Assessing Coastal Geomorphology Impacts on Algal Blooms in Johor Bahru Water Territory

Mohd Nadzri Md Reba (1,2), Fatin Nabihah Syahira Ridzuan (1), Monaliza Mohd Din (3), Mazlan Hashim (1,2), Po Teen Lim (4), Zaharah Ibrahim (3), Mohd Firdaus Abdul-Wahab (3)

[1] Faculty of Built Environment & Surveying, Universiti Teknologi Malaysia, 81310, Johor Bahru, Johor, Malaysia

[2] Geoscience and Digital Earth Centre (INSTeG), Research Institute for Sustainability and Environment (RISE), Universiti Teknologi Malaysia, Universiti Teknologi Malaysia, 81310, Johor Bahru, Johor, Malaysia

[3] Department of Biosciences, Faculty of Science, Universiti Teknologi Malaysia (UTM), Johor Bahru, Malaysia

[4] Institute of Ocean and Earth Sciences, University of Malaya, 16310 Bachok, Kelantan, Malaysia

Email: nadzri@utm.my; fatinabihahsyahira@gmail.com; monaliza_mdin@yahoo.com; mazlanhashim@utm.my; ptlim@um.edu.my; zaharah@utm.my; firdausw@utm.my

Abstract: Malaysian bays are considered vulnerable to the impacts of climate change and frequented with Harmful Algal Blooms (HABs). In addition to the expected rise in sea level, shoreline erosion, population pressure, interference of land-use, and lack of institutional capabilities make major challenges. Increasing frequency and distribution of bloom is often associated with environmental issues and economic losses, as their presence impacts on aquaculture and fisheries. Recent study reported the occurrence of bloom in Johor Bahru water territory in 2014 and 2015 that caused fish mortality in aquaculture cage. Therefore, assessing coastal geomorphology impacts are fundamental for monitoring blooms in the Johor Bahru water territory. Conventionally, ground survey and in situ measurement has been practiced measuring the coastal geomorphology and bloom detection. Yet, such acquisition limits and the historical data due to obsolete data and loss of documentations and remains challenging. Sensors on-board satellite platforms has served various and continuous medium resolution optical imageries for decades, offering an alternative, cost-effective approach to routinely detect and monitor phytoplankton and coastal geomorphology. By using medium resolution satellite remote sensing observations (Landsat OLI), in conjunction with available in situ data measurements (chlorophyll-a), this paper aims to assess coastal geomorphology impacts on the bloom in Johor Bahru water territory from 2017 and 2018. The coastal geomorphology conditions and chlorophyll-a (Chl-a) were analysed by using remote sensing data and validated using in situ measurements. This study indicates that the phytoplankton is induced by the agricultural and urban runoff, that brings high concentrations of nutrients from agricultural and urban runoff are causing phytoplankton blooms in Johor

Bahru water territory. This study exhibits the possibility of utilizing a combination of satellite data of Chl-a, Digital Elevation Model (DEM), and rainfall with coastal change detection information and in situ observations to give a better understanding of the coastal geomorphology impacts on bloom.

Keywords: Algae Blooms, phytoplankton, satellite, geomorphology, chloropyll-a.