

PREFACE

The Arabian Sea indeed experiences fewer cyclonic storms than the Bay of Bengal, earning the former the title of a “cyclone shy” body of water. However, recent studies have shed light on the change in this trend, rendering the Arabian Sea the subject of increased cyclonic landfalls – the source of the change emanates from climate change, particularly increased greenhouse gas emissions and increased water levels. As a result, low-lying areas like the Rann of Kachchh and the Gulf of Khambat are the most vulnerable to seeing inflows of rising sea levels. A 2018 paper by 11 hurricane scientist authors also points fingers at human-caused climate change as a major contributor to the increase in severe cyclonic activity over the Arabian Sea.

Roxy Koll, a climate scientist associated with the Pune-based Indian Institute of Tropical Meteorology (IITM), opines that the Arabian Sea has demonstrated the most rapid warming rate across tropical oceans – recording an increase in surface temperature of 1.2-1.4 degrees Celsius between 1982 and 2018. In a similar vein, research between 1891 to 2020 troublingly highlights a spike in the frequency of “very severe cyclonic storms” in recent years over the Arabian Sea.

To illustrate, the Arabian Sea witnessed Cyclone Maha in 2019, which intensified while running parallel to the Indian coast, albeit weakening upon its eventual landfall near Gujarat. In the same year, Cyclone Vayu arose from the Arabian Sea; although it effected moderate damage in Gujarat, it was successfully marked as the strongest cyclone to have hit the state since 1988. More recently, Cyclone Tauktae reached the pinnacle of the trend of increasing intense cyclonic activity over the Arabian Sea in 2021. It was the fifth-strongest tropical cyclone on record in the Arabian Sea, with a peak intensity of 120 mph winds and a central pressure of 950 mb, according to the Indian Meteorological Department. Most remarkably, it also brought floods to the low-lying coastal regions of Saurashtra.

The silver lining to be noted here is that (except for Cyclone Tauktae) the increasing frequency of cyclones has not yet threatened the west coast of India directly, as the bulk of the impact is borne by the coasts of Oman and Yemen. Nevertheless, the National Disaster Management Agency has taken cognisance of the increased threat posed by increased cyclonic activity over the Arabian Sea and its resultant threat to the states on the west coast along with West Bengal,

and implemented Phase II of the National Cyclone Risk Mitigation Project in 2015. The success of this project, however, remains to be seen.

In this backdrop, the Coastal Vulnerability Index (CVI) has emerged as the most commonly used metric to evaluate the risk associated along the coastal region due to multiple impacts from physical, environmental, social, and economic drivers during post-hazard events. The main aim of this study is to map the storm surge vulnerability of Kachchh district in Gujarat based on a calculation of a Total Vulnerability Index, so that it will give an idea of which talukas of the district need more focus and how storm surges can be adapted to in those regions. The vulnerability of areas to storm surge has been estimated using indices such as Exposure index, Sensitivity Index and Adaptive Capacity Index which incorporate determinant factors of storm surge vulnerability. The research findings will assist coastal disaster managers and decision makers to plan appropriate measures to minimize the losses due to storm surge impacts.