

## CONCEPTUAL OVERVIEW

### Coastal Vulnerability Index & Climate Change

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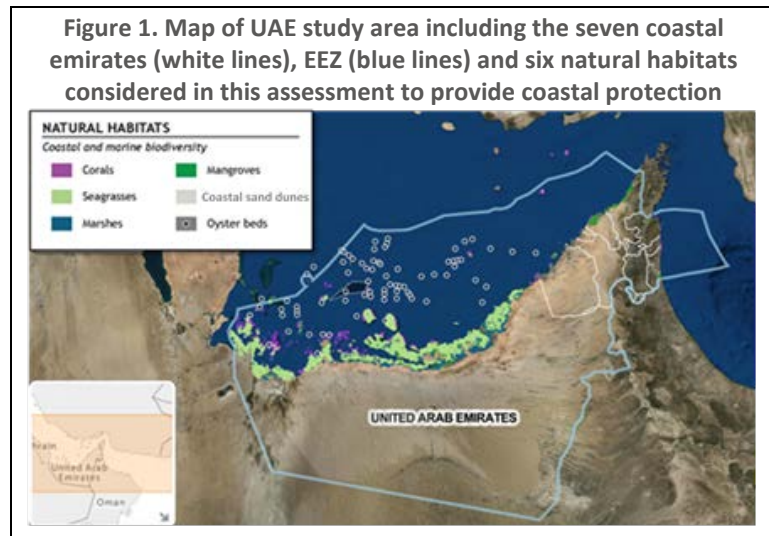
**Natural habitats provide a wide variety of benefits to people, known as ecosystem services, which are estimated to be worth between US\$127-145 trillion/year globally.** These ecosystem goods and services are an important natural resource, providing coastal communities with livelihood benefits including provisioning services (e.g., fisheries, aquaculture production), regulating services (e.g., shoreline protection and flood control) and supporting services (e.g., filtration of pollution and habitat for aquatic and terrestrial species). The challenge is also quantifying how these benefits will change under alternative climate and development scenarios and linking these results to the beneficiaries (coastal populations and land holders who demand these services).

**Faced with growing intensity of human activities and climate change, coastal communities seek a better understanding of how modifications to the biological and physical environment can affect their exposure to storm-induced erosion and flooding.** By analyzing the current distribution of shoreline protection services provided by coastal-marine habitats, we can assess their role in future protection of coastal settlements. This information can be used to assist decision-making from the national level to emirate and local levels. The role of habitats can be useful metric towards designing coastal plans and developing specific recommendations for development, rehabilitation and restoration strategies in the UAE coastal zone.

**In view of these factors, this sub-project focuses on an assessment of near-term coastal zone vulnerability to the UAE associated with sea level rise and other risks from coastal hazards.** Past studies of climate change impacts along coastal zones in the UAE have been undertaken from a long-term planning perspective. However, planners today in the UAE need of actionable information amenable to their near-term planning horizons. One vulnerability assessment approach that can meet this need is the “coastal vulnerability index” (CVI). A CVI can provide insights on issues of near-term concern to planners such as the relative risk to existing infrastructure, recommendations for coastal protection priorities, strategic land development offset zones, and potential set-aside areas for future protection.

**The overall goal of the CVI & Climate Change sub-project is to quantify the spatial distribution of vulnerability to hazards along the UAE coastline.** To do this, the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) has been used. InVEST is a coastal vulnerability model that calculates an exposure index based on the distribution of coastal

habitats, elevation, wind and wave characteristics, shoreline type, relative sea level change and surge potential. The model couples information about *physical exposure* (the location of people and property where hazards may occur) with *social exposure* (populations and property highly exposed to coastal hazards) to identify vulnerable coastline, people, and assets within the coastal zone. The model produces a variety of outputs, including a shoreline protection metric that characterizes the relative *role of habitats*. The spatial extent of the assessment is shown in Figure 1, the key objectives of the summarized in the bullets below:



- Develop a better understanding of the situation on the ground – hydrodynamics and storm regime of the area; extent and frequency of past erosion and flooding from hazards; socio-economic context and coastal development trends; current habitat extent and trends; and management options / adaptation strategies under consideration.
- Design alternative future scenarios to highlight the importance of biodiversity in different coastal zone locations and promote real protected areas. These scenarios consider potential impacts to natural habitats as a result of climate change and anthropogenic pressures as well as different snapshots of sea level rise for the Arabian Peninsula.
- Evaluate the current distribution of coastal protection services and also identify potential future value, including co-benefits of management and restoration actions (e.g., habitat conservation/rehabilitation) that can maintain or enhance benefits such as tourism, nursery habitat for fish, blue carbon storage and sequestration and water filtration services.

**In addition to assessing near-term coastal vulnerability, this research also sets the stage for the identification of important co-benefits resulting from potential habitat conservation and rehabilitation activities.** Certain habitat types may not factor as high in relation to coastal protection but are critical for other socio-economic benefits or their ecological role in connectivity, larval transport and supply to important areas. The CVI model is one approach to communicate nature’s benefits to people (“ecosystem services”) and can serve as a foundation for forthcoming natural capital mapping efforts in the region. All results are being integrated in an online mapping platform called the “CVI Inspector” which currently is available at (<http://www.ccr-group.org/coastal>).