

Chapter 7 Conclusion

“Implementing the Strategic Action Programme for the South China Sea and Gulf of Thailand (SCS SAP Project)”

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7. Conclusion

The National Transboundary Diagnostic Analysis (TDA) for Cambodia provides the first integrated, indicator-based synthesis of **socioeconomic and climate conditions, pollution pressures, ecosystem status, fisheries trends, and governance capacity** across the country's coastal and marine systems. Drawing from the detailed analyses in Chapters 2–6, this chapter summarizes how far Cambodia has met the TDA objectives, identifies key cross-cutting conclusions, reviews spatial patterns of risk, and outlines the audiences and future directions for indicator-based coastal environmental assessments.

7.1 Meeting the TDA Objectives

The TDA set out to achieve five core objectives, and these objectives have now been substantively met.

Objective 1: Identify major transboundary environmental problems

Major problems clusters are clearly diagnosed: socioeconomic & livelihood risks, land-based pollution (nutrients, microbes, plastics, industrial contaminants), habitat loss, fisheries over-exploitation, climate-related salinization/flooding, and weak enforcement capacity are consistently identified across all chapters. Across all chapters, the TDA confirms 6 priority problem clusters.

Objective 2: Assess drivers and root causes

Drivers and root causes are traced across multiple, reinforcing pressures. Rapid coastal development, expanding agriculture and aquaculture, untreated wastewater, continued trawl fisheries, and fast urbanization shape the problem landscape, while incomplete mandates at sea and uneven enforcement capacity constrain effective responses. As discussed in Chapter 6, governance overlaps and persistent financing gaps further limit coordination and sustained implementation. These drivers are both economic—rising FDI and large investments in ports, tourism, and aquaculture—and institutional, including fragmented mandates and chronically low operating budgets. Coastal provinces now host more than **1.7 million people** and continue to grow at roughly **2.3–4.2% per year**, intensifying demand for land, services, and coastal infrastructure. Tourism expansion has been a major accelerator: arrivals exceeded **6 million** in 2019, with the strongest concentration in Preah Sihanouk, increasing wastewater loads and solid-waste leakage in nearshore corridors. Despite these mounting pressures, FiA's budget for marine conservation remains limited—approximately **US\$150,000–440,000 per year** to cover more than 435 km of coastline—leaving gaps in patrol coverage, monitoring, compliance actions, and site-level management effectiveness.

Objective 3: Map spatial distribution of risks

Spatial hotspots are identified across Cambodia's coast and connected river-sea systems. Peam Krasop–Koh Kapik, Trapeang Ropov–Kampot Bay, the Kep–Ha Tien seagrass corridor, the Sihanoukville urban coastline, major river-sea discharge zones, and the Phnom Penh confluence are established as high-risk areas where pollution loads, habitat sensitivity, and livelihood exposure intersect. To substantiate these priority zones, the TDA incorporates spatial analyses that map **17 wastewater discharge hotspots**, delineate **six major sediment plumes**, and detect **five trawl-incursion clusters** that threaten nearshore habitats and fisheries productivity. The assessment also identifies **four high-dependence livelihood zones** where communities are most reliant on coastal ecosystems and therefore most vulnerable to degradation and shocks. Finally, it traces **three cross-border pollution**

pathways—Tonle Sap–Mekong–Bassac, Kep–Ha Tien, and Koh Kong–Trat—highlighting how upstream inputs and transboundary currents can concentrate impacts beyond administrative boundaries and reinforce the need for coordinated management responses.

Objective 4: Evaluate governance capacity

Governance capacity and gaps are assessed across the policy, institutional, and financing systems that underpin coastal and marine management. While integration frameworks such as ICZM and the coordinating roles of NCCMD and NCSD are in place, core constraints persist—particularly for offshore mandates, compliance and enforcement systems, and sustained financing—limiting the pace of ecosystem recovery. Governance capacity indicators presented in Chapter 6 show moderate progress on water-resources integration, with SDG 6.5.1 (IWRM implementation) assessed at **62%**, alongside very high reported coverage for SDG 6.5.2 (transboundary cooperation) at **98%**. Protected-area coverage is also significant, at approximately **44,000 ha of MPAs**, yet effective management lags behind designation: less than 30% is effectively patrolled, leaving gaps in deterrence, monitoring, and response. At the subnational level, provincial ICZM committees are functioning and active, but their ability to plan, coordinate, and implement priority actions is constrained by chronic underfunding, with average operating resources below **US\$50,000 per year**.

Objective 5: Provide evidence for SAP

The evidence base is complete and ready to support SAP preparation. All required SAP elements have been fully developed, including problem trees that trace drivers and root causes, risk rankings that prioritize issues by severity and exposure, and clear socioeconomic linkages that connect environmental pressures to livelihoods and well-being. The assessment also includes institutional mapping to clarify mandates and coordination needs, sector diagnostics that identify constraints and opportunities across key industries, and a consolidated analysis of ecosystem–livelihood dependencies. Together, these components provide a coherent foundation for selecting priority actions, assigning responsibilities, and defining targeted interventions for implementation under the SAP.

7.2 Key Conclusions and Cross-Cutting Interactions

Cambodia’s coastal–marine system is now shaped by a tight coupling of rapid economic change, persistent poverty, and livelihood dependence on natural resources, accelerating land-based pollution, and progressively weaker ecosystem functions. Climate change and governance gaps act as system-wide multipliers, amplifying risks and constraining the country’s ability to manage trade-offs. The evidence from Chapters 2–6 points to seven overarching conclusions.

1. Converging pressures in fast-transforming coastal provinces

The four coastal provinces host more than 1.7 million people, with a poverty rate of 17.8% (2019/20) and a large near-poor group whose incomes are highly sensitive to climate and economic shocks. Natural resource dependence remains high—particularly in Koh Kong, where wetland households derive 65–90% of their income from local ecosystems—while Sihanoukville’s economy is heavily reliant on tourism, exposing the province to external downturns and environmental degradation. Across all provinces, economic expansion is outpacing the capacity of environmental services and institutions to manage risks. Preah Sihanouk’s urban footprint expanded by roughly 250% between 2010 and 2023, aquaculture in the Kep–Kampot corridor increased from around 500 ha in 2010 to more than 3,000 ha by 2024, and concessions and land-cover change in Koh Kong have driven sediment inflows to estuaries and nearshore waters upward by more than 35%. These trends underpin a pattern

where growth in tourism, real estate and aquaculture is not yet matched by wastewater, solid-waste and land-use controls, creating strong pressure on coastal ecosystems and communities.

2. Land-based pollution as the fastest intensifying threat

Land-based pollution is the most rapidly worsening driver of coastal degradation. Coastal wastewater treatment remains extremely limited—capturing **<20%** of sewage in Preah Sihanouk, **<10%** in Kampot, and almost none in Koh Kong and Kep. Fecal coliform levels in bathing waters and landing sites frequently reach **10⁴–10⁵ CFU/100 mL**, while industrial effluents commonly exceed national limits for oil and grease, lead and zinc. River–coast transition zones commonly show BOD levels of **6–12 mg/L**, exceeding the ASEAN guideline range of **2–3 mg/L**, while TN/TP loads in major estuaries are estimated to have risen by **40–70%** since 2010. Solid waste and plastics compound these pressures: plastic leakage is estimated at more than **85,000 tonnes per year**, while only **10–12% of waste is recycled**, largely PET and metal streams. Because pollution hotspots coincide with tourism nodes, fishing grounds and mangrove/seagrass habitats, land-based pollution acts as a cross-cutting threat that undermines public health, ecosystem resilience and economic competitiveness.

3. Ecosystem degradation reducing fisheries productivity

Mangroves, seagrass meadows and coral reefs continue to contract or degrade, eroding both fisheries productivity and natural coastal protection. Available evidence indicates mangrove losses of roughly **3,500–4,000 ha** since 2014, concentrated in Koh Kong and parts of Preah Sihanouk. Seagrass meadows in Kampot–Kep are estimated to have declined by around 20% since 2010, driven by turbidity, trawling impacts, and coastal construction. Coral cover at many nearshore sites has fallen to approximately 6–10%, while healthier but still stressed offshore reefs are typically reported at 20–30% cover. Globally and regionally, mangroves are estimated to support roughly **60%** of coastal fisheries biomass, while seagrass meadows provide nursery habitat for at least **13 key commercial species**. The combined loss of mangroves, seagrass and coral is estimated to reduce juvenile survival by **20–40%**, weaken the coastline’s ability to buffer storms and erosion, and diminish blue-carbon storage potential—thereby linking biodiversity loss directly with climate mitigation and food security.

4. Overfishing and trophic collapse

Fisheries indicators show long-term systemic stress: marine CPUE has collapsed from more than 170 kg/hour in the 1960s to around 26 kg/hour today, accompanied by a downward shift in the Mean Trophic Index toward smaller, lower-value species. This reflects both overfishing and loss of higher-trophic predators, signaling trophic simplification. Exploitation rates for many demersal species are commonly reported in the range of 0.65–0.80, consistent with overfished stocks, while high-value groups such as groupers and snappers have declined by more than 50% compared with the early 2000s. Small pelagics now account for more than 70% of marine catches, signaling reduced ecosystem complexity and lower economic value per unit catch. This trophic simplification reflects the combined effects of high fishing pressure, habitat loss, weak enforcement, and limited alternative livelihoods. It also reduces the economic value and nutritional quality of the catch, deepening vulnerability for coastal communities.

5. Climate change as a system-wide amplifier

Climate change does not act as a separate problem, but as a force that amplifies existing pollution, habitat and livelihood stresses. Projections indicate **+11–20 cm** of sea-level rise by 2050, with documented salinity intrusion advancing **5–7 km** inland in Kampot during dry

seasons and affecting rice fields, drinking water and aquaculture. Between 2020–2022, extreme rainfall and floods affected more than **200,000 people** in coastal provinces. Sea-surface temperature anomalies reached **+0.8–1.1 °C** above baseline in 2023, increasing risks of coral bleaching and fish mortality events. Composite indices suggest coastal provinces already rank high in climate vulnerability—Kampot (0.53), Kep (0.55), Koh Kong (0.56), and Preah Sihanouk (0.60)—and sea-level rise threatens more than 35,000 ha of coastal settlements and rice fields. Climate change thus intensifies exposure (through higher floods, erosion, saline intrusion) and sensitivity (through degraded ecosystems and pollution), while adaptive capacity remains uneven and under-resourced.

6. Governance and limited enforcement

Although the policy framework has strengthened, implementation capacity and coordination remain partial. The draft mandate of the **NCCMD** for marine and coastal management is still pending, leaving offshore jurisdiction and cross-sector coordination under-defined. The national oil spill contingency plan is prepared but not yet fully operational. Operational indicators illustrate persistent gaps, including limited monitoring and enforcement of EIA conditions (estimated at only 60–70% in practice), inadequate patrol coverage (less than 20% of the required marine area is regularly covered by patrol assets), and inconsistent compliance with effluent standards (only around 25–30% of industrial and tourism facilities consistently meet requirements). Among MFMA, Koh Rong is the clearest example approaching full zoning, management planning, and community engagement, while other sites remain under-resourced. Financing constraints reinforce these weaknesses: the FiA marine budget has fluctuated between US\$150,000 and 440,000 per year, limiting sustained enforcement, monitoring, and co-management support. Collectively, these governance gaps slow progress toward fully functional ICZM, marine spatial planning, and effective pollution control at the scale required for recovery.

Table 7-1 Summary of key problem clusters and indicators of Cambodia TDA

Problem Cluster	Indicator / Evidence	Magnitude / Quantitative Value
Socioeconomic & Livelihood Risks	Coastal population	>1.7 million people in the 4 coastal provinces
	Poverty & vulnerability	Poverty 17.8% (2019/20); large near-poor group highly exposed to shocks
	Ecosystem-based livelihoods	Koh Kong wetland households derive 65–90% of income from wetlands
	Tourism reliance	Extremely high in Sihanoukville; economy highly sensitive to external shocks and environmental degradation
Climate-Related Coastal Risks	Sea-level rise	Projected +11–20 cm by 2050, threatening > 35,000 ha of coastal settlements and rice fields
	Flood impacts	> 200,000 people affected by coastal and riverine floods (2020–2022)
	Sea-surface temperature anomaly	+0.8–1.1 °C above baseline in 2023, increasing bleaching and mortality risks
Land-Based Pollution	Coastal wastewater treatment coverage	Preah Sihanouk < 20% , Kampot < 10% , Koh Kong & Kep ≈ 0% treated
	Fecal coliform concentrations	10⁴–10⁵ CFU/100 mL , exceeding ASEAN bathing-water thresholds
	Industrial effluent exceedances	Oil & grease 12 mg/L (limit 5 mg/L); Pb 0.25 mg/L (limit 0.1 mg/L); Zn 1.1 mg/L (limit 1.0 mg/L)
	Plastic leakage rate	> 85,000 tonnes/year ; national recycling rate 10–12%
	Nutrient loads (TN/TP)	+40–70% increase (2010–2023) in key estuaries and river–coast interfaces

Habitat Degradation	Mangrove loss	Loss of 3,500–4,000 ha since 2014; highest degradation in Koh Kong
	Seagrass decline	Kampot–Kep meadows reduced by ~20% since 2010
	Coral reef condition	Nearshore coral cover 6–10% ; offshore reefs 20–30%
	Salinity intrusion	Dry-season intrusion 5–7 km inland in Kampot, affecting rice fields and water supply
Fisheries Decline & Trophic Downgrading	Marine CPUE trend	Decline from >170 kg/hour (1960s) to ~26 kg/hour in recent years
	Catch composition shift	High-value demersal species down >50% ; low-value/small pelagics now >70% of catch
	Exploitation rate (E)	0.65–0.80 for many demersal species → overfished
	Mean Trophic Index (MTI)	Declining, indicating progressive food-web simplification and loss of apex predators
Governance Gaps	NCCMD marine mandate	Draft mandate pending; offshore authority and cross-sector coordination not yet fully formalised
	Oil spill preparedness	National contingency plan drafted but not operational at full scale
	EIA compliance	Only 60–70% of EIA conditions are monitored and/or enforced
	Marine enforcement coverage	Existing patrol assets cover <20% of the required marine area
	Fisheries conservation financing	FiA marine budget roughly US\$150,000–440,000/year , limiting sustained enforcement and co-management

This evidence base underlines that Cambodia’s coastal challenges are not isolated sector issues, but interconnected dynamics that require integrated, climate-aware, and equity-focused responses in the subsequent SAP and investment planning.

7. Cross-sectoral feedback loops intensify degradation

Evidence from the preceding chapters points to reinforcing feedback loops that lock coastal systems into a downward trajectory. A typical negative cycle can be summarized, as shown in **Error! Reference source not found.** below:

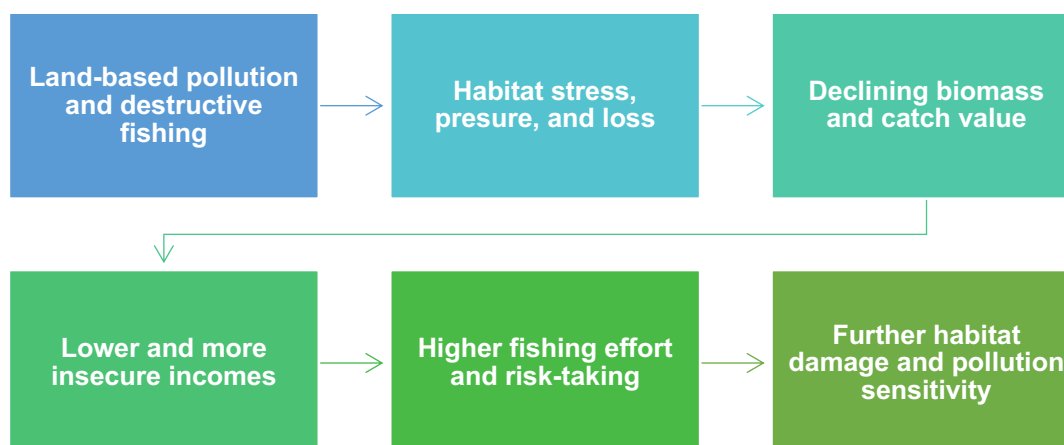


Figure 7-1 Cross-sectoral feedback loops intensify degradation

Because poor households are most dependent on open-access resources and least able to relocate or invest in adaptation, these feedbacks translate into growing social inequity and

conflict potential. At the same time, degraded ecosystems reduce the return on public and private investments in tourism, ports and aquaculture, undermining long-term growth prospects. Breaking these cycles requires coordinated action across sectors—wastewater, solid waste, fisheries, protected areas, land-use, and climate policy—rather than isolated project interventions.

7.3 Patterns of Risk Among Spatial Units of Analyses and at Country Scale

The spatial analysis conducted for the TDA shows that coastal–marine risk is highly uneven, concentrating in a limited number of “**hotspot**” zones where intense pressures coincide with high ecological value and vulnerable populations. Five zones stand out as priority areas for management attention and coordinated investment.

1. Koh Kong Complex (*Peam Krasop–Koh Kapik–Botum Sakor*)

The Koh Kong coastline, including Peam Krasop and Koh Kapik Ramsar sites and the Botum Sakor peninsula, represents Cambodia’s single most important cluster of mangroves, peat-rich wetlands and nearshore seagrass (see Chapter 4). These ecosystems underpin coastal protection, blue-carbon storage and small-scale fisheries, while more than 65% of wetland-adjacent households derive the majority of their income from fishing, gleaning and related activities. Risk arises from the interaction of: (i) *land concessions, roads and canalisation that fragment hydrology and increase sediment and nutrient inflows; (ii) peat oxidation and fire risk where mangroves and swamp forests are cleared or drained; (iii) nursery degradation for shrimp, crabs and finfish; (iv) salinity shifts under sea-level rise; and (v) high fishing pressure, including illegal trawl incursions into shallow nursery grounds.* Without improved land-use controls and co-management, this zone could shift from a national resilience asset to a major source of emissions, erosion and livelihood loss.

2. Preah Sihanouk Urban–Industrial Coast

The Sihanoukville–port corridor exhibits the highest concentration of built assets and the strongest land-based pollution signal (see Chapter 3). The zone combines international and domestic ports, SEZs, casinos, dense tourism infrastructure and expanding residential suburbs, but is served by limited and intermittently functioning wastewater systems. Monitoring shows recurrent exceedances of microbial standards ($>10^5$ CFU/100 mL at several bathing sites), elevated hydrocarbons and heavy metals in port-adjacent waters, and high plastic leakage from poorly managed solid waste. These pressures intersect with high exposure of people and infrastructure to coastal flooding and storm surges, as low-lying reclaimed land and canalized drains rapidly convey polluted runoff to beaches and nearshore reefs. Risk in this zone is therefore driven by the co-location of national-scale assets with weak environmental controls, making Sihanoukville a critical test case for integrated urban, industrial and coastal management.

3. Kampot Bay–Trapeang Ropov Estuary

Kampot Bay and the Trapeang Ropov estuary form a nutrient-rich, mixed-use system where river inflows, bivalve and finfish aquaculture, salt pans and expanding peri-urban development interact. River-borne sediments and nutrients are amplified by farm effluents and inadequate sanitation, generating high turbidity and elevated TN/TP and BOD levels in the estuary. The resulting risks include eutrophication, episodic low dissolved oxygen events that affect cages and wild stocks, and fragmentation of mangroves and seagrass by ponds, roads and salt fields. Because Kampot also functions as a regional tourism and fisheries hub, degradation in

this estuary has direct implications for food security, public health and the province's growth trajectory.

4. Kep–Ha Tien Seagrass and Nearshore Corridor

The Kep–Ha Tien corridor, spanning the Cambodia–Viet Nam border, contains the largest relatively continuous seagrass beds in the coastal zone, interspersed with patch reefs and mudflats. These habitats support transboundary fish and invertebrate populations and provide nursery grounds for at least 13 key commercial species. However, the corridor is highly sensitive to turbidity, sedimentation and bottom trawling. Trawl incursions into shallow areas, increased sediment from shoreline modification and nearshore construction, and nutrient inputs from aquaculture and agriculture raise risks of algal blooms and seagrass die-back. Because Kep's local population is small but heavily dependent on marine resources, even moderate ecological degradation can translate into acute livelihood stress, while the transboundary nature of the corridor calls for coordinated management with Viet Nam.

5. Phnom Penh Confluence–Bassac–Mekong Flow Path

Although far from the coast, the Phnom Penh confluence and downstream Bassac–Mekong channels are the dominant conduit for nutrient, microbial and solid-waste loads entering Cambodia's coastal waters (see Chapter 3). High population density, limited wastewater treatment, and industrial and agricultural discharges in the MTB system generate large pollutant loads that are transported through the delta to the Gulf of Thailand and the Viet Nam coast. This flow path is therefore a critical "upstream risk zone," where interventions in urban sanitation, industrial effluent control and agricultural nutrient management will directly influence coastal water quality and transboundary impacts in the Mekong delta and nearshore fisheries.

6. National-Scale Risk Pattern

Across these zones, a consistent national pattern emerges. Coastal–marine risk peaks where:

1. **High population density and economic assets** (urban centres, ports, SEZs, tourism hubs) overlap with
2. **Weak or absent wastewater and solid-waste treatment**, leading to high microbial, nutrient and plastic loads;
3. **High fishing pressure and limited livelihood diversification** drive overexploitation and destructive practices;
4. **Sensitive ecosystems**—mangroves, seagrass meadows, coral reefs and peat wetlands—are already fragmented or degraded; and
5. **High exposure to storms, floods, coastal erosion and salinity intrusion** coincides with low adaptive capacity.

This risk constellation is most pronounced in **Preah Sihanouk, Kampot Bay–Trapeang Ropov** and the **Koh Kong complex**, where intense development and ecosystem value are tightly interwoven. **Kep–Ha Tien** stands out as a zone of high ecological sensitivity and transboundary importance despite its small population, while the **Phnom Penh–Bassac–Mekong corridor** illustrates how inland development trajectories shape coastal and regional marine risks.

These patterns confirm that effective responses must operate at multiple spatial scales: strengthening upstream pollution control in the MTB basin; targeting coastal hotspots with

integrated urban, industrial and ecosystem management; and safeguarding remaining high-value habitats such as Koh Kong’s mangroves and the Kep–Ha Tien seagrass corridor through co-management and regional cooperation.

7.4 Target Audience

The TDA is intended as a shared evidence base for a wide community of decision-makers and stakeholders who influence Cambodia’s coastal and marine futures. It provides both a diagnostic of current conditions and a platform for dialogue on priorities, trade-offs and investment options. Key user groups include:

1. National Decision-Makers

National decision-makers, including NCSD, NCCMD, MAFF/FiA, MoE, MPWT, MLMUPC, MoT, and other line ministries—can use the TDA to guide national policy reforms and the roll-out of MSP and ICZM, support NDC implementation, and integrate coastal and marine priorities into wider climate, land-use, and blue-economy strategies. The report also provides an evidence base to inform national budgeting, public investment programming, and regulatory updates such as EIA requirements, effluent standards, protected-area instruments, and fisheries management measures.

2. Sub-National Authorities

Sub-national authorities, including provincial governors, PCCMDs, and district and commune administrations in coastal provinces and across the Mekong–Tonle Sap–Bassac basin, can apply the TDA to strengthen provincial spatial planning, coastal zoning, and investment screening for ports, tourism, aquaculture, and infrastructure. The findings also support more coordinated enforcement of environmental regulations and joint actions across districts—for example, aligned patrol operations, targeted pollution control, and participatory mechanisms that engage local communities in planning and compliance..

3. Sectoral Agencies & Technical Departments

Sectoral agencies and technical departments, such as fisheries research centres, port and maritime authorities, water and sanitation utilities, and technical departments responsible for tourism, environment, and planning—can translate TDA indicators into operational standards, monitoring protocols, and compliance programmes for fisheries, water quality, dredging, shipping, solid waste, and tourism operations. The TDA also helps prioritize critical data gaps, strengthen environmental information systems, and design targeted interventions such as wastewater upgrades, trawl-control actions, and habitat restoration in the highest-risk zones..

4. Development Partners & Regional Institutions

Development partners and regional institutions, including PEMSEA, COBSEA, ASEAN bodies, and major bilateral and multilateral partners (ADB, FAO, UNDP, World Bank, and others), can use the TDA as a common reference to align country strategies, shape GEF and green-climate pipelines, and coordinate programmatic support for ICZM, MSP, wastewater investments, biodiversity protection, and fisheries reforms. The report also strengthens the basis for regional action on marine litter, oil-spill preparedness, fisheries management, and climate resilience across the Gulf of Thailand and the wider South China Sea..

5. Academic & Research Institutions

Academic and research institutions, including universities, national research centres, observatories, and mapping initiatives—can build on the TDA’s datasets, maps, and indicator framework to improve long-term monitoring, ecosystem and hydrodynamic modelling, socioeconomic analysis, and scenario development. The TDA also supports co-designed research with government and communities to fill priority knowledge gaps such as blue-carbon stocks, trophic dynamics, and pollution pathways..

6. CFIs/CPAs, Civil Society & Community Networks

Community Fisheries (CFIs), CPAs, civil society, and community networks can use the evidence to advocate for stronger safeguards, equitable benefit-sharing, and recognition of community rights. The TDA also provides practical grounding to strengthen co-management arrangements, community patrols, ecosystem restoration initiatives, and locally led blue-economy innovations such as low-impact tourism and improved practices in aquaculture..

7. Private Sector

Private-sector actors—including port and shipping companies, SEZs, industrial facilities, aquaculture operators, real-estate developers, tourism enterprises, and financial institutions—can draw on the TDA to assess environmental and climate risks, strengthen ESG and corporate sustainability strategies, and identify priority investments in pollution reduction, resource efficiency, and habitat conservation. The report also helps inform green and blue finance products, public–private partnerships, and voluntary commitments that support the forthcoming SAP and associated coastal investment programme.

By serving these diverse audiences, the TDA aims to function not only as a technical report but as a living reference that underpins the development, implementation and periodic revision of Cambodia’s National Strategic Action Programme for coastal and marine management.

7.5 Future Indicator-Based Environmental Assessments

The TDA provides an initial, integrated set of biophysical and socioeconomic indicators that can be used to track change in Cambodia’s coastal and marine systems. To transform this one-off assessment into a living monitoring framework that supports adaptive management, several follow-up actions are recommended. If implemented, these actions would transform the TDA from a one-time diagnostic into the foundation of an ongoing, indicator-based environmental assessment system that supports evidence-driven governance of Cambodia’s coastal and marine resources.

1. Institutionalize a national coastal–marine indicator framework

A concise set of core indicators should be formally adopted and updated under NCS and the future NCCMD marine mandate, drawing directly from the TDA. This would include water-quality parameters (BOD, COD, TSS, TN/TP, microbial counts), land-cover metrics (mangroves, seagrass, reefs, built-up area), fisheries indicators (CPUE, catch composition, exploitation rates, Mean Trophic Index), human-pressure indices (e.g., Human Footprint, port and vessel density), and socioeconomic metrics (HDI, poverty rates, livelihood dependence, and ICZM implementation scores) These indicators should be embedded in national reporting processes—such as State of the Environment reports, NDC and SDG tracking, and marine spatial planning (MSP) reviews—so that coastal performance is routinely measured alongside economic and social targets.

2. Expand spatial and temporal monitoring coverage

Current monitoring remains fragmented and uneven across provinces and ecosystems, requiring a progressive expansion plan to achieve representative coverage. Priority measures include deploying continuous or high-frequency water-quality sensors in key estuaries and port areas (such as Sihanoukville, Kampot Bay, and Koh Kong mangrove channels); conducting annual or biennial mapping of mangroves, seagrass, and coral reefs using remote sensing and field validation to support loss/gain tracking and blue-carbon accounting; maintaining regular CPUE, effort, and trophic-level monitoring through FiA and partners harmonized with regional fisheries systems; and requiring real-time or near-real-time pollution reporting from ports, SEZs, municipal wastewater plants, and major industrial facilities, linked to compliance dashboards for regulators..

3. Move toward full Marine Spatial Planning (MSP)

The TDA's risk maps and hotspot analyses can serve as the analytical backbone for MSP. Indicator trends—such as CPUE decline, eutrophication hotspots, and shoreline erosion—should be systematically overlaid with existing and proposed uses including ports, aquaculture zones, tourism developments, shipping lanes, and conservation areas. This integration can help define no-go or high-precaution zones for new infrastructure, set and periodically revise coastal setback rules and erosion buffers, determine trawl-exclusion areas and gear restrictions aligned with habitat sensitivity, and prioritize critical habitats and blue-carbon areas for strict protection and restoration under MFMA, MPAs, and community-managed areas..

4. Integrate climate-risk indicators

Future assessments should explicitly link environmental status with climate hazards and adaptive capacity. In addition to conventional water-quality and habitat parameters, monitoring should include salinity-intrusion length and frequency in key rivers and irrigation canals; shoreline-change and erosion-rate indicators; storm-surge and flood exposure for people and critical infrastructure; SST anomalies and coral-bleaching alerts; and drought–flood cycle indices relevant to the Mekong–Tonle Sap–Bassac system. Tracking these indicators will support climate-smart ICZM, prioritisation of nature-based solutions, and integration of coastal risk into disaster management and land-use planning.

5. Develop a shared regional indicator platform

Cambodia's coastal systems are tightly connected to the Gulf of Thailand and the wider South China Sea, so indicator frameworks should be interoperable with neighboring countries and regional bodies. Priority areas for harmonization with Viet Nam and Thailand include nutrient and sediment loads from shared basins, marine-litter and plastic-leakage indicators including riverine inputs, IUU fishing indicators (vessel activity, infractions, sanctions), habitat connectivity metrics for mangroves, seagrass, and reefs, and oceanographic parameters (currents, temperature, salinity) relevant to pollution dispersion and larval transport. A shared platform—potentially under PEMSEA, COBSEA or ASEAN mechanisms—would enable joint assessments, early-warning systems and coordinated responses to transboundary risks.

6. Establish a national data-sharing and transparency mechanism

To maximize the policy value of indicators and strengthen public accountability, Cambodia should move toward open, interoperable coastal–marine information systems. Key steps include establishing a national coastal and marine data portal where MoE, FiA/MAFF, MPWT and port authorities, water utilities, and other agencies upload validated datasets in common formats; standardizing metadata, quality-control procedures, and data-sharing agreements to enable cross-sector integration; providing user-friendly visualizations such as maps,

dashboards, and trend graphs for planners, communities, researchers, and private investors; and embedding feedback loops so monitoring results trigger management actions—for example, compliance inspections when thresholds are exceeded, or adaptive zoning updates when environmental conditions deteriorate.

7.6. Overall Conclusion

Cambodia's coastal and marine systems remain ecologically rich and economically important, yet they are now subject to rapid, cumulative and increasingly interconnected pressures. The TDA demonstrates that land-based pollution, habitat degradation, overfishing and climate change no longer operate as separate problems; they interact in ways that accelerate decline and concentrate risks in a limited number of hotspots. Where weak wastewater treatment, destructive fishing, fragile ecosystems and high exposure to floods and salinity intrusion coincide, the system is already close to a tipping point toward chronic degradation.

At the same time, the analysis highlights substantial assets and opportunities. Cambodia still retains extensive mangrove, seagrass and wetland complexes with high blue-carbon value and nursery functions; a vibrant small-scale fisheries sector that can recover under improved management; and growing national commitments to climate action, ICZM and MSP. Investments in wastewater and solid-waste management, fisheries reform, habitat restoration and nature-based coastal protection can therefore deliver multiple dividends—reducing pollution, rebuilding stocks, protecting communities and securing carbon and biodiversity benefits.

The TDA also underscores that governance is the decisive factor that will determine future trajectories. Emerging institutions such as NCCMD, the expansion of MFMA and MPAs, updated environmental and climate policies, and stronger participation of communities and civil society provide a platform for more integrated, equitable and climate-responsive management. However, this potential will only be realized if indicator-based monitoring, enforcement, spatial planning and financing are scaled up and better coordinated across ministries, provinces and development partners.

Overall, the chapter confirms that Cambodia is now positioned to move from *diagnosis* (TDA) to *action* through a National Strategic Action Programme (SAP) that is spatially explicit, evidence-driven and aligned with national development and climate goals. The risk maps, indicators and priority hotspots identified here offer a clear basis for sequencing interventions, targeting finance and tracking results over time. If these insights are translated into coherent policies, investments and co-management arrangements, Cambodia can shift from a path of incremental degradation toward one of resilient, inclusive, and sustainable use of its coastal and marine resources.

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Annex 7

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