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Review

# Improving management of future coastal development in Qatar through ecosystem-based management approaches

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ABSTRACT

The coastline of Qatar is a rich mosaic of productive and diverse ecosystems including mangrove forests, intertidal mudflats (sabkha), seagrass beds, and coral reefs. These ecologically interconnected ecosystems contain a substantial proportion of Qatar's total biodiversity, and support an estimated 97% of the >US$ 67 million in annual commercial fisheries, the highest value resource sector after petroleum. The extreme environmental conditions that characterize Qatar has led to fauna that are robust compared with other regions, but makes them highly sensitive to further pressure from anthropogenic stress. These vulnerable ecosystems have come under increasing pressure in recent decades as a result of dramatic expansion of coastal development, and threats to these ecosystems are likely to accelerate in the coming years as Qatar's economy and population continue to grow. Although environmental regulation had historically lagged behind the rapid pace of development, in recent years Qatar's leadership has aggressively expanded environmental management as a result of the growing awareness of the importance of coastal ecosystems. While these improvements are encouraging, management remains challenged by its current sectorial, project-driven focus. Ecosystem-based management (EBM) offers an opportunity to overcome these challenges by integrating impacts from across all major activities in multiple sectors and considering their cumulative effects on ecosystem services and products. While an EBM approach would require modest reprioritizing of existing processes and attention to addressing deficiencies in data needed to support decision making, it has the potential to greatly enhance the efficiency and effectiveness of coastal zone management. The article closes by summarizing a recently initiated research project on coral reefs and seagrass beds in Qatar which can serve as a model for development of the EBM approach for other coastal ecosystems in Qatar.



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## 1. Introduction

### 1.1. Qatar: a rapidly growing nation

Qatar is a peninsular nation (11,437 km$^2$) that extends north from mainland Arabia into the central Arabian Gulf (Fig. 1). Due to its geography, Qatar's borders are almost exclusively surrounded by sea, with over 550 km of maritime coastline and only a 60 km land border it shares with Saudi Arabia. Established in 1971, the country has experienced rapid population and economic growth since the late-1970's oil boom (see Fig. 2), with further accelerated urban and industrial development taking place since the discovery of natural gas fields in the 1990s. These fields hold the second largest gas reserves in the world (Economides and Wood, 2009). Today, Qatar is among the world's richest nations, with its relatively small population (2.54 million in 2016) having among the highest per capita income in the world (WorldBank, 2016).

Due to its long historic involvement in maritime trade (Carter, 2006; Caspers, 1971; Facey, 1987), urban development has mainly occurred in coastal areas. Virtually the entire population of Qatar resides in its capital city of Doha (92%), and major industrial centers supporting oil and gas and chemicals manufacturing, ports, desalination facilities and related industries extend along much of the eastern coastline north and south of Doha (Richer, 2008). In recent years development has also grown to include the previously underdeveloped northern and west coasts of Qatar under continued economic and population expansion.

While expanding urbanization and industrialization has been a

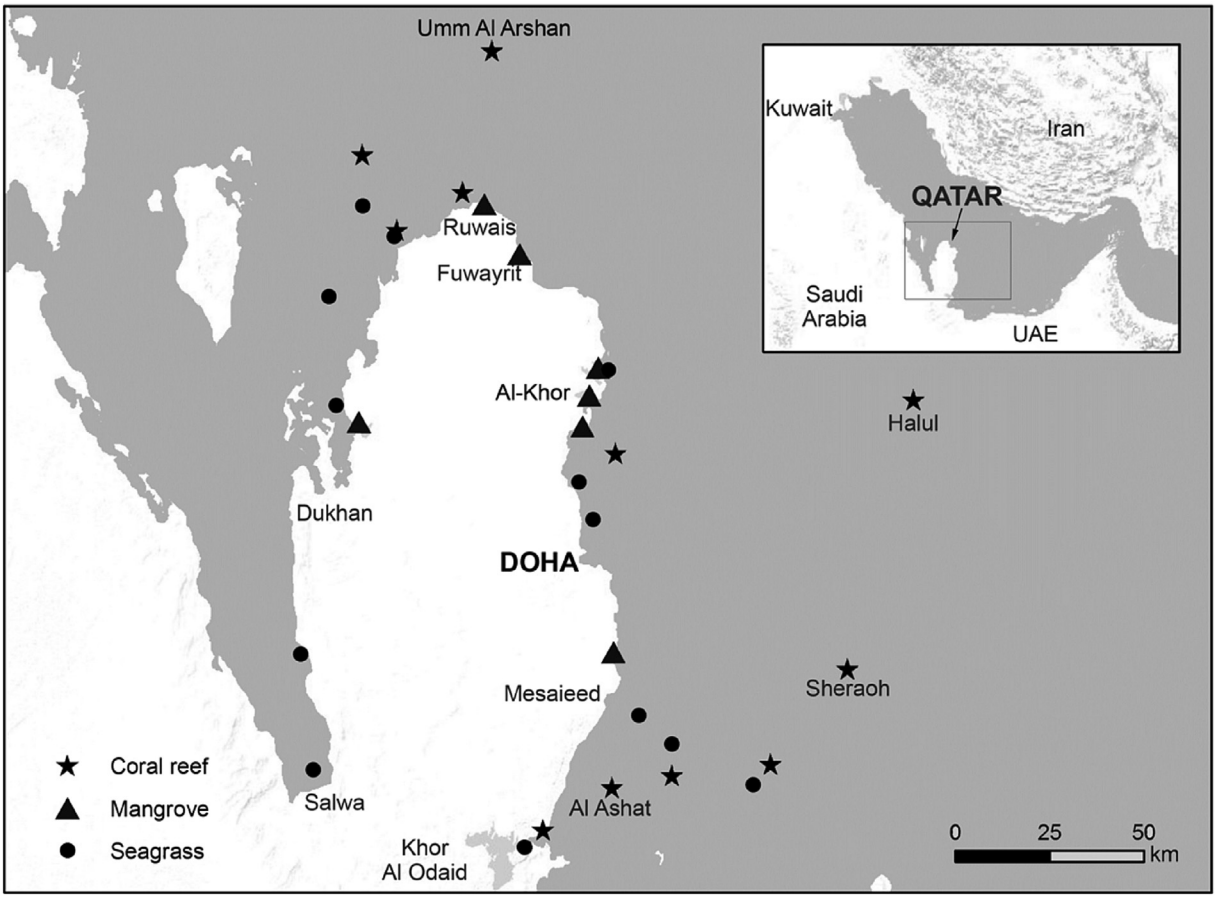


**Fig. 1.** Map of the location of major coral reef, mangrove, and seagrass ecosystems in coastal and marine systems of Qatar (See Supp. Tab. 1 for additional details). Note: this map includes only confirmed major sites, and additional habitats are likely to exist.