



Iraqi shoreline stability: a review of recent geological and engineering research

Hiba Ahmed Mahdi¹ · Raid Aziz Mahmood¹ · Wisam R. Muttashar² 

Received: 9 September 2024 / Accepted: 8 May 2025
© Saudi Society for Geosciences and Springer Nature Switzerland AG 2025

Abstract

This research has extensively reviewed previous studies of the dynamics of the Iraqi shore zone that is characterized by low-lying plains of mudflats and situated in the northwest of the Arabian Gulf. To ensure a comprehensive and critical evaluation of the existing literature, the methodology in this research entailing categorizes that research interested in shoreline changes into several groups based on their main scope: shoreline change-related studies, sedimentary-focused studies, and coastal engineering studies. The research then deduced the findings of these research groups in two ways: firstly, the long-term reduction of water discharges from the Shatt al-Arab River due to upstream water management projects has led to decreased sediment supply, exacerbating erosion, and altering the shoreline geomorphology; secondly, the construction of new coastal marinas, notably the Grand Faw Port (GFP), has the potential to mitigate erosion along specific segments of the coastline even though the long-term impacts remain inadequately studied. The previous research on the Iraqi coastline most likely shows fragmented and insufficient to comprehensively understand the region's coastal dynamics and then assess critical natural hazards, such as erodibility and sedimentation rates. This critical gap exists in knowledge and has severely limited ability to predict and mitigate coastal hazards. The most significant conclusion that emerged from this review study is that the Grand Faw Port (GFP) construction most likely caused the Iraqi seashore to split into two areas, the western and the eastern, each of which has distinctive features.

Keywords Shoreline change · Sedimentation · Erosion · Human impact · Khor Abdullah · Shatt al Arab

Introduction

Shoreline dynamic, due to erosion and accretion processes, is a complex phenomenon that is influenced by a variety of factors, including natural fluvial, waves, and tide processes, as well as human interventions such as breakwaters and marinas (Sytnik et al. 2018; Saengsupavanich 2022; El-Masry 2022; Fernández-Hernández et al. 2023). Understanding shore instability over time allows future adaptations and designing appropriate mitigation measures to be recommended (Dede et al. 2023; Tiede et al. 2023). The Iraqi shoreline and Shatt al-Arab estuary environments have

been much studied through focusing on depositional and erosional features and their effects on the coastal area (Dar-moian and Lindqvist 1988; Albadran and Albadran 1993; Albadran 1995; Albadran et al. 2002; Al-Aesawi et al. 2020). Unstable sedimentation and erosion processes in the area have been the subject of much research in various fields. Despite these substantial efforts, it appears that they still lack a comprehensive grasp of these matters. There is likely to be disagreement in the literature on how sedimentation and erosion rates have changed over time across these studies (Muttashar et al. 2024).

Furthermore, the majority of these studies were likely conducted in isolation, without integration for easy correlation. This lack of integration has hindered the ability to provide a comprehensive picture of the risks, including erodibility, movement rates, and erosion sediment rates. For instance, previous research on sedimentation processes (Albadran and Albadran 1993; Albadran et al. 2002; Al-Aesawi et al. 2020) has done an outstanding task of evaluating depositional processes and shoreline change, but it has

Responsible Editor: Amjad Kallel

✉ Wisam R. Muttashar
wisam.muttashar@uobasrah.edu.iq

¹ Geology Department, College of Sciences, University of Basrah, Basra, Iraq

² Marine Science Center, University of Basrah, Basra, Iraq