

# **Understanding the palaeo-environment of Rann of Kachchh, western India through Holocene: implications to Harappan Civilization**

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The evolution of Rann of Kachchh through Holocene holds in its heartland the clues for the rise and decline of the famous Harappan Civilization in the Indian Subcontinent. Decline of such an advanced human settlement has always intrigued researchers to study the effect of past climate and environment on contemporary human habitation. Contradictory theories have suggested that the Rann was a marine gulf and the decline of the Harappan Civilization occurred due to the withdrawal of the sea, while other studies implicated the changing summer monsoon intensities for the rise and abandonment of human settlements in this region. This study therefore attempts to understand the palaeo-environmental conditions of this region from the Rann sediments, which are an important archive of the Holocene. Carbon isotopic ratio ( $^{13}\text{C}/^{12}\text{C}$ ) of bulk organic matter (OM) in sediments is an important palaeo-environment proxy as it records the signature of the ambient vegetation. The bulk OM  $\delta^{13}\text{C}$  values measured from the Rann sediments indicate predominance of terrestrial organic matter as sediment organic carbon source. But as the Rann is a marginal marine setting, the contribution of marine OM cannot be ruled out on the basis of bulk OM  $\delta^{13}\text{C}$  values only. Therefore, to decipher the actual source of organic carbon, oxidation of the bulk OM is done further, to dominantly remove the marine and labile terrestrial OM if present. The similar  $\delta^{13}\text{C}$  values of both bulk and oxidised OM indicate that the sediments likely do not contain marine OM and is dominated by resistant terrestrial OM. In the study area,  $\text{C}_3$ - $\text{C}_4$  vegetation reconstruction from the oxidised OM  $\delta^{13}\text{C}$  values clearly records the Meghalayan Age drought period with a significant increase in the  $\text{C}_4$  photosynthesizing plant groups favoured in dry and arid climate. It also implies that the weakening of Indian Summer Monsoon was likely the driving factor behind the decline of the Harappan Civilization.