more consistent monitoring, and a more operational legal framework, progress in individual sectors is unlikely to consolidate into coherent coastal management. For that reason, the report argues that the revised ICZM Strategy and Law should not remain at the level of general principle. They should establish **clearer institutional roles, stronger coordination and enforcement pathways, a more coherent monitoring architecture, and a stronger link between coastal management, coastal land-use planning, environmental service provision, and Maritime Public Domain (MPD) protection**.



5 February 2026, Crowne Plaza Beirut

2. Workshop summary

As outlined in the introduction, Climagine Workshop 3 builds directly upon the participatory foundation and analytical refinement established in Workshop 1 and Workshop 2. Workshop 3 should therefore be read as the transition from indicator refinement to structured interpretation. It is the stage at which the broader indicator architecture is filtered into an analytical subset and used to **reveal patterns of imbalance, stress, and strategic priority**.

This report consolidates the cumulative logic of the Climagine sequence, explains the relationship between the broader and narrower indicator sets, interprets the workshop 3 thematic findings, and translates them **into strategic and legal implications for the revised ICZM Strategy and Law**.

At the outset, the reader should note the distinction between the two indicator subsets used throughout the report:

- The consolidated indicator dashboard (Annex 3) presents the broader framework emerging from the cumulative Climagine sequence.
- The prioritized subset (Annex 4) presents the subset of indicators actually used in workshop 3 for the Band of Equilibrium (BoE) and Amoeba diagram exercises

This distinction is methodologically coherent and reflects the Climagine process itself, which moves from a wider indicator universe toward a smaller set of representative indicators for structured analysis.

2.1 WORKSHOP STRUCTURE

Workshop 3 was designed as a **structured expert convergence exercise** rather than a general consultation session. Its purpose was to translate the earlier Climagine diagnosis and indicator-refinement work into **decision-relevant analytical outputs** by defining Bands of Equilibrium, scoring amoeba diagrams, and identifying which indicators were sufficiently mature to support **threshold-based** discussion. The workshop structure followed the stepwise logic of the broader Climagine process. Progressing from the earlier identification of sustainability dimensions and indicators, Workshop 3 occupied the third step: defining the **"safe operating space" for a reduced set of prioritized sustainability indicators**. This served as the **final expert alignment point before translating these indicators into strategic recommendations and policy pathways for the revised ICZM Strategy and Law**. Operationally, the workshop was conducted through thematic expert-group work supported by pre-defined indicator sheets, facilitation prompts, and reflection matrices (Annex 4). Experts were asked to work by theme, review the retained indicators, discuss their current condition and future trajectory, and define acceptable minimum and target levels as ranges rather than exact numbers. The facilitation guidance stressed that the objective was **not precision for its own sake, but agreement on what should be considered acceptable, unacceptable, and desirable under a sustainable ICZM trajectory**. Experts were also instructed to document assumptions clearly, rely on expert judgment where datasets remained incomplete, and avoid introducing new indicators unless there was a strong and explicit justification. The workshop materials also helped structure the thematic discussions through a matrix of key reflection questions organized by priority sector. These questions invited participants to consider the main coastal challenges, their territorial variation, their underlying drivers, the principal actors involved, relevant existing plans and frameworks, environmental trade-offs, available data, future trends toward 2030 and 2050, and realistic actions for improvement. In practice, this matrix served as a bridge between the earlier diagnostic narrative and the threshold-setting and action-orientation work of workshop 3. The immediate expected outputs of the workshop were threefold: first, thematic equilibrium tables defining acceptable operating ranges; second, amoeba diagrams visualizing current conditions against a sustainable ICZM trajectory; and third, a shared understanding of which indicators were robust enough to serve as direct analytical inputs to strategy and law discussions.



2.1.1 From Indicator Development to Analytical Prioritization

The indicator architecture used in this report operates at two distinct but complementary levels. First, the broader consolidated dashboard presented in Annex 3 reflects the cumulative outcome of the indicator development and refinement process initiated in the first session and further elaborated in the subsequent technical phase. It represents the wider monitoring framework emerging from the Climagine process and is intended to remain useful beyond this final exercise, including for future ICZM monitoring and for correlation with other coastal diagnostic and policy work. As previously established, priority indicators are limited to a manageable number per thematic area even where the wider pool remains larger.

Second, the analytical work carried out during this stage relied on a reduced subset of prioritized indicators, presented in Annex 4. This subset was used for the Band of Equilibrium and Amoeba exercises in order to focus the discussion on the most representative and operationally useful indicators for threshold-setting, strategic interpretation, and orientation of priority action. This is consistent with the logic established in the second workshop, which outlined a Tier 1 subset of indicators considered sufficiently mature for direct threshold-based discussion and strategic interpretation.

2.1.2 From Indicators to Decision Thresholds: The Band of Equilibrium

A central component of the workshop was the definition of the Band of Equilibrium (BoE) for each priority indicator. The **BoE represents the range within which an indicator can vary while remaining within acceptable sustainability limits.**

Participants were invited to define:

- A minimum acceptable level, below which the situation is considered critical;
- A desired target level, reflecting improved conditions in the medium to long term (2030–2050).

Given the limited availability of consistent quantitative data, the exercise relied on a combination of expert judgment, stakeholder knowledge, and available evidence. This qualitative yet structured approach allowed participants to move beyond general discussions and define concrete sustainability boundaries. The process also highlighted that these thresholds are not fixed, but will need to be refined over time as monitoring systems improve and more data becomes available.

Colour	Number	Ranking of the SI on the Band of Equilibrium
	1	Unsustainable by default
	2	Low sustainability by default
	3	Lower sustainability threshold
	4	Sustainable
	5	Upper sustainability threshold
	6	Unsustainable by excess
	7	Very unsustainable by excess

During the workshop, participants used a 1 to 7 scoring scale to define the Band of Equilibrium (BoE) numbers. On this scale, scores of 1-2 generally indicate a critical absence or failure of systems (unsustainability by default), 3-5 represent the optimal sustainable operating space (the equilibrium band), and 6-7 indicate excessive pressure or overexploitation of resources (unsustainability by excess). **Categories 3-5 represent the acceptable 'safe operating space', with 4 being the ideal situation.** Including this clear explanation allows for the removal of the redundant "Min/Max" columns in the indicator matrices, making the content and the resulting Amoeba diagrams much more visible and readable. A detailed explanatory sheet outlining this methodology and the scoring criteria distributed during the workshop is included in Annex 4.

2.1.3 Amoeba Diagrams and Scenario Exploration

The Amoeba diagram was introduced as a visual tool to represent multiple indicators simultaneously and to compare current conditions with desired future states.

- Each thematic group used Amoeba diagrams to:
- Illustrate the current situation across key indicators;
- Define a target configuration representing a sustainable pathway;
- Compare this with a Business-as-Usual scenario.

Due to time constraints, the diagrams were not fully quantified and should be interpreted as indicative representations rather than precise analytical outputs. Nevertheless, they provided valuable **insights into system imbalances and priority areas for intervention**.

2.1.4 Limits, assumptions, and data gaps

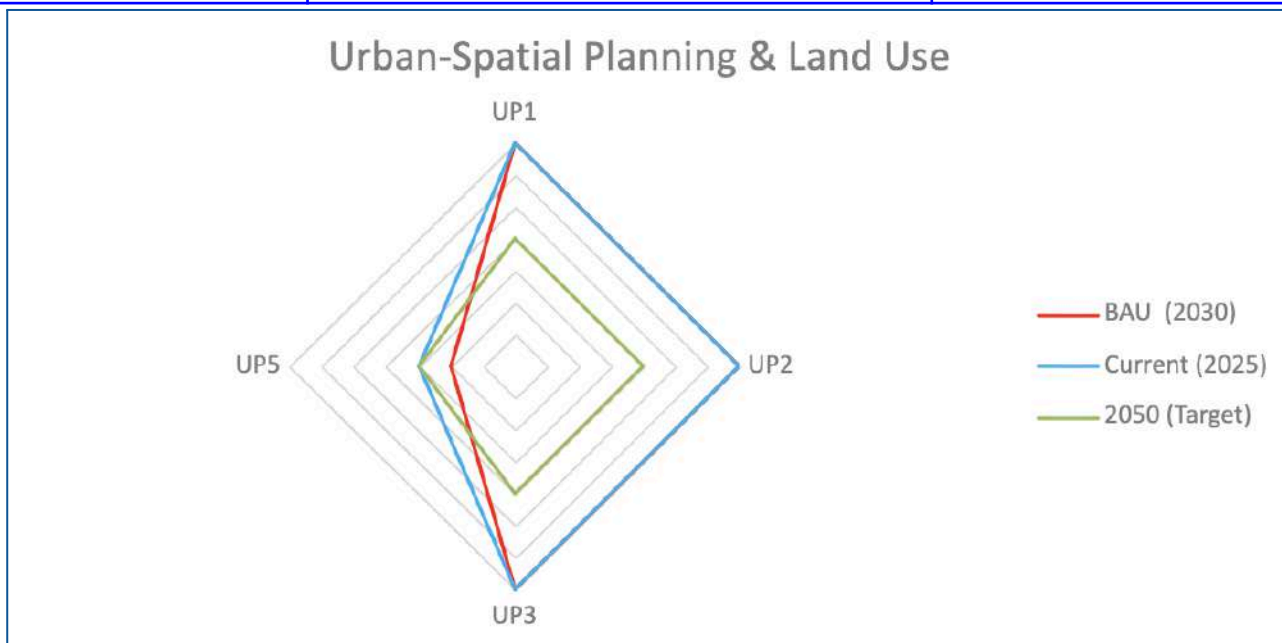
Previous consultative phases explicitly highlighted persistent data gaps, including hydrological monitoring, specific blue-economy employment data, and several coastal quality parameters. It also identified the need for a unified public coastal data platform and harmonized monitoring protocols. Accordingly, the current results should be read as structured expert-stakeholder assessments based on the best available evidence, rather than as a fully normalized and statistically closed national dataset. This does not weaken the exercise. On the contrary, it reveals that monitoring weakness is itself a core governance issue.

2.2 WORKSHOP SUMMARY

2.2.1 Urban-spatial planning, coastal land use, and public coastal space

Group Urban-Spatial Planning & Land Use										
#	Indicator	Unit	Baseline	BAU Value	Alternative Value	Sustainable Minimum	Sustainable Maximum	Current (2025)	BAU (2030)	2050 (Target)
UP1	Coastal Urbanization Rate	ha/yr	214 ha/yr	> 250 ha/yr	< 50 ha/yr	0 ha/yr	50 ha/yr	7	7	4
UP2	Land Reclamation / Sea Filling	ha/yr	20 ha/yr	≥ 20 ha/yr	0 ha/yr	0 ha/yr	0 ha/yr	7	7	4
UP3	Rate of urban expansion in coastal zones	%	≈ + 40% to 55%	> +60%	Stabilisé (0 à +2%)	0% d'expansion	+5% d'expansion	7	7	4
UP5	Master Plan Coverage	%	Minimal/Reactive	< 20%	100%	80%	100%	2	3	3
Indicator		Current situation and BAU scenario					Recommendations - alternative scenario			
UP1. Coastal Urbanization Rate		The coastal zone faces rapid, unregulated urban expansion, resulting in an average of 214 ha/year of green land lost to built-up areas. The Business-as-Usual (BAU) scenario is characterized by quick, uncontrolled expansion and a reactive approach described as "damage control" rather than proactive planning					The alternative sustainable pathway requires the implementation of revised master plans and strict regulations to actively control urban sprawl			
UP2. Land Reclamation / Sea Filling		Uncontrolled sea filling is occurring at a rate of ≈ 20 ha/year. This threatens natural habitats, degrades marine ecosystems, and significantly reduces public access to the coast.					Enforce existing laws to prevent illegal construction and completely halt illegal sea filling to regain control of the coastline.			
UP3. Rate of urban expansion in coastal zones		Approximately 40% to 55% of the coastal zone is already artificialized. The BAU trend points to continuous expropriation and fragmented spatial planning					Implement revised master plans and the National Physical Master Plan of the Lebanese Territory (NPMPPLT) . This must be coupled with the strict enforcement of construction setbacks and the protection of the maritime public domain against violations.			
UP5. Master Plan Coverage		Spatial planning coverage is minimal to non-present. Governmental institutions struggle with a lack of enforcement capacity, leading to the proliferation of informal settlements					Adopt integrated land-use planning and ensure strict law implementation (including Environmental Impact Assessments). Regain			

	and illegal infrastructure, with actions remaining purely reactive	control by reissuing municipality permits based solely on the revised plans
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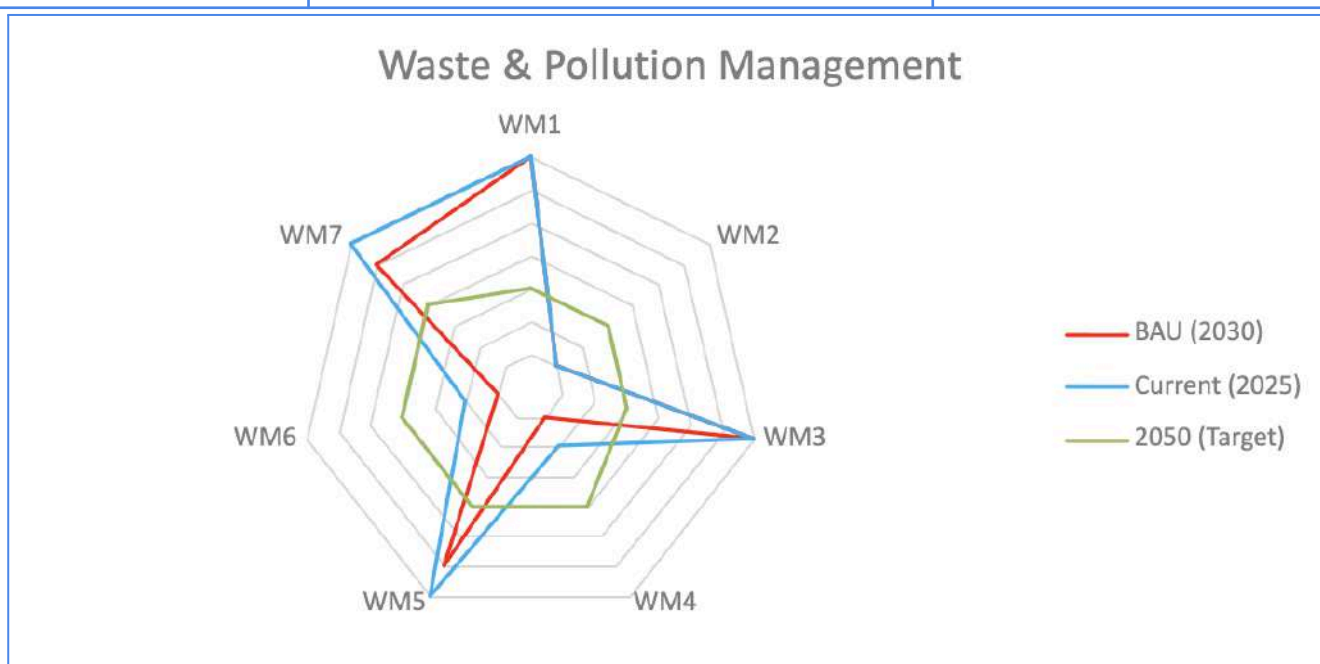
Interpretation

It suggests a system under pressure from both sides. On one hand, coastal land-use change and coastal occupation continue to intensify. On the other hand, the governance instruments needed to regulate them, especially planning coverage, MPD control, and enforcement continuity, remain partial or weak. The likely result is an amoeba pattern showing pressure protrusion on land-conversion indicators and contraction on planning and access indicators. The strategic implication is that the revised ICZM Strategy and Law should treat **coastal spatial governance and MPD governance as central** rather than peripheral concerns. The legal update should strengthen operational links between coastal planning, EIA (Environmental Impact Assessment) and SEA (Strategic Environmental Assessment) practice, public-domain protection, and enforcement against illegal occupation and sea filling.

2.2.2 Waste, pollution, and environmental service performance

Group Waste & Pollution Management										
#	Indicator	Unit	Baseline	BAU Value	Alternative Value	Sustainable Minimum	Sustainable Maximum	Current (2025)	BAU (2030)	2050 (Target)
WM1	Marine Litter (Plastics)	%	77.70%	> 85%	< 20%	0%	20%	7	7	3
WM2	Wastewater Treated	%	8% treated	< 10%	> 80%	60%	100%	1	1	3
WM3	Median Beach Marine Litter Density	items/m ²	≈ 4.7 items/m ² (Spring) / 6.6 items/m ² (Autumn)	> 8 items/m ²	< 1 item/m ²	0 items/m ²	1 item/m ²	7	7	3
WM4	Operational Treatment Capacity	%	6.80%	< 15%	> 80%	70%	100%	1	2	4

WM5	Average Annual PM2.5	µg/m³	29.5 µg/m³	> 35 µg/m³	< 15 µg/m³	0 µg/m³	15 µg/m³	6	7	4
WM6	Materials recycled or composted	%	7.90%	< 15%	> 50%	40%	100%	1	2	4
WM7	Open dumping rate	%	42%	> 50%	0%	0%	0%	6	7	4
Indicator		Current situation and BAU scenario					Recommendations - alternative scenario			
WM1. Marine Litter (Plastics)		Plastics make up 77.7% of marine litter. The BAU scenario involves continued reliance on single-use plastics and scattered municipal efforts, leading to critical accumulation (score 7)					Ban single-use plastics, implement regular beach cleanup campaigns , and apply the principles of the circular economy .			
WM2. Wastewater Treated		Only 8% are treated. Coastal WWTPs (like Ghadir, Tripoli, and Sayniq) operate only at a primary level. BAU maintains a severe deficit (score 1).					Rehabilitate coastal WWTPs so that they operate at secondary or tertiary treatment levels prior to any discharge.			
WM3. Median Beach Marine Litter Density		Litter density reaches 4.7 to 6.6 items/m². Under BAU, waste leakage into the sea continues due to fragmented and inefficient collection					"Treat waste before disposal" and systematically "sort at source" to prevent leakage. Strictly enforce laws against littering .			
WM4. Operational Treatment Capacity		A mere 6.8% of installed treatment capacity is functional. While BAU projects a slight improvement (score 2), structural failures persist					Operationalize existing plants, complete network connections, and invest heavily in sorting facilities .			
WM5. Average Annual PM2.5		The national mean is 29.5 µg/m³, indicating degraded coastal air quality. BAU anticipates worsening air pollution (score 7).					Rigorously monitor generator emissions and improve public transport infrastructure			
WM6. Materials recycled or composted		Only 7.9% of waste is recycled. The BAU trend is characterized by "minimal recycling" with no unified municipal vision (score 2)					Municipalities must communicate and plan jointly . Maximize material recovery, composting, and the valorization of reusable materials .			
WM7. Open dumping rate		Currently, 42% of waste ends up in open dumps. The BAU scenario sees this reliance continuing to contaminate the coast (score 7)					Close illegal coastal dumps immediately and expand sanitary landfills as a controlled, last-resort alternative.			



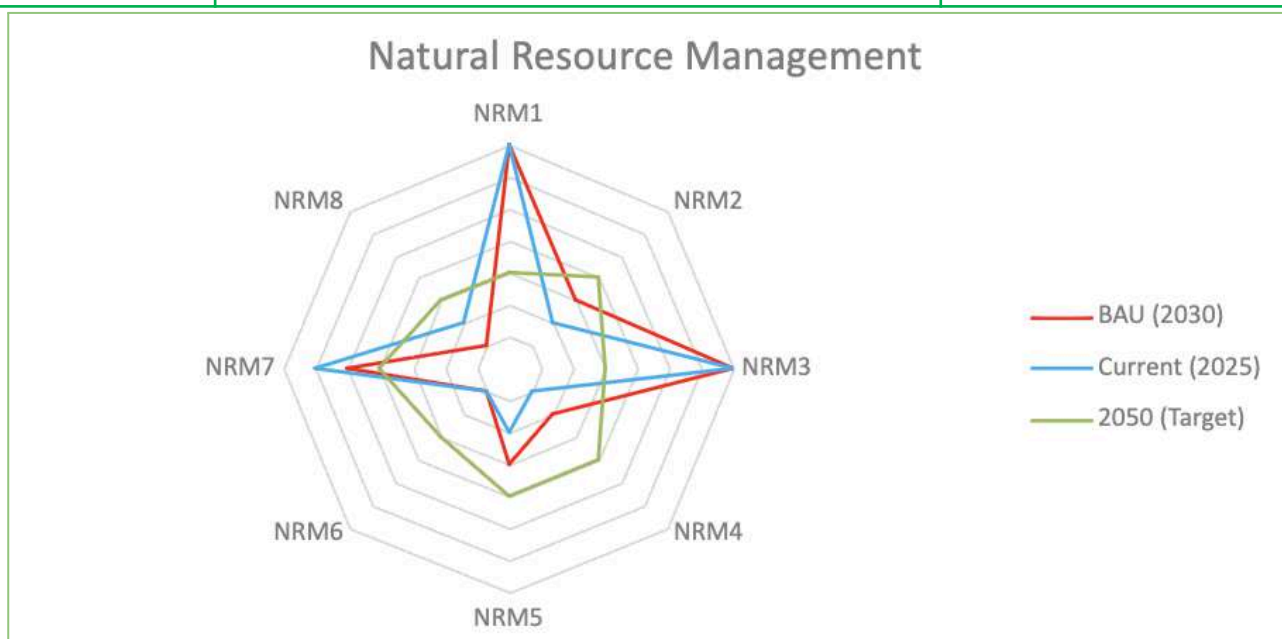
Interpretation

Coastal degradation is not only being driven by **excessive pollutant pressures**, but by **persistent deficits in the systems** meant to contain them. Wastewater treatment remains inadequate, waste leakage continues into coastal and marine environments, and service performance remains highly uneven. The expected Amoeba diagram pattern is therefore one of generalized **contraction across response and environmental-quality indicators**, with some pressure indicators still extending beyond acceptable bounds. The strategic implication is that the Integrated Coastal Zone Management framework should treat wastewater, waste management, and coastal environmental quality as foundational governance and service issues rather than as narrow technical subsectors. It should explicitly **recognize Source-to-Sea connectivity and the integration of water-resource and ecosystem considerations into coastal governance**, applying the principles of the **circular economy**. The legal update should **strengthen the interfaces between environmental compliance, municipal and inter-municipal service systems, pollution control, and coastal monitoring obligations**. Furthermore, it must support stronger monitoring obligations, inter-agency data exchange, and more explicit treatment of estuaries, river mouths, wetlands, aquifers, and ecologically sensitive coastal interfaces.

2.2.3 Natural resources

Group Natural Resources Management										
#	Indicator	Unit	Baseline	BAU Value	Alternative Value	Sustainable Minimum	Sustainable Maximum	Current (2025)	BAU (2030)	2050 (Target)
NRM 1	Groundwater level trend in coastal aquifers	cm/year	≈ - 50 cm/year	> - 60 cm/year	0 to - 10 cm/year	- 20 cm/year	0 cm/year	7	7	3
NRM 2	Irrigated Land Using Water-Saving Techniques	%	50%	< 40%	> 80%	60%	100%	3	2	4
NRM 3	Incidence of saltwater intrusion in wells	Total dissolved solids (TDS) (mg/L)	≈ 1 500 to 37 500 mg/L (TDS)	> 5 000 mg/L	< 1 000 mg/L	0 mg/L	1 500 mg/L	7	7	3
NRM 4	Average annual flow of coastal rivers	m³/s	≈ 89 m³/s	< 50 m³/s	> 80 m³/s	60 m³/s	Natural Flow	2	1	4
NRM 5	Marine Biodiversity Richness	Count	≈ 3 265 species recorded	< 3 000 species	> 3 300 species	3 200 species	Natural Richness	3	2	4
NRM 6	National sea Marine Protected Area (MPA) coverage	%	≈ 0.41%	< 1%	> 10%	5%	30%	1	1	3
NRM 7	Invasive Species Impact	% of catch	37%	> 45%	< 15%	0%	20%	5	6	4
NRM 8	Cooperative Membership Rate	%	5%	< 5%	> 30%	20%	100%	1	2	3
Indicator			Current situation and BAU scenario in the Damour area				Recommendations - alternative scenario			

NRM1. Groundwater level trend in coastal aquifers	Aquifers are suffering from severe depletion (≈ -50 cm/year) due to over-pumping. The BAU scenario anticipates worsening depletion of aquifers and reliance on unregulated private wells (score 7)	Manage abstraction tightly. Establish at least " 1 monitoring well per municipality " and strictly regulate private wells
NRM2. Irrigated Land Using Water-Saving Techniques	Currently at 50%, with traditional practices wasting significant water. The BAU trend points to a decline in efficiency (score 2) as infrastructure ages and modern techniques are not adopted	Incentivize the transition from flood to drip irrigation . Modernize irrigation networks and promote widespread adoption of "eco-friendly farming" to reduce runoff.
NRM3. Incidence of saltwater intrusion in wells	Saltwater intrusion is extreme, reaching 1,500 to 37,500 mg/L TDS, rendering water unusable. Under BAU, increasing salinity will persist and spread further inland (score 7)	Implement strict groundwater extraction limits and establish systematic, regular testing of both public and private wells .
NRM4. Average annual flow of coastal rivers	The flow is highly vulnerable to seasonal variability, compounded by persistent gaps in hydrological monitoring. BAU anticipates further flow reduction and dry riverbeds (score 1)	Ensure the maintenance and calibration of gauging stations . Establish and legally enforce environmental flow requirements for all coastal rivers
NRM5. Marine Biodiversity Richness	Approximately 3,265 species are recorded, but habitats are fragmenting. The BAU scenario predicts a loss of species and deteriorating conservation status (score 2)	Update the national marine inventory and implement strong protective measures for vulnerable habitats like deep-sea canyons
NRM6. National sea Marine Protected Area (MPA) coverage	Formal conservation coverage is critically low at $\approx 0.41\%$. BAU expects this coverage to remain stagnant and ineffective (score 1)	Finalize decrees for pending MPAs (e.g., Al Chamiyeh/Jbeil). Designate and manage Key Biodiversity Areas (KBAs) and ensure strict legal protection against encroachments
NRM7. Invasive Species Impact	Alien/invasive species currently make up a massive 37% of the commercial catch in some areas (e.g., Tyre). The BAU trend sees this ecological alteration worsening (score 6)	Systematically monitor non-indigenous species (NIS) and actively support targeted fishing of invasive species (such as the pufferfish)
NRM8. Cooperative Membership Rate	Only 5% of farmers/fishers are organized in cooperatives, reflecting high fragmentation. Under BAU, local actors remain isolated and unable to implement sustainable practices (score 2)	Strengthen the legal framework for cooperatives. Invest in capacity building to reduce fragmentation and foster collective sustainable resource management



Interpretation

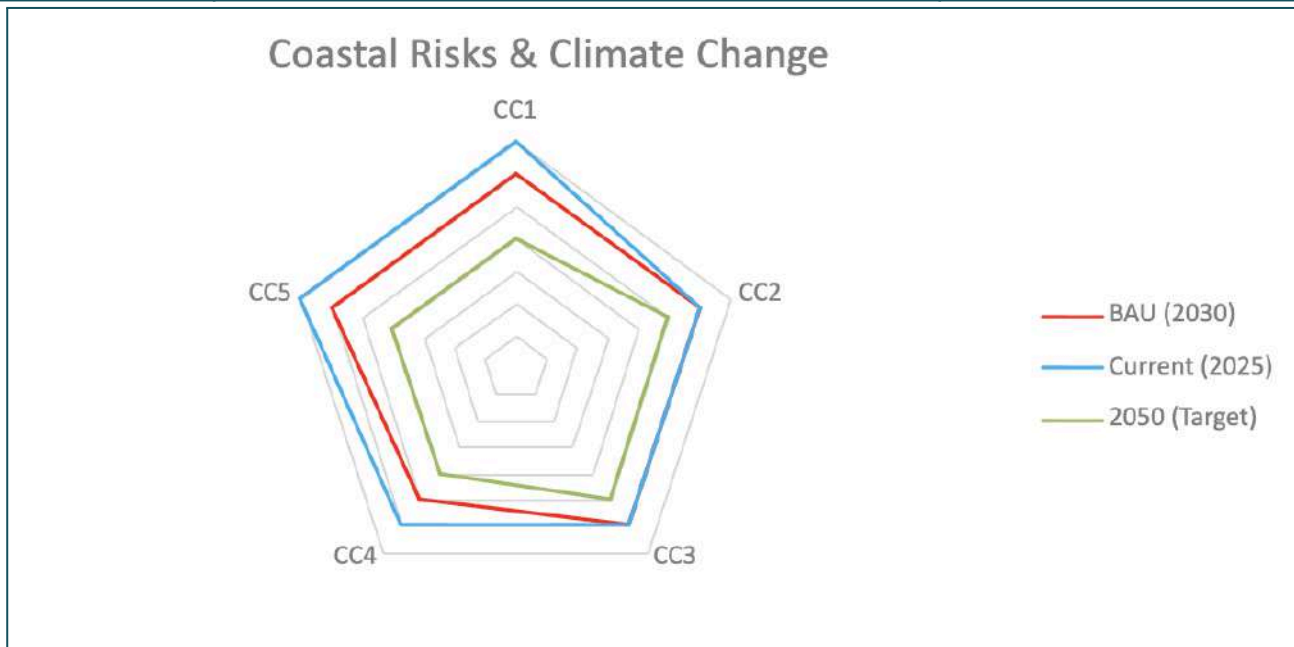
The analysis of the Amoeba diagram reveals a **dual dynamic of unsustainability within natural resource management**. On one hand, there is a critical **deficit in protection and monitoring** (e.g., low MPA coverage, missing hydrological data, and

failing river flows scoring 1 or 2 on the Band of Equilibrium). On the other hand, there is unsustainability by excess due to **extreme pressure** (e.g., severe saltwater intrusion and the proliferation of unregulated private wells scoring 6 or 7). The strategic implication is that the Integrated Coastal Zone Management (ICZM) framework must strictly adopt a "Source-to-Sea" approach, formally linking **Integrated Water Resources Management (IWRM)** with coastal governance. The legal update should move beyond declarative environmental protection by establishing stringent groundwater extraction limits, mandating continuous monitoring networks (such as piezometers), and finalizing decrees for pending Marine Protected Areas (MPAs) to actively halt habitat fragmentation.

2.2.4 Coastal risks and climate change

Group Coastal Risks & Climate Change										
#	Indicator	Unit	Baseline	BAU Value	Alternative Value	Sustainable Minimum	Sustainable Maximum	Current (2025)	BAU (2030)	2050 (Target)
CC1	CO ₂ Emissions	Mt CO ₂ eq	28.8 Mt CO ₂ eq (2020)	> 32 Mt CO ₂ eq	< 20 Mt CO ₂ eq	0 Mt CO ₂ eq (Net Zero)	25 Mt CO ₂ eq	6	7	4
CC2	Coastal erosion (shoreline retreat)	ha/year	≈ -3.6 ha/year	> -5.0 ha/year	0 to -1.0 ha/year	-2.0 ha/year	0 ha/year (Stable)	6	6	5
CC3	Sea Level Rise Rate	mm/year	≈ +20 mm/year (historical trend since 1960)	> +25 mm/year	Global Mitigation targets	0 mm/year	+10 mm/year	6	6	5
CC4	Occurrence rate of climate-related disasters	events/year	≈ 1 to 2 events/year	> 3 events/year	0 events/year (impacts averted)	0 events/year	1 event/year	5	6	4
CC5	Average annual sea surface temperature deviation	°C/year	≈ +0.04 °C/year	> +0.06 °C/year	< +0.02 °C/year	0 °C/year	+0.02 °C/year	6	7	4
Indicator		Current situation and BAU scenario in the Damour area					Recommendations - alternative scenario			
CC1. CO ₂ Emissions		National greenhouse gas emissions stand at 28.8 Mt CO ₂ eq. (2020). Under the Business-as-Usual (BAU) scenario, emissions will continue to rise due to reliance on fossil fuels, inefficient transport, and private generators (score 7)					Accelerate the national renewable energy transition and drastically improve efficiency in both the transport and industrial sectors			
CC2. Coastal erosion (shoreline retreat)		Net erosion is currently exceeding accretion (≈ -3.6 ha/year). The BAU scenario anticipates worsening land loss, with interventions limited to reactive "damage control" rather than systematic protection (score 6)					Shift to proactive, Nature-based Solutions (Nbs) for coastal protection. Strictly enforce construction setbacks to preserve natural buffers			
CC3. Sea Level Rise Rate		A historical trend of ≈ +20 mm/year threatens coastal infrastructure and worsens saltwater intrusion into aquifers. Under BAU, vulnerabilities will compound as sea levels continue to rise globally (score 6)					Since sea-level rise is not controllable locally, the alternative scenario relies entirely on adaptation : develop dedicated adaptation plans for coastal cities and reinforce critical infrastructure			
CC4. Occurrence rate of climate-related disasters		The coast currently experiences 1 to 2 major climate-related events (mostly flooding) per year, with frequency rising. BAU leaves communities exposed with no systematic monitoring (score 6)					Establish and maintain functional early warning systems . Integrate proactive disaster risk reduction (DRR) planning directly into coastal governance			
CC5. Average annual sea surface temperature deviation		The ocean is warming at ≈ +0.04 °C/year, driving ecosystem changes and stressing marine life. The BAU trend points to unmitigated temperature and acidity increases without proper observation (score 7)					Implement systematic monitoring of physical parameters (like temperature and acidity) at fixed stations and foster long-term research			

partnerships to better understand marine climate stress



Interpretation

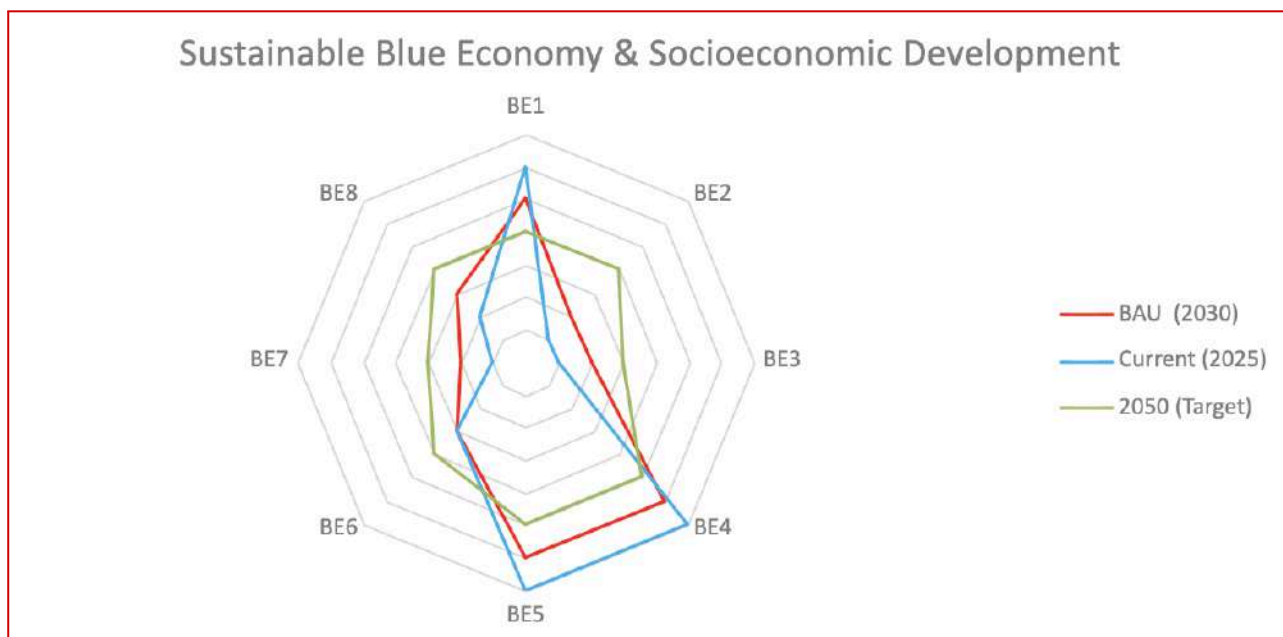
The workshop 3 reading of this theme should avoid presenting climate risk as a standalone environmental issue. Rather, climate risk should be interpreted as an amplifier of existing spatial, ecological, and governance weaknesses. Coastal erosion, sea-level rise, and growing hazard exposure (such as flooding and extreme weather events) become **more severe where settlement patterns are poorly regulated**, public-domain (particularly the MPD) governance is weak, and ecological buffers are degraded. The strategic implication is that adaptation should be **embedded in coastal land-use planning and enforcement, ecosystem protection** (through Nature-based Solutions - NbS - and Ecosystem-based Adaptation - EbA), **planning criteria**, and **risk-sensitive coastal governance**. The legal update should consider how **adaptation principles**, shoreline-risk considerations, and **disaster-resilience requirements** (including Disaster Risk Reduction - DRR - and functional early warning systems) can be operationalized more clearly within the broader ICZM framework.

2.2.5 Sustainable blue economy, public access, and socioeconomic conditions

Group Sustainable Blue Economy & Socioeconomic Development										
#	Indicator	Unit	Baseline	BAU Value	Alternative Value	Sustainable Minimum	Sustainable Maximum	Current (2025)	BAU (2030)	2050 (Target)
BE1	IUU Fishing Index	Score	2.41	> 3.0	< 2.0	1.0	2.5	5	6	4
BE2	Unemployment rate	%	29.6%	> 35%	< 15%	5%	20%	2	1	4
BE3	Female labor force participation	%	27.5%	< 25%	> 40%	35%	60%	2	1	3
BE4	Cost of environmental degradation	% GDP	10.9% of GDP (≈ \$1.96 Billion)	> 12%	< 8%	0%	9%	6	7	5

BE5	Cost of coastal degradation	% GDP	0.5% of GDP (≈ \$84.6 Million)	> 1%	< 0.2%	0%	0.4%	6	7	5
BE6	Gender Inequality Index	Index	0.432	> 0.45	< 0.3	0.1	0.4	3	3	4
BE7	Accessible beaches	km	≈ 40 km	< 30 km	> 80 km	60 km	200 km	2	1	3
BE8	Safe swimming beaches	%	≈ 63%	< 50%	> 90%	80%	100%	3	2	4

Indicator	Current situation and BAU scenario in the Damour area	Recommendations - alternative scenario
BE1. IUU Fishing Index	Currently at 2.41, showing reasonable but imperfect compliance with "loopholes remaining". In the BAU scenario, the proliferation of Illegal, Unreported, and Unregulated (IUU) fishing leads to the severe overexploitation of resources (score 6)	Ensure proper enforcement of laws, establish citizen monitoring systems, and focus on closing existing regulatory loopholes
BE2. Unemployment rate	National unemployment stands at 29.6%, heavily affecting coastal livelihoods. The BAU trend expects worsening poverty levels and a critical lack of economic opportunities (score 1)	Foster blue job creation and provide targeted vocational training to diversify coastal livelihoods
BE3. Female labor force participation	Only 27.5% of women (age 15+) are active in the workforce. Under BAU, this exclusion from Blue Economy sectors persists or worsens (score 1)	Actively support women-led initiatives in agri-food and eco-tourism , provide vocational training for women in coastal sectors, and enhance their role in protecting marine life
BE4. Cost of environmental degradation	The overall economic cost of environmental damage is massive (10.9% of GDP). The BAU scenario sees this burden increasing as unmanaged degradation continues (score 7)	Implement integrated reforms in all environmental sectors to reduce these vast economic losses
BE5. Cost of coastal degradation	The economic loss specifically tied to the coastal zone is 0.5% of GDP. Under BAU, the loss of ecosystem services and infrastructure damage will escalate (score 7)	Use robust economic valuation for strong policy advocacy to justify investments in coastal protection
BE6. Gender Inequality Index	The index is at 0.432, having worsened from previous years. The BAU scenario leaves disparities in empowerment and the labor market unaddressed (score 3)	Strengthen institutional mechanisms for gender mainstreaming within coastal governance and strictly enforce laws prohibiting discrimination in the workplace
BE7. Accessible beaches	Only ≈ 20% of the shoreline (≈ 40 km) is accessible; the coast is marred by predominantly illegal private investments. BAU predicts a complete saturation of coastal access and loss of public beaches (score 1)	Remove all violations and illegal private investments. Amend Law 64/2017 to firmly restrict occupation to the public interest
BE8. Safe swimming beaches	Approximately 63% of monitored beaches are deemed safe. The BAU scenario anticipates worsening water quality due to untreated sewage, threatening public health and tourism (score 2)	Systematically address the issue of untreated wastewater being discharged into the sea and ensure regular testing of water quality (bacteriological/chemical)



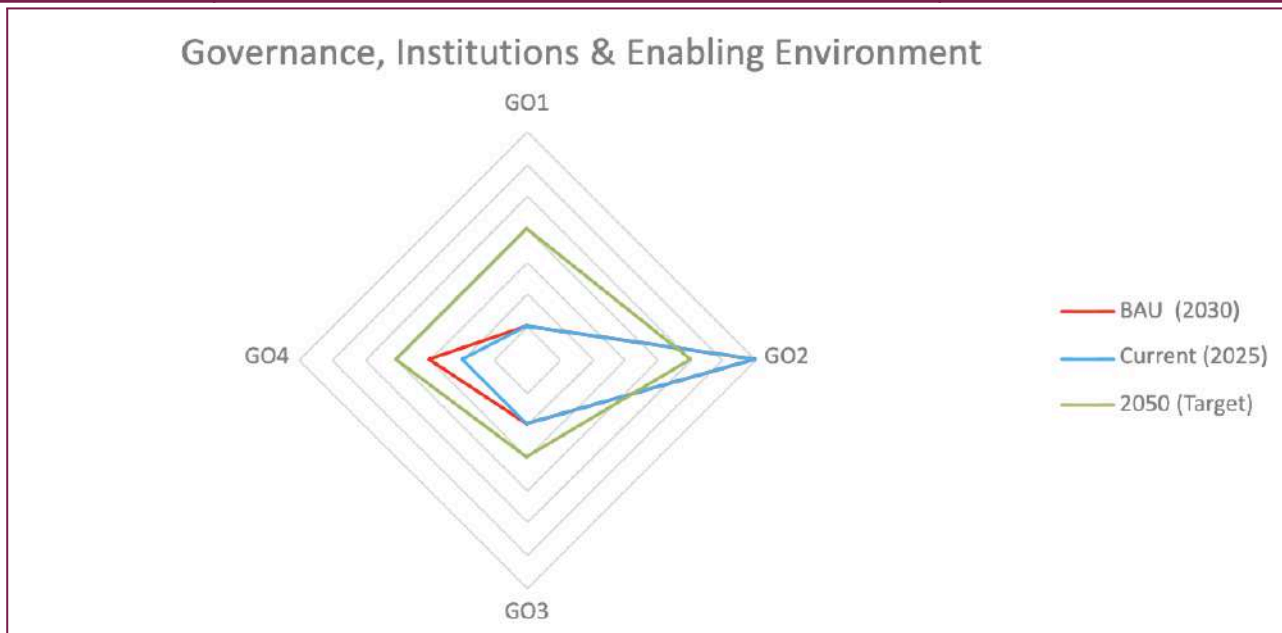
Interpretation

The analytical pattern here is one of mixed signals. The **coast continues to hold economic value and livelihood relevance, but that value is eroded by environmental loss** (such as the high Cost of Environmental Degradation - COED), reduced public access, compliance weaknesses (including Illegal, Unreported, and Unregulated - IUU - fishing), and uneven inclusion (reflected by the Gender Inequality Index - GII). The overlap of indicators such as accessible beaches or safe swimming beaches across thematic areas is not an inconsistency; it **reflects their cross-cutting importance in the workshop logic**. The strategic implication is that **Blue Economy objectives in the revised ICZM Strategy should be linked directly to environmental thresholds, public rights, and social inclusion**. A growth-only reading would be analytically weak and politically fragile. Consequently, the ICZM Strategy must clarify that it prioritizes **fundamental governance reform alongside the sustainable development of specific sectors** (such as eco-tourism and artisanal fisheries). Furthermore, acknowledging and actively **addressing the current gaps in sex-disaggregated data** is essential to strengthen the credibility of future socioeconomic analyses and ensure equitable coastal livelihoods.

2.2.6 Governance, institutions, and enabling environment

Group Governance, Institutions & Enabling Environment										
#	Indicator	Unit	Baseline	BAU Value	Alternative Value	Sustainable Minimum	Sustainable Maximum	Current (2025)	BAU (2030)	2050 (Target)
GO1	ICZM Strategy Implementation	Status	Draft/Pending (Law not ratified)	Pending / Stalled	Legally Adopted & Implemented	Formally Adopted	Fully Enforced	1	1	4
GO2	Illegal Coastal Occupation	m ²	~2.5 to 5 million m ² sea filling/illegal occupation	> 5 million m ²	< 1 million m ²	0 m ² (New occupation)	1.5 million m ² (Tolerated legacy)	7	7	5
GO3	Number and quality of laws/decrees adopted or amended	Count	~5 relevant texts (enforcement weak)	Scattered / Weak enforcement	Fully cohesive & enforced framework	1 Comprehensive ICZM Law	Continuous legal updates & 100% enforcement	2	2	3

GO4	Public coastal data platform	Count	~3 (incomplete/scattered)	0 functional unified platforms	1 unified, open-access platform	1 operational platform	1 advanced, real-time digital platform	3	2	4
Indicator		Current situation and BAU scenario in the Damour area				Recommendations - alternative scenario				
GO1. ICZM Strategy Implementation		Currently, the ICZM Strategy is only at the draft stage, and the Law remains unratified. Under the Business-as-Usual (BAU) scenario, legal adoption remains stalled, leaving a critical deficit (score 1) and no binding framework to manage the coast				The absolute priority is to finalize and ratify the National ICZM Law . The legal update must move beyond declarative provisions to ensure operational clarity, clear institutional responsibilities, and mechanisms for conflict resolution				
GO2. Illegal Coastal Occupation		An estimated 2.5 to 5 million m ² (over 1,000 transgressions) of the maritime public domain is illegally occupied by private entities or sea filling. In a BAU scenario, this unchecked privatization and occupation continues to expand (score 7)				Conduct a strict audit of the maritime domain and apply heavy fines (e.g., Law 324/2024). The alternative scenario requires removing violations and strictly enforcing the protection of the Maritime Public Domain (MPD)				
GO3. Number and quality of laws/decrees adopted or amended		While around 5 relevant legal texts exist, their enforcement is fundamentally weak. The BAU scenario is characterized by outdated/separate mechanisms and overlapping institutional mandates that paralyze enforcement (score 2)				Update the ICZM Law to establish an inter-ministerial committee to ensure coordinated enforcement. The new legal framework must align coastal management, spatial planning, and environmental compliance				
GO4. Public coastal data platform		Data is scattered across approximately 3 incomplete platforms, with no unified existence. In a BAU scenario (score 2), decision-makers and the public remain disconnected from crucial data, hindering transparency				Create a Unified digital platform with regular data updates to consolidate datasets across institutions . The ICZM Law must include provisions that mandate inter-agency data exchange and public reporting				



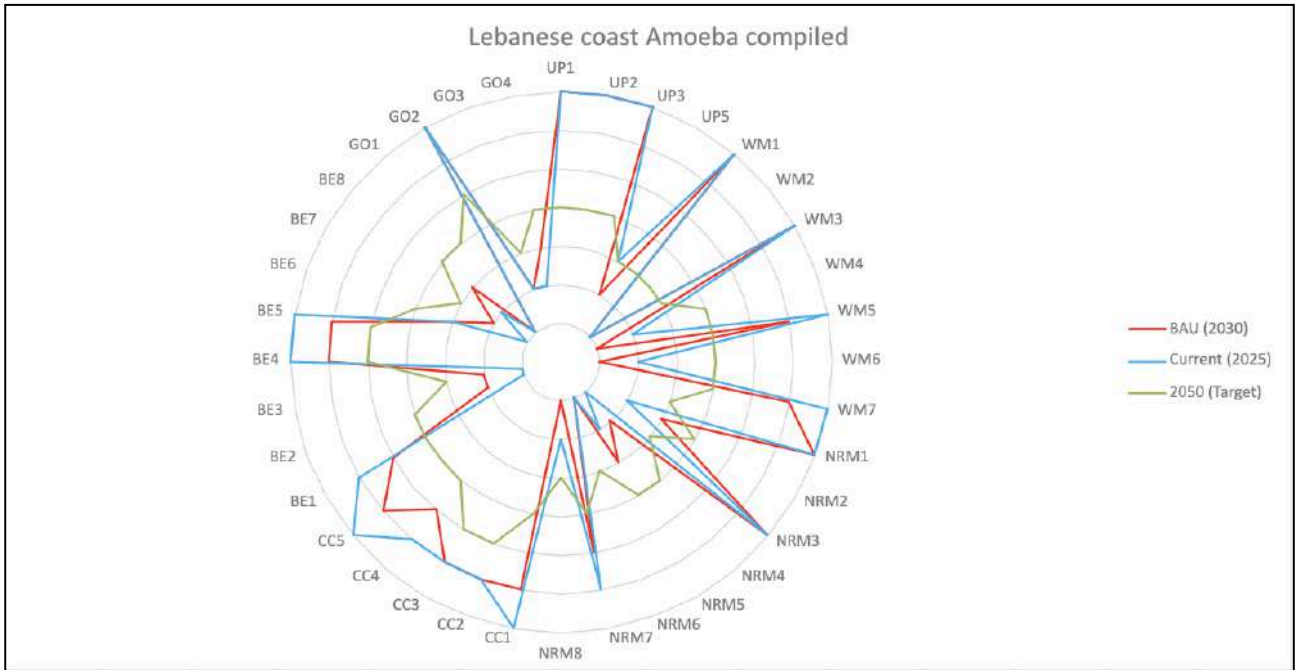
Interpretation

The analysis of Workshop 3 plainly demonstrates that governance is not just another theme among others. It is the main cross-cutting explanation for why pressures (such as Illegal Coastal Occupation) remain high and responses remain inconsistent. The Amoeba diagram pattern here is one of severe contraction around implementation, transparency, coordination, and enforcement, even where some legal texts already exist. The strategic implication is that the revised ICZM

Strategy and Law should focus on **operational governance architecture, not only on principle**. This includes establishing formal **inter-ministerial coordination**, creating a **unified public-data infrastructure** (digital platform), mandating **inter-agency monitoring duties**, clarifying **enforcement pathways**, and accelerating the **practical implementation status of the strategy and law themselves** to overcome prevailing institutional fragmentation and public apathy.

2.2.7 Cross-Sectoral Interpretation

Figure 1. Compiled Amoeba diagrams for the Lebanese Coast



Dual unsustainability: excess and deficit

Across the thematic domains, the workshop 3 analytical pattern points to a dual unsustainability, characterized by a clear **polarization at the extremes** of the Band of Equilibrium (BoE) scale. Some indicators reveal unsustainability by excess (scoring 6 to 7 on the BoE), including sea filling, coastal land-use change, pollution loading, and occupation pressure on the Maritime Public Domain (MPD). Others reveal unsustainability by deficit (scoring 1 to 2 on the BoE), including weak wastewater treatment, limited planning coverage, fragmented monitoring systems, weak public access protection, and insufficient legal implementation. **This distinction matters because it explains why conventional sector-by-sector responses often remain ineffective. Excess pressures cannot be managed where response systems are weak, and response systems cannot stabilize while pressures continue to rise unchecked, thereby reducing overall system resilience.**

Fragmentation rather than uniform decline

The Amoeba diagram logic also suggests that Lebanon’s coast is not simply declining uniformly across all dimensions, but is indeed **fragmented in management, producing an irregular, "spiky" visual shape**. Some themes show partial structure or isolated progress (falling near the safe operating space of BoE 3-5), while others remain deeply imbalanced. This fragmentation is itself a governance finding: it demonstrates that **gains in one area are not**



reinforced by complementary improvements elsewhere, which severely limits the effectiveness of isolated sectoral interventions.

Governance as a Systemic Bottleneck and Monitoring Weakness

The recurrent emphasis in workshop 2 on data gaps and the need for a unified public coastal data platform should not be read as a secondary technical issue. It is central to the governance diagnosis, acting as a systemic bottleneck. A **coastal-management framework that cannot produce coherent, accessible, and periodically updated information on its core indicators is already structurally constrained**. Even where technical or sectoral improvements exist, weak governance acts as a cross-cutting constraint, preventing systemic alignment and scaling.

Strategic implications for integrated coastal management

Taken together, these patterns suggest that the revised ICZM Strategy should move beyond thematic listing and toward **clearer prioritization of structural imbalances**. Managing coastal land-use change, addressing environmental service deficits, enforcing MPD governance, embedding climate-sensitive planning, and establishing an integrated monitoring framework emerge as the central clusters for intervention.

2.2.8 Narrative Scenarios: Envisioning the Lebanese coast in 2050

- **The Cost of Inaction (Business-as-Usual Scenario):** Imagine standing on the Lebanese coast in the summer of 2050 under the Business-as-Usual scenario. The shoreline is completely **choked** by haphazard concrete sprawl and relentless sea filling, with the maritime public domain entirely privatized and closed off to everyday citizens. Sea-level rise and severe coastal erosion have battered the few remaining natural ecological buffers. The Mediterranean Sea is heavily **contaminated** by raw, untreated sewage from failing infrastructure and an endless accumulation of plastic marine litter, making safe swimming a memory of the past. Underground, decades of unregulated pumping have exhausted the coastal aquifers, driving **extreme saltwater intrusion** that ruins both domestic water supplies and agricultural lands. **Traditional fishermen struggle to survive as marine biodiversity collapses** under the combined weight of pollution, warming waters, and unchecked illegal (IUU) fishing. It is a landscape defined by institutional fragmentation and **apathy**—where the absence of an enforced ICZM Law has allowed **private interests and structural neglect to permanently erode the ecosystem’s capacity to sustain both nature and equitable livelihoods**.
- **A Rebalanced System (Sustainable Alternative Scenario):** Now, envision an alternative 2050, shaped by the **firm and coordinated implementation of the National ICZM Strategy and Law**. The coastline **breathes** again. Strict enforcement and heavy fines have successfully removed illegal structures, reclaiming the maritime public domain and opening dozens of kilometers of safe, clean beaches for everyone to enjoy. Proactive Nature-based Solutions (NbS) and strict construction setbacks protect the shoreline from climate risks, while an expanded network of Marine Protected Areas allows deep-sea habitats and commercial fish stocks to **recover** and **thrive**. Fully operational, solar-powered wastewater treatment plants and zero-waste circular economy practices have eradicated open dumping and stopped plastic leakage, restoring the **crystal-clear quality of the sea**. Supported by a unified public coastal data platform and inter-ministerial coordination, **local communities, women, and youth are actively engaged in sustainable Blue Economy jobs, from eco-tourism to responsible artisanal fishing**. In this future, the Lebanese coast is no longer a fragmented battleground of illegal occupations, but a **resilient, interconnected socio-ecological system where human development flourishes securely within the safe operating space of nature**.

Figure 2. The Lebanese coast in 2050: on the left, unchecked urban sprawl and ecological collapse; on the right, restoration, resilience, and a thriving balance between nature and people¹.



2.2.9 Gender Inclusiveness at the Third Climagine Workshop

A core pillar of the MedProgramme is gender equality and the systematic integration of gender perspectives, as set out in the MedProgramme Gender Mainstreaming Strategy. In line with this commitment, the National ICZM Strategy and Law Climagine workshop was designed to foster an inclusive and representative environment, both in its methodology and in the composition of its participants. The workshop brought together 49 participants and speakers from a wide range of sectors, including government ministries (Energy and Water, Agriculture, Public Works and Transport, Environment, Industry), local authorities (Damour Municipality and other municipalities), academic and research institutions (University of Balamand, CNRS, LARI, etc.), United Nations agencies (UNESCO, UNICEF, UN/ESCWA, GWP-Med, PAP/RAC, Plan Bleu), consulting firms, NGOs, and civil society. Among the participants, both women and men held technical, decision-making, and facilitation roles, with women serving as directors, researchers, engineers, project coordinators, hydrologists, and sector experts, including key figures such as Dr. Manal Nader (Director, Marine and Coastal Resources Program, University of Balamand), Tracy Zarour (Hydrologist, UN/ESCWA), and Dr. Youssef Goussein (Researcher, CNRS).

Gender Statistics for the Third ICZM Law&Strategy Climagine Workshop

Total number of participants with identified gender: 49

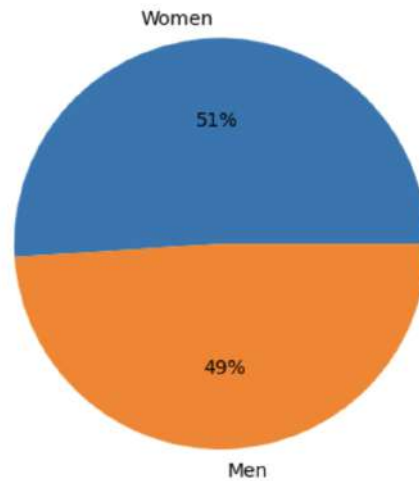
- Women : 25
- Men : 24

Percentage of women: 51%

Percentage of men: 49%

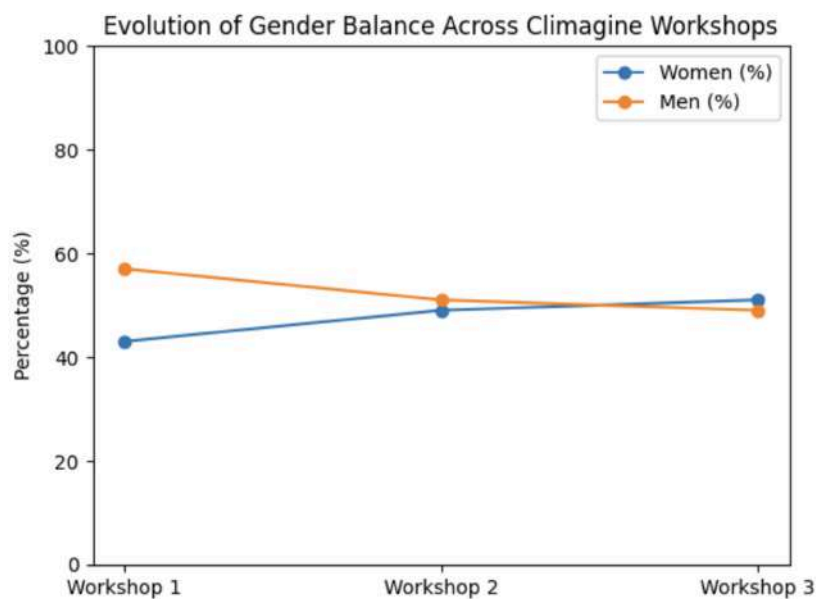
¹ Please note that these pictures have been created using an AI.

Figure 3. Gender Distribution of Participants for the Third ICZM Law&Strategy Climagine Workshop



This represents positive evolution in gender balance across the Climagine series: the first workshop (July 2025) had 47 participants (43% women, 57% men), the second (51 participants, 49% women, 51% men), and now the third achieving near parity at 51% women.

Figure 4. Evolution in Gender Balance across the Climagine Series



Gender was also addressed as a **cross-cutting theme** throughout the workshop, both in plenary discussions and within the thematic group work. Discussions nevertheless highlighted persistent challenges, particularly the **lack of sex-disaggregated data** and the **limited integration of gender indicators** in the water, agriculture, environment, and governance sectors. This lack of gender-specific data, combined with limited awareness of the gender-differentiated impacts of environmental management and climate change, underscores the need for targeted efforts in future data collection, capacity building, and awareness-raising activities under the programme.

3. Conclusion and Next Steps

3.1 IMPLICATIONS FOR THE REVISED ICZM STRATEGY AND LAW

The revised ICZM Strategy should be structured around a **limited number of strategic pillars** that reflect the **patterns revealed** through the workshop 3 analysis **rather than a generic sector inventory**. These should include **coastal land-use planning and enforcement and MPD protection, environmental service performance, coastal and water-related ecosystem integrity, climate and risk integration, and governance and monitoring architecture**.

Workshop 2 explicitly stated that the technical outputs would inform the drafting of the National ICZM Strategy and the update of the ICZM Law. The legal implication of workshop 3 is that the law update should focus on **operational clarity**. It should help resolve **practical ambiguity around coordination** (e.g., establishing an independent National Council for ICZM or an Inter-Ministerial Coordination Committee), **enforcement, data obligations, planning interfaces, and implementation status**. Note that, the exact legal phrasing and status of the current law update should still be checked against the latest official drafting material before final submission. The **existence of legal fragments is not enough**. What **matters is whether they form a coherent and enforceable framework**.

A recurring conclusion of the workshop sequence is the need for **stronger coordination** and a **more coherent public-data and monitoring architecture**, which should be operationalized through a Unified National Coastal Observatory. This is not optional if the BoE logic is to be meaningful beyond the workshop itself. The revised framework should therefore include regular monitoring, public reporting, and clearer institutional responsibility for indicator maintenance and review.

Direct and actionable inputs for the development of the ICZM Strategy and Law are provided below:

- First, the identification of **acceptable ranges for key indicators** establishes a clear reference framework for defining **policy objectives and performance targets**. Rather than relying on general principles, the **Strategy can be anchored in measurable thresholds that reflect both current conditions and desired future states**.
- Second, the process highlights the need for the **ICZM Law to move beyond declarative provisions and ensure operational enforceability**. This includes:
 - clear allocation of institutional responsibilities,
 - mechanisms for coordination and conflict resolution to overcome historically fragmented mandates,
 - integration of monitoring and reporting requirements,
 - and provisions linking environmental data to regulatory action, explicitly mandating Environmental Impact Assessments (EIA) and Strategic Environmental Assessments (SEA) as binding prerequisites for coastal development projects.
- Third, the convergence of sectoral discussions underscores the importance of adopting an integrated approach, where water, land use, pollution, ecosystems, and economic activities are managed as interconnected components of a single coastal system, strictly applying the "Source-to-Sea" continuum and the Water-Energy-Food-Ecosystems (WEFE) Nexus.
- Fourth, the results emphasize that the ICZM framework must incorporate a robust monitoring and evaluation system, based on the indicator set developed through the Climagine process. This system should support:
 - regular assessment of coastal conditions,
 - tracking of progress toward sustainability targets,
 - and adaptive management based on observed trends.
- Fifth, the ICZM Strategy must bridge the "implementation gap" by integrating **economic instruments**. Proposed coastal adaptation and management measures must be systematically filtered through Multi-Criteria Analysis (MCA) and Cost-Benefit Analysis (CBA) to ensure financial viability and create bankable project pipelines ready to attract private and public investments.

3.2 ENVIRONMENTAL MONITORING FRAMEWORK AND INSTITUTIONAL ACTORS

The environmental monitoring system in Lebanon, as reflected in the compiled matrix of actors and responsibilities (see Annex 5), reveals a **multi-layered but fragmented institutional landscape**, where monitoring functions are distributed across numerous entities without a unified operational framework.

At the **national level**, several public institutions hold **formal mandates** related to environmental monitoring, including ministries, national research centers, and sectoral agencies. These institutions collectively cover a **wide range of thematic areas** such as water quality, marine pollution, biodiversity, meteorological conditions, and environmental compliance. However, despite this **broad institutional presence**, **monitoring efforts remain sectorally compartmentalized**, with limited horizontal coordination or data integration mechanisms, severely **hindering the implementation of the Integrated Coastal Zone Management (ICZM) Strategy**.

Research institutions and technical bodies play a particularly important role in generating environmental data, especially in areas such as climate monitoring, marine ecosystems, and hydrological systems. Their contributions are often technically robust but are typically **project-based or donor-driven**, which limits continuity and long-term comparability of datasets. As a result, monitoring outputs are **not consistently translated into policy-relevant information or decision-support systems**, highlighting the urgent need to **shift from short-term project-based monitoring to institutionalized, state-funded observation**.

At the same time, **municipalities and local authorities** are expected to contribute to environmental monitoring, particularly in areas related to waste management, local pollution sources, and land-use changes. However, their capacity to do so remains constrained by **limited technical resources, lack of standardized tools, and absence of clear reporting channels to national systems**.

The matrix further highlights the role of **civil society organizations and non-governmental actors**, which are increasingly involved in awareness raising, localized monitoring initiatives, and community-based data collection. While these contributions are valuable, they are **not systematically integrated into formal monitoring frameworks**, leading to parallel data streams that remain underutilized. To bridge this gap, these grassroots efforts must be formalized through "**Citizen Science**" initiatives and the establishment of **local community-based observatories** to ensure continuous and socially validated data collection.

A key finding emerging from the analysis is the **absence of a centralized or interoperable environmental data platform**, which should be operationalized as a Unified National Coastal Observatory (potentially integrated into digital geospatial platforms like MapX). Data generated by different actors are often **stored in isolated systems, with varying formats, standards, and accessibility levels**. This fragmentation significantly reduces the ability to:

- track environmental trends at the national coastal scale,
- support integrated coastal zone management decisions,
- and monitor the implementation of environmental policies and regulations.

In addition, **monitoring efforts are uneven across thematic areas**. While certain parameters—such as meteorological data or specific water quality indicators—are relatively well monitored, other critical aspects, including coastal ecosystem health, cumulative pollution loads, and land-sea interactions (which are critical under the "Source-to-Sea" continuum), remain insufficiently covered. The institutional mapping also reveals a **gap between monitoring and enforcement**. Even where data exist, they are **not consistently used to trigger regulatory action or corrective measures**. This disconnect reflects broader governance challenges identified throughout the Climagine process, including weak enforcement mechanisms, unclear accountability, and limited coordination between monitoring entities and regulatory authorities.

From an ICZM perspective, the current monitoring system does not yet function as an integrated tool supporting coastal management. Instead, it operates as a **collection of parallel and often donor-driven initiatives**, lacking the coherence required to inform strategic planning, evaluate policy effectiveness, or guide adaptive management.

The matrix therefore points to several priority needs:

- Establishment of a national environmental monitoring framework aligned with ICZM objectives, explicitly integrating the "Source-to-Sea" continuum to capture both upstream river pressures and coastal impacts.
- Development of a centralized and interoperable data platform (such as a National Coastal Observatory) to consolidate datasets across institutions.
- Standardization of indicators, methodologies, and reporting formats, applying a 3-Tier Data Classification system to systematically address data gaps, treating missing data as a strategic intervention priority rather than a roadblock.
- Strengthening coordination mechanisms between national institutions, research bodies, and local authorities by formalizing a Coastal Forum and an Inter-Ministerial Coordination Committee to overcome fragmented mandates.
- Enhancing the link between monitoring and enforcement, ensuring that data informs binding regulatory action, specifically mandating Environmental Impact Assessments (EIAs) and Strategic Environmental Assessments (SEAs) as prerequisites for coastal development.

- Institutionalizing long-term monitoring programs, reducing reliance on short-term project-based initiatives, and supplementing official data with "Citizen Science" and local community-based observatories.

In this context, the environmental monitoring system should be understood not only as a technical function, but as a **core governance pillar of the ICZM Strategy and Law**, enabling evidence-based decision-making, transparency, and accountability.

3.3 PRIORITY ACTION FRAMEWORK

The priority action framework below is derived primarily from the prioritized workshop 3 analytical subset presented in Annex 4. It translates the main areas of imbalance identified through the Band of Equilibrium and Amoeba exercises into strategic directions for action and for the revision of the ICZM Strategy and Law. At the same time, the actions remain traceable to the broader monitoring architecture presented in Annex 3, which provides the wider reference framework for implementation, follow-up, and future correlation with other coastal diagnostic work. To ensure these strategic directions do not remain theoretical, all proposed actions must be systematically filtered through Multi-Criteria Analysis (MCA) and Cost-Benefit Analysis (CBA) to verify their financial viability and readiness for investment.

Priority area	Main signal from workshop 3 analysis	Strategic implication	Priority actions	Main institutional relevance
Coastal land-use planning and MPD enforcement	High pressure from urbanization, reclamation, and coastal occupation; weak master-plan coverage and reduced public access	Coastal space is being transformed faster than governance systems can regulate it	Strengthen enforcement against illegal occupation and sea filling; update and extend coastal planning tools (integrating the National Physical Master Plan - NPMPLT); improve protection of the public maritime domain (MPD); align ICZM with master planning and mandate binding EIA and SEA practice	Central to law update, spatial governance, and public-domain protection
Pollution and environmental service deficits	Very low wastewater treatment, low treatment-capacity usage, continued open dumping, litter leakage, uneven beach quality	Coastal degradation is sustained by basic service failure as much as by direct pressure	Prioritize wastewater treatment performance (including solarization of facilities), improve operational functionality of infrastructure, reduce open dumping, expand waste sorting and recovery applying circular economy principles, strengthen coastal water-quality monitoring under a "Source-to-Sea" approach.	Critical for enforceability, service governance, and environmental compliance
Climate and coastal risk exposure	High scores for erosion, sea-level rise, climate events, and marine temperature stress	Climate risk amplifies pre-existing spatial and ecological fragility	Integrate climate adaptation into coastal planning through Ecosystem-based Adaptation (EbA) and Nature-based Solutions (NbS), strengthen shoreline monitoring using the Coastal Vulnerability Index (CVI), improve disaster-risk preparedness via Early Warning Systems, and align adaptation with ecosystem and land-use policy	Requires stronger planning criteria and adaptation-oriented legal provisions
Socioeconomic and blue-economy imbalance	High environmental degradation costs, weak inclusion (gender and youth disparity), labor vulnerability, mixed beach access and fisheries compliance	Blue-economy potential remains undermined by environmental loss and uneven social access	Link blue-economy policy to public access, environmental quality, fisheries compliance (curbing IUU fishing), and inclusive coastal livelihoods; avoid growth-only framing by conducting financial reality checks (MCA/CBA) on proposed projects.	Important for strategic narrative and social legitimacy of ICZM

Governance, data, and legal implementation	Weak implementation status, scattered data systems, partial legal reform, persistent occupation pressure	Governance remains the main cross-cutting constraint on all other sectors	Finalize ICZM strategy and legal update; establish stronger coordination mechanism (such as a Coastal Forum and Inter-Ministerial Committee); create or consolidate public coastal data platform (Unified National Coastal Observatory utilizing the 3-Tier Data system); clarify institutional roles, monitoring duties, and enforcement pathways	Core area for law update and implementation architecture
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3.4 IMPLEMENTATION ROADMAP AND NEXT STEPS

The transition from strategy development to implementation requires a structured and phased approach, building on the outcomes of the Climagine process to actively bridge the "implementation gap":

1. **Finalization and validation of the ICZM Strategy and Law:** The immediate next step is the consolidation of the Strategy and Law, incorporating the **outcomes of the consultation process** and ensuring **alignment with national priorities and international commitments** (most notably the Barcelona Convention and its ICZM Protocol)
2. **Consolidation of the indicator framework and BoE results:** The indicator set and associated BoE ranges developed during the workshops should be finalized and formalized as part of the ICZM monitoring framework. This includes:
 - validation of indicator definitions,
 - agreement on minimum and maximum thresholds,
 - and clarification of data sources and responsibilities.
3. **Establishment of a national environmental monitoring system:** A key requirement for implementation is the development of an integrated monitoring system that consolidates data across institutions and ensures accessibility and usability. This system should be supported by:
 - standardized methodologies,
 - interoperable data platforms,
 - and clear reporting protocols.
4. **Operationalization of governance and coordination mechanisms:** Effective implementation will depend on the creation of formal coordination structures, enabling collaboration between ministries, agencies, municipalities, and other stakeholders. This includes:
 - defining roles and responsibilities to overcome historically overlapping mandates,
 - establishing a formal Coastal Forum and an Inter-Ministerial Coordination Committee to overcome fragmented institutional mandates and ensure coordinated enforcement,
 - and ensuring accountability mechanisms.
5. **Strengthening enforcement and compliance mechanisms:** The effectiveness of the ICZM framework will depend on its ability to enforce regulations and ensure compliance. This requires:
 - strengthening inspection and monitoring capacities (e.g., officially empowering the Coastal Brigade Command and the Ministry of Public Works and Transport enforcement bodies),
 - linking monitoring results to enforcement actions and binding regulatory tools, such as Environmental Impact Assessments (EIAs),
 - and ensuring transparency in decision-making processes.
6. **Integration into planning and investment frameworks:** The ICZM Strategy should be integrated into national and local planning processes (including the National Physical Master Plan of the Lebanese Territory - NPMP/LT), ensuring that coastal considerations are reflected in infrastructure investments, land-use planning, and sectoral policies. This integration must involve a strict financial reality check, systematically filtering proposed coastal adaptation measures through Multi-Criteria Analysis (MCA) and Cost-Benefit Analysis (CBA) to create bankable project pipelines ready for public and private investment and green finance
7. **Continuous stakeholder engagement and capacity building:** Sustaining the ICZM process requires ongoing engagement with stakeholders, including public institutions, private sector actors, civil society, and local communities. Capacity building efforts should support:
 - technical skills development,

- awareness raising, and the operationalization of a science-policy-community "Coastal Platform" to disseminate information,
- and participatory monitoring initiatives (Citizen Science and local community-based observatories), while explicitly ensuring gender equality (SDG 5) and youth inclusiveness

Immediate and medium-term follow-up: In the short to medium term, the process should move toward operationalization. This includes translating strategic priorities into legally binding provisions, securing early financing through impact investors, aligning the emerging legal text with the strategic priorities identified through the workshop 3 analysis, and formally adopting the updated ICZM Law.

3.5 FINAL STATEMENT

The overall conclusion is that Lebanon's coastal system is characterized less by isolated thematic failures than by a **cumulative structural imbalance driven by a profound "implementation gap"**. Pressures remain excessive in several domains, while response systems remain fragmented, incomplete, or weakly implemented due to historically overlapping institutional mandates and chronic data scarcity. The main policy lesson is therefore **institutional**. Coastal sustainability will depend not only on identifying the right themes or indicators, but on **building a more coherent framework for coordination** (such as the Inter-Ministerial Coordination Committee), monitoring (operationalized through a Unified National Coastal Observatory), enforcement, and adaptive implementation. Furthermore, to ensure the **Strategy does not remain a static document on a shelf**, all proposed interventions must be continuously backed by rigorous Cost-Benefit Analysis (CBA) and Multi-Criteria Analysis (MCA) to **attract green finance and private investment**. Ultimately, the **ICZM Strategy and Law must transform top-down mandates into socially validated "social contracts"**, placing local communities, explicitly including women and youth, at the core of the decision-making process (via the Coastal Forum and Citizen Science initiatives) to **ensure long-term coastal resilience**.

4. Annexes

4.1 EVENT AGENDA





Venue: Crowne Plaza Beirut By IHG, Hamra Main Street, Beirut 7512 Lebanon

Day 1 - 3 February 2026

I. Cross-sectoral coordination and spatial integration for enhanced natural resources management in Lebanon within the framework of MedProgramme (ICZM Strategy and Law)

Time	Session Description	Partner
08:30-09:00	Registration and Welcome Coffee	
09:00-11:00	Session 1: Draft ICZM Strategy and Law <ul style="list-style-type: none"> Welcome words by Ms. Daria Povh Škugor, PAP/RAC Director Introductory Presentation on ICZM Strategy – Dr. Manal Nader, University of Balamand Working Groups on the measures from the drafted ICZM Strategy 	PAP/RAC
	<i>Coffee break (continuous)</i>	
11:00 - 13:00	<ul style="list-style-type: none"> (cont.) Working Groups on the measures from the drafted ICZM Strategy Introductory Presentation on the Law – Dr. Josiane Yazbeck, Environmental Legal Expert Working Groups on the draft Law 	
13:00-14:00	<i>Lunch break</i>	
14:00-15:30	Session 2: Building a shared vision for the Lebanese coastal area through the Climagine participatory approach <ul style="list-style-type: none"> Introduction to the Climagine participatory methodology for integrating stakeholders’ views on the Lebanese coast Thematic groups assess past and present coastal conditions using sustainability indicators ranked by RACER criteria Groups define minimum and maximum indicator values to establish a “safe operating space” for ecosystem and socio-economic balance by 2050 Groups use of the Band of Equilibrium (BoE) to visualize current sustainability states and limits 	Plan Bleu PAP/RAC





15:30-16:00	<i>Coffee Break</i>	
16:00-17:30	<ul style="list-style-type: none"> Workshop participants examine two future scenarios for Lebanon’s coast: <ul style="list-style-type: none"> - Business-as-Usual with ongoing unsustainable impacts, and - a Sustainable Pathway focused on long-term policies Each thematic group uses amoeba diagrams to graphically represent the current status and desired future targets of Sustainability Indicators, highlighting gaps to address 	

Day 2 - 4 February 2026

II- Cross-sectoral coordination and spatial integration for enhanced natural resources management in Lebanon within the framework of MedProgramme (ICZM Strategy and Law) - continued

Time	Session Description	Partner
09:00-10:30	Session 3: Prioritisation introduction <i>Dr. Jean Hugé, Dr. Ante Ivcevic</i> <ul style="list-style-type: none"> Coasts as complex social-ecological systems Coastal stakeholders and multiple rationalities From prioritisation principles to criteria Prioritisation in practice: which tools to use when, for what and with whom? 	PAP/RAC
10:30-11:00	<i>Coffee break</i>	
11:00-12:30	Session 4: Prioritisation in practice <ul style="list-style-type: none"> Prioritisation in practice: nominal group technique (NGT)-based exercise for the measures of the ICZM Strategy Short reflection, strengths and weaknesses of the approach 	PAP/RAC
12:30-14:00	<i>Lunch break</i>	
14:00-16:00	Session 4 (cont.): Prioritisation in practice <ul style="list-style-type: none"> Prioritisation in practice: nominal group technique (NGT)-based exercise for the measures of the ICZM Strategy Wrap up of NGT 	PAP/RAC





Day 3 – 5 February 2026

I. The development of an Integrated Management Plan for the Damour Area from source to sea (Damour IMP)

Time	Session Description	Partner
09:00-11:30	<p>Session 5: The Damour Area Integrated Management Plan from source to sea <i>GWP-Med and MORES s.a.r.l</i></p> <ul style="list-style-type: none"> Updated Situational Analysis and Deliberation on the Damour Area Integrated Management Plan Discussion of Problems Action Plan Focus Groups 	GWP-Med
11:00-11:30	<i>Coffee Break (continuous)</i>	
11:30-13:00	<p><i>GWP-Med and CNRS</i></p> <ul style="list-style-type: none"> The Water-Energy-Food-Ecosystems Nexus Assessment for the Damour Area: findings and way forward 	
13:00-14:00	<i>Lunch break</i>	
14:00-15:30	<p>Session 6: Climagine - Building a shared vision for the Damour Area - 2050 indicator targets</p> <ul style="list-style-type: none"> Introduction to the Climagine foresight approach for participatory planning Thematic groups addressing water, agriculture, biodiversity, and governance Each group establishes minimum and maximum indicator values that define a “safe operating space” to maintain ecosystem and socio-economic balance through 2030 and 2050 Each group uses the Band of Equilibrium (BoE) to visualize current states and limits of sustainability 	Plan Bleu PAP/RAC
15:30-16:00	<i>Coffee Break</i>	
16:00-17:30	<ul style="list-style-type: none"> Each group explores two main scenarios: <ul style="list-style-type: none"> i. Business-as-usual: continuation of current unsustainable trends. ii. Sustainable pathway: proactive strategies to achieve sectoral and overall sustainability 	

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	<ul style="list-style-type: none"> • Each group presents past and present Sustainability Indicators states using BoE diagrams • Each group introduces Amoeba diagrams for illustrating proposed future indicator values in 2050 	
17:30-18:00	<p>Closing remarks</p> <ul style="list-style-type: none"> • <i>Éloïse Leguérinel, Ante Ivcevic, Barbara Tomassini</i> 	Plan Bleu, PAP/RAC, GWP-Med



4.2 LIST OF PARTICIPANTS

Title	First Name	Last Name	Organisation	Position
Dr.	Abbas	Fayad	National Advisor/Consultant	Private Sector.
Mr.	Ali M.	Zeidan	Khatib & Alami	Senior Manager/ Water Resources and Stormwater...
Ms.	Amina	Basbous	CAS	Department of National Accounts and coordination.
Mr.	Ante	Ivcevic	PAP/RAC	International Organization.
Mr.	Antoine	Waked	National ICZM Strategy...	Climate Change expert.
Mr.	Bachir	Aoun	Municipality of Damour	Lawyer.
Ms.	Barbara	Tomassini	GWP-Med	International Cooperation / Private Sector.
Ms.	Christina	Kontaxi	GWP-Med	International Organization.
Ms.	Daria	Povh Skugor	PAP/RAC	International Organization.
Ms.	Éloïse	Leguérinel	Plan Bleu / RAC	Project Manager / International Organization.
Ms.	Fatima	Hmede	LARI	Academic / Research.
Mr.	Georges	Gharios	UNESCO	National Programme Officer for Natural Sciences.
Mr.	Habib	Maalouf	Ministry of Environment	Minister's Advisor.
Ms.	Hanan	Hassan	Shouf Biosphere Reserve	Public Sector (Water).
Mrs.	Hiam	Abou Abdallah	Damour Municipality	Vice President.
Mr.	Hussam	Hawwa	Difaf	National Expert and Consultant.
Ms.	Iffat	Idriss	Lebanese Coastal Forum / Cedards for care	Civil Society / NGO.
Mr.	Jean	Huge	Consultant	International Organization.
Ms.	Josée	El Haddad	Consultant/Univ Balamand	International Organization.
Mr.	Joseph	Bechara	Lebanon Reforestation Initiative	Wildfire and Forest Management expert.
Dr.	Josiane	Yazbeck	National ICZM Strategy...	Consultant/ Legal expert.
Mr.	Jules	Hatem	MORES	Private Sector / Consulting.
Mr.	Kareem	Salameh	Hariri Foundation	Program coordinator.
Ms.	Karen	Nawwar	National ICZM Strategy...	Social expert.
Ms.	Leya	Zgheib	MoE / UNDP	Project Coordinator.
Mr.	Mahmoud	Termos	Mol	Department of Technical Affairs & Industrial Services / Industrial Zone Beam.
Mr.	Malek	Ghandour	Lebanese Environment Forum	President.
Dr.	Manal	Nader	University of Balamand	Director, Marine and Coastal Resources Program.
Colonel	Mazen	Saker	Lebanese General Security	Maritime expert.
Ms.	Mia	Farah	Media Sector	Journalist/Media specialist.
Dr.	Milad	Fakhry	CNRS - National Center for Marine Sciences	Academic / Research.
Mr.	Nabil	Rizk	UNICEF	WASH specialist - Communication and engagement.
Mr.	Nadim	Kanaan	Municipality of Damour	Municipal Council.
Ms.	Nadine	Saade	CAS	National coordinator of the environment sector.
Ms.	Najwa	Chaaya	Municipality of Damour	Lawyer.

Ms.	Nancy	Awad	Council for Development and Reconstruction	Public Sector (Planning).
Mr.	Nizam	Bou Khzam	البيت اللبناني للبيئة كفر حيم	Eco-tourism.
Mr.	Nizar	Zahreddine	Kfarfakoud Municipality	Member.
Mr.	Paul	Abi Rached	Terre Liban	President.
Mr.	Raed	Nasr	Kfarfakoud municipality	Head.
Mr.	Raed	Al Rayess	Aley Municipality, Go Green Recycling	Council member, founder and CEO.
Ms.	Raghida	Haddad	SPNL	Civil Society / NGO.
Mr.	Raji	Maasri	MORES	Private Sector / Consulting.
Ms.	Rawan	Al Jamal	University of Balamand	Research Assistant, Marine and Coastal Resources Program.
Ms.	Salam	Nassar	MORES	Private Sector.
Ms.	Samah	Termos	Remote Sensing Center	Surveying Engineer Research Assistance.
Ms.	Soumaya	Ayadi	ACE	Civil Society / NGO.
Mr.	Tony	Naufal	MORES	Junior Geologist.
Ms.	Tracy	Zarour	UN/ESCWA	Hydrologist.
Dr.	Youssra	Ghoussein	CNRS	Researcher.

4.3 CONSOLIDATED ICZM INDICATOR DASHBOARD EMERGING FROM WORKSHOP 1—WORKSHOP 3 REFINEMENT

A. Urban-Spatial Planning and Coastal Land Use						
Indicator	Unit	DPSIR	Indicative baseline / current status	Desired direction	Indicative source(s)	Strategic use
Coastal urbanization / land loss	ha/year	Pressure	≈ 214 ha/year of green land lost to built-up areas (2010–2020 average)	Decrease	CNRS-L, MoE, CDR	Tracks direct artificialization of the coastal corridor
Rate of urban expansion in coastal zones	% increase	Pressure	≈ 40%–55% of the coastal zone artificialized	Decrease	CNRS, CDR, METAP / World Bank, SEDAC	Measures spread and density of urban pressure
Rate of land reclamation (sea filling)	ha/year	Pressure	≈ 20 ha/year uncontrolled filling	Decrease sharply toward zero	CNRS-L, UN-Habitat, MoE	Tracks irreversible coastline change and habitat loss
Net change of unauthorized coastal constructions	Count / monitoring period	Response	High prevalence of illegal structures	Decrease in illegal structures; increase in removals and enforcement	MoPWT, MoIM, MoE, legal records	Proxy for enforcement effectiveness and recovery of public coastal space
Proportion of coastal zones covered by master plans	%	State / Response	Minimal to non-present; mainly reactive planning	Increase	DGA, MoIM, UN-Habitat	Measures territorial planning coverage and preventive control

B. Waste, Pollution, and Environmental Service Performance						
Indicator	Unit	DPSIR	Indicative baseline / current status	Desired direction	Indicative source(s)	Strategic use
Wastewater treated at secondary / tertiary level	% of total generated	Response	≈ 6%–8% treated	Increase strongly	MoEW, CDR, World Bank, MoE	Core service-performance indicator for pollution reduction
Proportion of operational wastewater treatment capacity	% of installed capacity functioning	State	≈ 440 tons/day operational out of 6,390 tons/day equivalent cited in workshop 2 notes for waste infrastructure; wastewater functionality remains low and fragmented	Increase strongly	MoE, CDR, OMSAR, municipal records	Distinguishes nominal infrastructure from real performance
Open dumping rate	% of waste disposed in open dumps	Pressure	≈ 42% in 2023	Decrease	MoE, UNDP, World Bank	Tracks unmanaged disposal pressure
Median beach marine litter density	items/m ²	State	≈ 4.7 items/m ² in spring to 6.6 items/m ² in autumn	Decrease	MoE, CNRS-L, World Bank	Direct coastal cleanliness and leakage indicator
Marine litter composition	% composition	State	≈ 77.7% of marine litter is plastic	Reduce plastic share	CNRS-L, World Bank	Helps target dominant waste streams
Proportion of coastal municipalities with functional waste collection systems	%	State	Low and uneven	Increase	OMSAR, MoE, municipal reports, CDR, UNDP	Municipal service coverage indicator relevant to coastal pollution prevention
Proportion of coastal municipalities	%	State	Limited and scattered	Increase	MoE, CDR, OMSAR, UNDP,	Tracks progression toward waste separation and circularity

with sorting activities					municipalities	
Percent of materials recycled, composted, or otherwise treated	%	Response	Low; workshop 1 stressed need for standardized definitions	Increase	Municipal reports, MoE	Indicates uptake of resource recovery and waste valorization
Average annual PM2.5 in coastal urban zones	µg/m ³	State	≈ 29.5 µg/m ³ national mean, higher in Beirut	Decrease	MoE, universities, World Bank	Broad environmental quality indicator for dense coastal settlements

C. Water Resources, Natural Resources, and Ecosystem Integrity

Indicator	Unit	DPSIR	Indicative baseline / current status	Desired direction	Indicative source(s)	Strategic use
Groundwater level trend in coastal aquifers	cm/year	State	≈ -50 cm/year	Stabilize, then recover	MoEW, MoA, MoE	Core signal of aquifer depletion and over-extraction
Share of irrigated land using water-saving techniques	%	Response	≈ 50%	Increase	MoA, FAO, LRA	Tracks transition toward lower groundwater pressure
Incidence of saltwater intrusion in wells	TDS mg/L	Impact	≈ 1,500 to 37,500 mg/L depending on location	Decrease	MoEW, MoA, MoE, CNRS-L	Critical indicator of coastal aquifer degradation
Average annual flow of coastal rivers	m ³ /s	State	Mentioned as important but affected by strong seasonal variability and data gaps	Maintain environmental flowworkshop and improve monitoring	MoEW, LRA, CNRS-L	Links catchment hydrology directly to coastal sustainability
Marine biodiversity richness	Count of identified species	State	≈ 3,265 recorded species cited in workshop 2	Maintain / improve status and knowledge	CNRS-L, SPA/RAC, World Bank	High-level ecological integrity indicator
Marine protected area coverage	% of territorial waters	State / Response	≈ 0.41%	Increase	MoE, CNRS-L, MAPAMED, UNESCO MAB	Tracks formal marine conservation response
Invasive species impact in commercial catch	% of catch	Impact	≈ 37% in Tyre case cited	Decrease / monitor	CNRS-L, MoA	Proxy for ecosystem change and fisheries stress
Cooperative membership rate in agriculture / linked livelihoods	%	Response	≈ 4.5%	Increase	MoA, NGOs, ILO	Enabling indicator for local sustainable resource governance

D. Coastal Risks and Climate Change

Indicator	Unit	DPSIR	Indicative baseline / current status	Desired direction	Indicative source(s)	Strategic use
Coastal erosion / shoreline retreat	ha/year	State	≈ -3.6 ha/year net erosion exceeding accretion	Reduce erosion losses	CNRS, MoPWT	Core physical-risk indicator for shoreline change
Sea level rise rate	mm/year	Impact	Historical increase cited in workshop refinement	Not controllable locally; use for adaptation planning	MoE, IPCC-aligned sources	Strategic adaptation and exposure indicator
Occurrence rate of climate-related disasters	events/year	Impact	≈ 1–2 events/year, mainly floods and storms	Reduce incidence and consequences through preparedness	Disaster Risk Management authorities, CNRS	Tracks exposure and response effectiveness

Average annual sea surface temperature deviation	°C/year	Pressure	≈ +0.04°C/year increasing trend	Monitor and integrate into adaptation planning	CNRS, NOAA, MoE	Marine climate stress signal
CO ₂ emissions	Mt CO ₂ eq	Pressure	≈ 28.8 Mt CO ₂ eq in 2020	Decrease	MoE, UNDP	Broad climate-pressure indicator with coastal relevance

E. Sustainable Blue Economy, Public Access, and Socioeconomic Conditions

Indicator	Unit	DPSIR	Indicative baseline / current status	Desired direction	Indicative source(s)	Strategic use
Unemployment rate	%	State	≈ 29.6% in 2022	Decrease	CAS, ILO	Context indicator for social vulnerability
Female labor force participation	% of female population 15+	State	≈ 27.5% in 2023	Increase	CAS, ILO, MoL	Social inclusion and gender-equity proxy
Cost of environmental degradation, total	% of GDP	Impact	≈ 10.9% of GDP in 2023	Decrease	World Bank	Economic rationale for integrated environmental reform
Cost of coastal zone degradation	% of GDP	Impact	≈ 0.5% of GDP in 2023	Decrease	World Bank	Coastal-specific loss indicator
Gender Inequality Index	index	State	≈ 0.432 in 2021	Decrease	UNDP, CAS	Cross-cutting equity and resilience proxy
Proportion of monitored beaches deemed safe for swimming	%	State	≈ 63% of monitored beaches safe	Increase	CNRS-L, MoE, MoPH, AUB	Public-health and coastal-quality indicator
Length of publicly accessible beaches	km or % of coastline	State	≈ 20% of shoreline accessible, about 40 km	Increase	CNRS-L, NAHNOO	Core public-rights and social-equity indicator
Compliance rate of fishing regulations / IUU Fishing Index	% or index	State / Response	≈ 2.41 IUU index cited	Improve compliance / reduce risk score	MoA, Coast Guard	Fisheries governance and sustainable use indicator
Share of coastal population employed in blue economy	%	Response	Underdeveloped and insufficiently measured	Improve definition first, then monitor and increase sustainably	CAS, MoL	Important but still methodologically weak

F. Governance, Institutions, and Enabling Environment

Indicator	Unit	DPSIR	Indicative baseline / current status	Desired direction	Indicative source(s)	Strategic use
Illegal coastal occupation / sea filling	m ² or count of transgressions	Pressure	≈ 2.5 to 5 million m ² cited; more than 1,000 transgressions referenced in workshop material	Decrease sharply	MoPWT, legal records, cadastral and planning authorities	Core governance-pressure indicator
Number and quality of laws / decrees adopted or amended related to ICZM	Count and/or quality score	Response / State	≈ 5 relevant texts cited in workshop 2 discussion, but weak enforceability	Increase coherence, quality, and enforceability	Official gazettes, MoE, MoJ, MoPWT, MoEW, MoA, MoIM	Tracks legal reform progress and usefulness of the law update
Existence of a public coastal data platform	Yes / No or operational score	Response	Partial and scattered systems exist; no fully integrated platform	Consolidate into one functional integrated system	CNRS-L, MoE, universities, public portals	Indicator of transparency, interoperability, and monitoring capacity

ICZM Strategy implementation status	Stage / status	Response	Earlier strategy draft exists; implementation remains incomplete	Advance to formal adoption and implementation	MoE	Direct strategic progress indicator
Number of public consultations on coastal issues	Count/year	Response	Low; weak participation and apathy noted in workshop 2	Increase	MoE, line ministries, civil society	Tracks procedural openness and legitimacy
Proportion of coastal municipalities with ICZM-aligned local planning instruments	%	Response	Still weak and incomplete	Increase	MoIM, DGA, municipalities	Measures local translation of national ICZM

4.4 PRIORITIZED WORKSHOP 3 INDICATOR SUBSET USED FOR BAND OF EQUILIBRIUM AND AMOEBA ANALYSIS

Code	Indicator	Unit	Thematic domain	Main strategic relevance
CC1	CO2 Emissions	Mt CO2 eq	Climate / Coastal Risk	Climate-pressure signal relevant to long-term coastal sustainability
CC2	Coastal erosion (shoreline retreat)	ha/year	Climate / Coastal Risk	Core physical-risk indicator for shoreline loss and exposure
CC3	Sea Level Rise Rate	mm/year	Climate / Coastal Risk	Strategic adaptation and exposure indicator
CC4	Occurrence rate of climate-related disasters	events/year	Climate / Coastal Risk	Tracks hazard occurrence and resilience needs
CC5	Average annual sea surface temperature deviation	°C/year	Climate / Coastal Risk	Marine climate stress signal
GO1	ICZM Strategy Implementation	Status	Governance / Enabling Environment	Direct indicator of legal-strategic progress
GO2	Coastal Occupation	km²	Governance / Enabling Environment	Proxy for illegal occupation, sea filling, and weak coastal governance
GO3	Number of laws/decrees adopted/amended	Count	Governance / Enabling Environment	Measures progress of legal reform and institutional response
GO4	Public coastal data platform	Count / operational status	Governance / Enabling Environment	Transparency, interoperability, and governance-capacity indicator
UP1	Coastal Urbanization Rate	ha/year	Urban-Spatial Planning	Tracks coastal land transformation and built-up pressure
UP2	Sea Filling / Reclamation	ha/year	Urban-Spatial Planning	Tracks irreversible coastal alteration and habitat loss
UP3	Public Beach Accessibility	km	Urban-Spatial Planning	Measures public access and equity in coastal space
UP4	Master Plan Coverage	%	Urban-Spatial Planning	Indicates planning coverage and preventive governance
WM1	Marine Litter (Plastics)	%	Waste / Pollution / Environmental Quality	Tracks dominant waste leakage into the marine environment
WM2	Wastewater Treatment	%	Waste / Pollution / Environmental Quality	Core indicator of environmental service performance
WM3	Beach litter density	items/m²	Waste / Pollution / Environmental Quality	Direct coastal cleanliness and pollution indicator
WM4	Treatment capacity usage	%	Waste / Pollution / Environmental Quality	Distinguishes nominal capacity from actual service performance
WM5	PM2.5	µg/m³	Waste / Pollution / Environmental Quality	Broad environmental quality indicator for dense coastal settlements
WM6	Recycling / composting rate	%	Waste / Pollution / Environmental Quality	Tracks resource recovery and circularity response
WM7	Open dumping rate	%	Waste / Pollution / Environmental Quality	Measures unmanaged disposal pressure
WM8	Safe swimming beaches	%	Waste / Pollution / Environmental Quality	Public-health and coastal-water-quality indicator
BE1	IUU Fishing Risk Index	Score	Blue Economy / Socioeconomic Conditions	Sustainable fisheries governance and compliance indicator
BE2	Unemployment rate	%	Blue Economy / Socioeconomic Conditions	Socioeconomic vulnerability indicator
BE3	Female labor participation	%	Blue Economy / Socioeconomic Conditions	Gender inclusion and labor-equity proxy
BE4	Cost of environmental degradation	% GDP	Blue Economy / Socioeconomic Conditions	Measures aggregate economic burden of degradation
BE5	Cost of coastal degradation	% GDP	Blue Economy / Socioeconomic Conditions	Coastal-specific economic loss indicator
BE6	Gender Inequality Index	Index	Blue Economy / Socioeconomic Conditions	Cross-cutting equity and resilience indicator

BE7	Accessible beaches	km	Blue Economy / Socioeconomic Conditions	Social-equity and public-rights indicator
BE8	Safe swimming beaches	%	Blue Economy / Socioeconomic Conditions	Public-health and tourism-related coastal quality indicator

4.5 ENVIRONMENTAL MONITORING: MAIN ACTORS

	Air Quality Monitoring	Marine Water Quality	Groundwater Monitoring	Surface Water / River Monitoring	Soil Quality / Pollution	Biodiversity & Ecosystem Health	Industrial Wastewater	Municipal Wastewater	Solid Waste Pollution	Agricultural Runoff / Pesticides	Microbiological Contamination	Coastal Erosion / Shoreline Monitoring	Tide & Current Monitoring	Oil Spills & Algal Blooms	Environmental Standards & Thresholds	Health-related Environmental Hazards
Ministry of Environment (MoE)	X	X				X	X		X		X				X	
Ministry of Energy and Water (MoEW)		X	X	X			X	X								
CNRS-L (National Council for Scientific Research Lebanon)	X	X	X	X	X	X					x	X	X	X		
LARI (Lebanese Agricultural Research Institute)	X				X					X						
Municipalities								X	X							
Ministry of Public Health (MoPH)	X										x					X
Ministry of Industry (MoI)							X									

LIBNOR (Lebanese Standards Institution)	X						x	x	x	x	x				X	
Third Party Labs / Consultants	X										x					

4.6 EXPLANATORY SHEET OUTLINING THE METHODOLOGY AND THE SCORING CRITERIA DISTRIBUTED DURING THE WORKSHOP

ICZM Workshop 3 – Expert Guidelines

Purpose of Workshop 3

Workshop 3 is the final expert convergence step of the Climagine process for the National ICZM Strategy and Law. The objective is to agree on acceptable limits, targets, and system balance using the Band of Equilibrium (BoE) and Amoeba diagrams.

1. Review the Current Value (derived from WS2).
2. Define the Safe Operating Space (Min & Max acceptable values).
3. Assign a BoE Score (1-7) to the Current Situation.
4. Assign a BoE Score for the 2030 "Business as Usual" (BAU) scenario if no laws are passed.

Rules for Experts

1. Ranges, not Digits: Focus on thresholds (min/max), not precise figures.
2. Expert Judgment: Use your professional judgment where data is incomplete.
3. Justification: Do not introduce new indicators unless strongly justified.
4. Sustainability First: Prioritize long-term coastal sustainability over short-term feasibility.

Band of Equilibrium – Indicator Sheet

Theme:

Indicator:

Unit:

Tier (1/2/3):

DPSIR Role:

Current State:

Minimum Acceptable Level (Red Line):

Target Level (2030 / 2050):

Confidence (High/Medium/Low):

Data Source / Responsible Institution:

Notes / Assumptions:

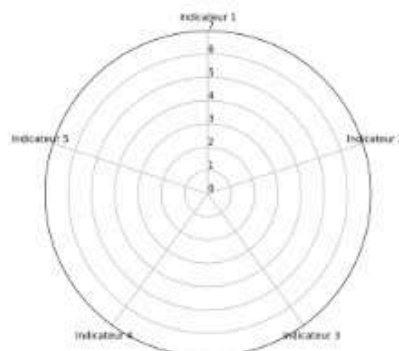
1. Validate Baseline: Look at the "Baseline (2025)" column. Does this match your field experience?
2. Define Safe Range: What are the minimum and maximum acceptable numbers for Lebanon in 2030? (e.g., Minimum 10% MPAs).
3. Score the Present: Using the 1-7 scale, give a score to the "Baseline".
 - *Example: 8% wastewater treatment is a SCORE 1 (Critical Deficit).*
4. Score the Future (BaU): If we do nothing, what will the score be in 2030? (Better, same, or worse?)

Colour	Number	Ranking of the SI on the Band of Equilibrium
Dark Blue	1	Unsustainable by default
Blue	2	Low sustainability by default
Light Green	3	Lower sustainability threshold
Green	4	Sustainable
Dark Green	5	Upper sustainability threshold
Yellow	6	Unsustainable by excess
Red	7	Very unsustainable by excess

Amoeba Diagram Guidance

The Amoeba diagram visualizes system balance across multiple ICZM dimensions. Scores are informed by the BoE discussion.

- Step 1: On the radar chart, place a BLUE DOT for the Current Score of each indicator. Connect them. -> This is the "Sick Patient".
 1. Plot the Current State (Blue): On your radar chart, mark the Current Score (0-7)
 - Step 2: Place a RED DOT for the Future (BaU) Score. Connect them. -> This is the "Prognosis without treatment".
 2. Plot the Sustainable 2050 Scenario (Green): Mark the Target Score (usually 4 or 5) where you want to be.
 - Step 3: The GREEN CIRCLE (Score 3-5) is the Band of Equilibrium. Your Strategy must bring the dots into this circle!
3. Analyze the Gap:
- The distance between the Blue line and the Green line represents the "Implementation Gap" for the new ICZM Law.
- Key Reminder: The objective is not precision, but agreement on what is acceptable (Score 3), what is not (Score 0-1), and where the coast should go (Score 5).
- Where does the shape collapse inward (Score 1-2)? This is a deficit (e.g., Lack of laws, lack of water).
 - Where does the shape explode outward (Score 6-7)? This is an excess (e.g., Pollution, Urban Sprawl).
- Imagine a radar chart (Spider chart) with 7 concentric rings.
- Center (1): Critical Failure.
 - Ring (3-5): THE GREEN ZONE (GOAL).
 - Edge (7): Critical Excess.



DEFINITIONS / REMINDERS

Band of Equilibrium (BoE)

The **Band of Equilibrium** defines the *acceptable operating space* for an indicator.

- **Minimum acceptable level (red line):**
Below this level, risks to the coastal system become unacceptable and corrective action is required.
- **Target level (green line):**
Desired condition under a sustainable ICZM vision (2030–2050).

BoE values are **ranges**, not exact numbers.

Indicator Tiers

- **Tier 1:** Robust enough to define BoE today
- **Tier 2:** Relevant but provisional (data or methods need improvement)
- **Tier 3:** Strategically important but not yet quantifiable

Tiering reflects **feasibility**, not importance.

DPSIR Reminder

Indicators may reflect:

- **Pressure** – human stresses on the coast
 - **State** – condition of systems
 - **Impact** – consequences for nature or society
 - **Response** – policies and actions
-

Amoeba Diagram

A **visual synthesis tool** showing ICZM system balance across key themes.

- Compares **current situation vs sustainable ICZM trajectory**
- Supports prioritization and communication
- Not a ranking or performance score

Key Reminder

The objective is **not precision**,

but agreement on **what is acceptable, what is not, and where the coast should go**.

STRATEGY CARD: From Diagram to Law

• **Sector:** _____

• **The "Red" Alert:** Which indicator is the furthest from the Green Zone?

○ *Indicator:* _____

○ *Current Score:* ____ (Target: 4)

○ *Indicator:* _____

○ *Current Score:* ____ (Target: 4)

○ *Indicator:* _____

○ *Current Score:* ____ (Target: 4)

○ *Indicator:* _____

○ *Current Score:* ____ (Target: 4)

○ *Indicator:* _____

○ *Current Score:* ____ (Target: 4)

• **The Fix (Action Plan):** What specific clause must be in the ICZM Law/Strategy to pull this indicator back into the Band of Equilibrium?

○ *Legal/Policy Action:*

○ *Infrastructure Action:*
