

*Application case: EB-ICZM for Aqaba, Jordan*  
*Report type: Thematic Scoping for Application Case (System Matrix)*  
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*Issued by: Royal Marine Conservation Society of Jordan (JREDS)*



# Mediterranean Forum For Applied Ecosystem-Based Management



Item	Description	Key management issues	Key stakeholders
<b>Biophysical systems</b>	<b>=&gt; Identify each of the main components which constitute the key coastal and marine biophysical systems (e.g. climate; hydrological and hydrogeological system; coastal vegetation types; wetlands; mangroves; rocky coast; dunes and beaches; marine prairies; coral reefs, cayos).</b>	<b>=&gt; Identify the most important management issues (e.g. resource uses and/or conflicts; ecological problems/threats) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</b>  <b>=&gt; Use one bullet (=&gt;) for each of the management issues (and add as many lines as needed).</b>	<b>=&gt; Identify the most important stakeholders (e.g. institutional management, data provider, resources user) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</b>  <b>=&gt; Use one bullet (=&gt;) for each of the stakeholders (and add as many lines as needed).</b>
rocky coastline	The extremely limited Jordanian coast on the Gulf of Aqaba, not exceeding 30 km (almost 27 km), represents the only marine access of Jordan and must serve for all the conflicting uses of the coastal area; tourism, ports, industry, military, education and marine conservation. Between the gulf shores of Jordan and Egypt, the minimum width is 5 km and the maximum is 20 km.  Rocky beaches are mainly located in the southern coastal part.  Sandy beaches are mainly found in the northern coastal part.	The Aqaba Marine Park (AMP) was established in 1997 over an area of 7 km to conserve and manage the natural near-shore marine environment of the Aqaba south coast region with its rich biodiversity, while allowing touristic uses at sustainable levels, for the benefit and enjoyment of the present and future generations of Jordanians and the global community. The AMP is located south of Aqaba city stretching from the Passenger Terminal in the North to the Police Officers' Club in the South. The area's terrestrial boundaries lies 50 m east of the Mean High Water Mark and the marine boundaries lies 350m west of the mean high water mark. The Aqaba Marine Park Bylaw no. (22) of 2001 governs it.  The Aqaba Special Economic Zone Authority (ASEZA) adopted in 2002 a comprehensive regulatory plan covering development activity in the region at the level of the tourism, commercial, industrial and logistics sectors, as well as other investment sectors. The broad planning currently covers five areas: Aqaba City, Aqaba Port Area, Southern Coastal Zone, Southern Heavy Industries Area and Northern Airport Area.	Aqaba Special Economic Zone Authority (ASEZA). Marine Science Station. Aqaba Marine Park. The Royal Marine Conservation Society of Jordan (JREDS). Dive Centres. Ben Hayyan- Aqaba International Laboratories. Fishermen.
sandy beaches	The region is extremely arid, with high temperature and intense sunshine. The climate is affected by airflows from the Indian monsoonal trough and the Mediterranean low -pressure systems.  The temperature ranges between 14 °C in January to 45 °C in summer. The evaporation rates of sea water (200- 365 cm/yr). Most of the rainfall in the Gulf of Aqaba occurs during the period between November and May. The average annual rainfall in Aqaba city is about 35 mm/yr.	The city of Aqaba has experienced a series of local administration systems. With the continuous progress of the local administration, was a continuous progress in giving more attention to the environmental dimension. During the preparatory stages for the Aqaba Special Economic Zone Authority (ASEZA), the Marine Science Station (MSS) in collaboration with the Aqaba Region Authority established a monitoring program of the basic components of the marine ecosystem; water, sediment, benthic community and fish, along the entire Jordanian coast. The MSS was responsible for designing the monitoring program, writing the proposal that won the project and has been responsible for implementing it.	
climate	In the northern Gulf of Aqaba, seawater temperature ranges between ~21 °C in winter and 27 °C in summer. Salinity is high with little annual variation (40.3 to 40.8 PSU).	Higher weight was given to the monitoring program after the establishment of ASEZA. This is because the tendency in ASEZA is to build their coastal management policy on scientific findings. Also, the findings of the monitoring program serve the purpose of putting the regulations for investment and exploitation of the marine environment.	
sea-waters	The little matter in suspension, low biomass,	The activities of the monitoring program involve monthly collection and analysis of	

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<i>Plant Species of interest.</i>	<i>=&gt; Identify key groups of species which, for any reason, are of particular interest for the management of the focused ecosystems (e.g. endemic; threatened; invasive; commercial. Note that plant-communities/habitat may be already included under Vegetation-Types).</i>	<i>=&gt; Identify the most important management issues (e.g. resource uses and/or conflicts; ecological problems/threats) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</i>  <i>=&gt; Use one line for each of the management issues (and add as many lines as needed).</i>	<i>=&gt; Identify the most important stakeholders (e.g. institutional management, data provider, resources user) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</i>  <i>=&gt; Use one line for each of the stakeholders (and add as many lines as needed).</i>
seagrass  benthic macroalgae	<p>Seagrass survive beneath the seawater and form the bulk of the biomass upon which other organisms in the benthic community depend.</p> <p>Seagrass ecosystems are important and at risk. Seagrasses are marine flowering plants that form ecologically important coastal habitats in tropic and temperate oceans, playing a key role in unison with coral reefs and other habitats. These habitats exchange nutrients and organic matter, and seagrasses provide important habitat for many species of marine fauna and juvenile fish.</p> <p>Endangered marine organisms and sea turtles graze on seagrass beds. In addition to supporting marine biodiversity, seagrass beds provide many benefits to human society. They support fisheries and provide livelihoods for millions of people in coastal communities. Seagrass beds also maintain water quality and reduce turbidity through sediment deposition.</p> <p>By acting as nurseries for many economically important fish species such as snapper and grouper, they help support both tourism and</p>	<p>The main threats affect the seagrasses are industrial run-off, coastal infrastructure development, and dredging were determined to have the greatest impacts on seagrasses globally. These anthropogenic activities disturb seagrasses by increasing water turbidity and physically damaging seagrass habitat. Trawling, and boat damage can also harm coastal seagrass communities. In addition to these direct human activities, maybe climate change and sea level rise will be increasing severity of storms were seen as potential risks for seagrasses. Invasive species could be cause problems to seagrass and algae ecosystem.</p> <p>In order to manage seagrasses, effective policies must be implemented at the local level. However, there is a disconnect between the regions of conservation research (developed nations), and the primary regions of seagrass habitat (developing nations). If seagrasses are to be protected through the use of management and Marine Protected Areas (MPAs), there must be greater cooperation between governments, policy makers, and scientists both at the national and international level. The global status of seagrass species and the current threats facing them have been established. While more research will certainly be beneficial, we need to focus on reducing the impacts of human activities. The best possible management effort will take into account all users of seagrass ecosystems, so that they can be used but not overexploited for future generations.</p>	<p>Aqaba Special Economic Zone Authority (ASEZA). Marine Science Station. Aqaba Marine Park. The Royal Marine Conservation Society of Jordan (JREDS). Dive Centres. Ben Hayyan- Aqaba International Laboratories. Fishermen. Investors.</p>
<i>Animal Species of interest</i>	<i>=&gt; Identify key groups of species which, for any reason, are of particular interest for the management of the focused ecosystems (e.g. endemic; threatened; invasive; commercial).</i>  <i>=&gt; Identify also key groups/taxa which are important in the structure of the relevant ecosystems and related services</i>	<i>=&gt; Identify the most important management issues (e.g. ecological problems/threats related to the given infrastructure) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</i>  <i>=&gt; Use one line for each of the management issues (and add as many lines as needed).</i>	<i>=&gt; Identify the most important stakeholders (e.g. institutional management, data provider, user of the infrastructure) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</i>  <i>=&gt; Use one line for each of the stakeholders (and add as many lines as needed).</i>
		Natural Threats. Natural Predators, Diseases, and Extreme Low Tide.	

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hard coral species	A total of 157 hard coral species were positively identified.	<p>Anthropogenic Threats.</p> <p>Fishing Gears: despite its small scale in Aqaba, fishing affects corals and other organism seriously since reefs are very limited in area, and are of fringing type, which entitles they are located at shallow depths. Fishermen tend to use gear which consist of nets, ropes, cages and nylon lines, where almost all are made of non-biodegradable materials. In addition, lost or abandoned gears contribute to the marine debris and, which causes a phenomenon known as 'ghost fishing, which extremely affecting all marine life health and abundance worldwide.</p> <p>Tourism Impact: Diving industry is growing in Aqaba with the presence of 27 diving centers and 27 diving sites. Despite the importance of this industry to tourism business, it could contribute to serious damage to coral reefs and fish community if no proper control and management approach is applied. In addition, tourism could affect coral reefs and fish community in-directly through the expansion of tourism infrastructure and facilities, where high siltation and sedimentation rates through poorly planned and constructed hotels and resorts facilities are the primary cause of damage.</p> <p>Ports Establishment: Ports establishments contributes to the loss of hard corals and coral habitats and substrate through various means including the break of limestone and coral materials into extremely fine particles after dredging activities or the created sedimentation after landfilling activities over the construction phase. Based on the survey results, ASEZA has initiated coral transplantation efforts in 2012 where coral reefs from the southern region of the coast and the Al Derreh area were placed at damaged reefs and a created cave site from cement and metal structures at Aqaba Marine Park.</p>	<p>Aqaba Special Economic Zone Authority (ASEZA). Marine Science Station. Aqaba Marine Park. The Royal Marine Conservation Society of Jordan (JREDS). Dive Centres. Ben Hayyan- Aqaba International Laboratories. Fishermen. Investors. Marine Experts. Decision Makers. Boat Glass Owners Associations. Arabs and Foreigners Tourists. Media- all forms. The Main Port. General Security Services. Royal Rangers Department. Academic Institutions. Royal Navy Force. Jordan Marine Authority.</p>
fish species	The diversity of fish species is high with more than 510 species recorded, of which 5% are endemic.	<p>Corals and fish Harvesting and Trade: Coral and fish are collected in the dried ornamental trade business for souvenirs and jewellery at Aqaba and even in Amman city. Smuggling of dead corals specimens occurred in Jordan, where they are used as souvenirs. A detailed study on the magnitude and impact of coral and fish trade is required to understand its effects on marine ecosystem diversity and presence. During 2003, Jordan Management Authority has requested the Secretariat to inform all Parties that it applies stricter domestic measures with regard to trade in corals, in accordance with Article XIV, paragraphs 1 (a) and (b), of the Convention. Moreover, it stated that the collection of corals and the breaking of coral reefs are strictly prohibited in Jordan and offences are liable to fines and/or imprisonment. No import into or export from Jordan of corals is allowed except for scientific purposes and under permits granted by the Management Authority. And lastly, it make a notification to the Parties that Jordan requests all Parties not to authorize any export of coral specimens to Jordan and not to authorize any import of such specimens from Jordan, except where the Management Authority has issued a permit to authorize the trade for scientific purposes.</p>	
marine turtles	Three globally endangered species of the Marine Turtle were found at Aqaba, including: the Green Sea Turtle; Chelonia mydas, Loggerhead Sea Turtle; Caretta caretta, and the Hawksbill Sea Turtle; Eretmochelys imbricate.	<p>A single aquarium is located at the Marine Science Station at Aqaba southern beach. Despite its importance for tourism attraction, substantial harvesting of live corals and fish specimens occurs directly from the sea for exhibition purposes.</p>	
mesozooplankton	A total of 82 species of different mesozooplankton groups and larval stages of various other organisms have been identified in Aqaba, where copepods are, by far, the most abundant and ubiquitous mesozooplankton organisms.		
molluscs and protozoan	58 species of Sarcodina, 72 Species of Porifera, 237 Species of Cnidaria, 242 species of Nematoda, 645 species of Mollusca, 37 species of Annelida, 1210 Crustacea, and 125 species of Echinodermata.		

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		<p>Therefore, it is highly recommended to establish husbandry facilities for fisheries, and create artificial structures resembling corals in the aquariums to conserve the natural species diversity at the Gulf of Aqaba</p> <p>Marine Debris: the most significant accumulated debris at Aqaba's sea is the plastic.</p> <p>Ship Grounding and Anchoring: The grounding of large commercial ship and even the small recreational boat can cause massive damage to coral reef organisms. The effects will escalate and more injury to the reef will occur during the process of removing the grounded vessel from the hard-bottom habitat.</p> <p>Oil Spill: Oil floating on the water's surface can be deposited directly on corals in an intertidal zone when the water level drops at low tide. Rough seas can mix</p>	
<b>Coastal infrastructures</b>	<p><i>=&gt; Identify the main groups/category coastal infrastructures (e.g. ports; marinas; hotels; road network; urban areas; irrigation and drainage networks).</i></p> <p><i>=&gt; Use one line for each of the groups/categories (and add as many lines as needed).</i></p>	<p><i>=&gt; Identify the most important management issues (e.g. ecological problems/threats related to the given infrastructure) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</i></p> <p><i>=&gt; Use one line for each of the management issues (and add as many lines as needed).</i></p>	<p><i>=&gt; Identify the most important stakeholders (e.g. institutional management, data provider, user of the infrastructure) and try to associate them with the related "biophysical component" by listing each of them in the same line as that of the related component.</i></p>
Tourist infrastructures	Mega Touristic Project and Hotels	The environmental impact occurs through the construction and implementation stage, such as Dredging.	<p>Aqaba Special Economic Zone Authority (ASEZA). The Royal Marine Conservation Society of Jordan (JREDS). Dive Centres. Investors. Marine Experts. Decision Makers. Boat Glass Owners Associations. Arabs and Foreigners Tourists. Media- all forms.</p>
Aquarium	Marine Science Station/ Aquarium.	An only one aquarium is located at the Marine Science Station in the southern coast of Aqaba beach. Despite its importance for tourism attraction, but substantial harvesting of live corals and fish specimens occurs directly from the sea for exhibition purposes. Therefore, it is highly recommended to establish husbandry facilities for fisheries and create artificial structures resembling corals in the aquariums to conserve the natural species diversity at the Gulf of Aqaba.	<p>Marine Science Station. Aqaba Marine Park. The Royal Marine Conservation Society of Jordan (JREDS). Dive Centres. Ben Hayyan- Aqaba International Laboratories. Marine Experts. Decision Makers.</p>

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Fisheries facilities	Fishermen Harbour and fishermen facilities.	<p>Despite the small scale of fishing at Aqaba, but it affects corals seriously since reefs are very limited in area, and are of fringing type, which entitles they are located at shallow water depths. Fishermen tend to use gear consist of nets, ropes, cages and nylon lines, where almost all are made of non-biodegradable materials. This has affected hard corals, and caused damage, which will cause its death, or it will potentially introduce parasites and pathogens.</p> <p>In addition, loosing gear or abandoned will contribute to the marine debris and litter. This will mainly cause what we call it as the 'ghost fishing', which extremely affecting corals health and abundance worldwide.</p>	<p>Aqaba Special Economic Zone Authority (ASEZA). Marine Science Station. The Royal Marine Conservation Society of Jordan (JREDS). Fishermen. Marine Experts. Decision Makers. General Security Services. Royal Rangers Department. Academic Institutions.</p>
Port and industrial infrastructures	<p>Middle Ports Area, Aqaba Container Terminal and Passenger port.</p> <p>The Main Port.</p> <p>Industrial Area.</p>	<p>Since commercial shipping are vital to Jordan's economy, addressing that Aqaba is the only marine outlet for the country. Heavy investments in ports creation was performed by the government of Jordan where Ports Cooperation was developed, and consists of: i) main port, ii) Aqaba Container Terminal (ACT) and the iii) industrial port. In 2012, the Aqaba Development Corporation (ADC); the main development corporation for the Aqaba Special Economic Zone Authority (ASEZA) initiated the relocation of the main port from its location northern of the Gulf of Aqaba to the Southern parts based on the master plan which was developed by Royal Haskoning (RH) in 2006. A study by Spurgeon, 2008 was conducted to assess the coral compensation due to the port relocation. The estimated areas of hard corals affected by direct impact based on this study is 32,509 m2 based on the effects which will occur on Derreh Bay South (1,238 m2), Derreh Bay North (17,900 m2), Industrial Jetty (1,494 m2), Industrial Liquid Berth (481 m2), Phosphate Berth (3,152 m2), Grain berth (722 m2), and Grain berth and other miscellaneous liquids berth (7522 m2). Despite this information, but a major recommendation was made on the importance of establishing a comprehensive monitoring to establish the actual extent of such damages over time.</p> <p>Ports establishments contributes to the loss of hard corals through various means including the break of limestone and coral materials into extremely fine particles after dredging activities or the created sedimentation after landfilling activities over the construction phase. The sedimentation created including the milky white "clouds" of suspended sediments created by corals damage could stay in suspension for a long time, and spread over a large area and result in significantly reduced light penetration, which will affect corals over a wide area, and might led to their death. Moreover, the industrial area affects corals and marine environment and coastal zone even during the operational phase where pollution caused from cargo and ship spills, ship grounding and anchor damages on corals, reduction in light impacts to corals resulting from ships regularly moored above them, and pollutant discharges from the outfall are primary cause of corals death or through ship spills and chemicals material spill e.g. ammonia, sulphate and cooling water, which cause decreeing or increasing the water pH or water temp.</p> <p>Oil floating on the water's surface can be deposited directly on corals in an intertidal zone when the water level drops at low tide. Rough seas can mix lighter oil products into the water column, where they can drift down to coral reefs. As heavy oil weathers or is mixed with sand or sediment, it can become dense enough to sink below the ocean surface and smother corals below. Despite the</p>	<p>Aqaba Special Economic Zone Authority (ASEZA) Marine Science Station The Royal Marine Conservation Society of Jordan (JREDS) Ben Hayyan- Aqaba International Laboratories Investors Marine Experts Decision Makers The Main Port General Security Services Royal Rangers Department Academic Institutions Royal Navy Force Jordan Marine Authority</p>

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Tourist infrastructures and attractions.	<p>Al Hafayer Area (the Middle PalmBeach Area), agricultural plots, and historical significance - Al Sharif Hussein house and Aqaba Castle.</p> <p>The South Coastal Zone (Eco-Tourism Zone).</p> <p>Upland Eco-tourism Residential Gated Communities. This includes: =&gt; the Red Sea gated residential and =&gt; sea resorts facilities. =&gt; Seascape gated community villas and apartments. =&gt; Bernice Beach Club. =&gt; Barracuda Diving Centre. =&gt; Tourism Services and Diving Clubs area.</p>	<p>The most significant accumulated debris at Aqaba's sea is the plastic. Despite the lack in research on the effects of marine debris especially plastic on coral reefs, some expert observed the ingestion of micro plastic by scleractinian (reef-building) corals in the laboratory settings. In addition, solid waste might create a barrier separating corals from sunlight or decompose or break parts of these materials that may be toxic or harmful to coral, such as plastic. Large and heavy items can break down coral colonies, such as tires and metals pieces. other studies stated that more than 50% of the litter at Aqaba is plastic and the remainder are of wood, glass, cardboard, Styrofoam, metal and other materials. In addition, they found that most litter appears to be from local land-based or near shore sources, although there are some regional influences as well. The main local sources are the passenger port, the cargo port and the beach goers.</p> <p>The grounding of large commercial ship and even the small recreational boat can cause massive damage to coral reef organisms. The effects will escalate and more injury to the reef will occur during the process of removing the grounded vessel from the hard-bottom habitat</p> <p>Diving industry is growing in Aqaba with the presence of more than 27 diving centres and around 27 diving sites. Despite the importance of this industry to tourism business, but it could contribute to serious damage to coral reefs if no proper control and management approach was applied. The physical damage, which is caused, by snorkelers or divers could be in the form of kicking or brushing corals with fins, trampling, use of hands and grabbing corals to stabilize and manoeuvre across reefs and also the disruption of sediments creating sediment clouds. In addition, the direct contact of part of the divers' body (hands,</p>	<p>Aqaba Marine Park. The Royal Marine Conservation Society of Jordan (JREDS). Dive Centres. Decision Makers. Boat Glass Owners Associations. Arabs and Foreigners Tourists. Media- all forms.</p>
<b>Available Data</b>	<p><i>=&gt; Provide a brief description of each the available relevant data sets. For example: technical report or scientific papers including data on habitats and species occurring in the focused area; web-ports, excel files or databases storing data on economic activities; GIS shapefiles mapping habitat, land use, coral reefs, species distribution and other relevant spatial features).</i></p>	<i>n.a.</i>	<p><i>List the institution holding each of the datasets entry (in the same line of the corresponding dataset).</i></p>
	<p>JREDS created database for commercial fish in Aqaba since 2014 until now. within the project "Management of Local Fisheries in the Gulf of Aqaba" provided the possibility for JREDS to have reliable data on the status of fishing in Aqaba as a management tool, which ultimately aims to enhance sustainable fisheries in Jordan.</p>		<p>JREDS. Marine Science Station.</p>

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	JREDS published the guide "hard coral of Jordan" including all hard-coral taxonomy: This guide field is addressed to a broad public and its main aims are to provide an overview of the hard corals living on the coral reefs of Jordan, and an aid to their identification underwater and Assess for the first time the		JREDS.
	JREDS prepared the marine habitat map for aqaba marine park and old power station, the main achievements. It develops an updated marine habitat map for the Aqaba Marine Park, which define ecosystems and habitats as a base for future sustainable development. This map includes the followings: => Assess environmental settings, including the quantity of reef development and levels of coral cover. => Identify and prioritize various habitats/sites, which are likely to be of key conservation significance. => Geospatial analyses and heat maps for pressures and threats along the Jordanian coast in the Gulf of Aqaba. => Produce sensitivity maps for marine habitats and coastline to be used in the future		JREDS.
	State of the coast environment, report for Aqaba.		UNDP.
	Aqaba ICZM report 2014.		UNDP.
	The National Monitoring Program: In February 2000, the Aqaba Special Economic Zone Authority (ASEZA) was established and the monitoring program, becoming under the responsibility of the Environment Commission has gained additional weight and stronger recognition. The long-term outcome of both programs was the declared commitment of ASEZA to finance and manage a sustainable		ASEZA.

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	<p>Reef Check: The Royal Marine Conservation Society of Jordan (JREDS) hosted a Reef Check EcoDiver Training in Aqaba, aiming to raise awareness and knowledge about coral reefs and to build up a team of qualified divers for further reef monitoring activities at the Jordanian Red Sea coast. Aside from creating familiarity with the indicators and procedures of Reef Check, the training succeeded in raising awareness in divers to the attractiveness of Aqaba's diversity. Also, it allowed divers to witness the coral damage caused by diving, anchoring boats, and</p>		JREDS.
	<p>Coastal Environmental and Socioeconomic Monitoring at the Aqaba Marine Park: Conducted full socio-economic studies of the</p>		JREDS.
	<p>Coastal Environmental and Socioeconomic Monitoring at the Aqaba Marine Park: Full information related to water quality with 5</p>		JREDS.
	<p>Marine litter and clean up dive (several</p>		JREDS.
	<p>Integrated Coastal Zone Management: aimed to achieve sustainable integrated coastal zone development in Jordan by supporting change processes for the major organizations that work on planning and administration. Through the project, the Association sought to unify the efforts of all parties and involve them in achieving sustainable development that meets the needs, rights, and duties of all stakeholders. Including: =&gt; Coastal Management Action Plan =&gt; Legal studies showing the laws, regulations, and agreements in force in Jordan and some neighbouring countries that</p>		JREDS.