Simulation Model to Assess Tidal Potential Energy in East Coast of Malaysia using GIS

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Abstract. This article studies the GIS simulation of yearly power generation in five different tidal stations in the East Coast region of Malaysia. The tidal stations are Geting, Tanjung Gelang, Tioman, Tanjung Sedili and Cendering. The tidal station in Geting is not analysed in this study because the tidal range is insignificant. After analysing the lagoons nearby to the four tidal stations, Tanjung Gelang and Tanjung Sedili are chosen in this study based on their natural characteristics and geomorphology of lagoons. The simulation model is based on yearly power generation using tidal barrage. This article also looks into the model in terms of mapping using GIS software to obtain bathymetry and tidal range data. Bathymetry data in GIS format is obtained from NOAA (National Oceanic and Atmospheric Administration) and tidal range data is obtained from 'Jabatan Ukur dan Pemetaan Malaysia'. The latest tidal data up to date is the year 2011. The minimum depth of tidal basin should be 3.0 meter. Using GIS software to analyse bathymetry and tidal range data, the results are then combined to find yearly generation power output in the two tidal stations and are plotted in one map for each tidal station. The area of basin in Tanjung Gelang and Tanjung Sedili are 17.736 km² and 27.919 km². The calculation includes the important parameters such as area of basin, tidal range, number of tide cycles per year, and number of hours per tide. From the results and analysis, it is concluded that Tanjung Sedili and Tanjung Gelang produce 25.0 GWh and 21.6 GWh as their yearly power generation in 2011.

1. INTRODUCTION

A tidal phenomenon is a sea water movement in sequence due to natural entity [1]. Tidal and its wave are different as their relationship is hard to determine. A tidal involves sea water increment and decrement, while its waves show the movement of its flow horizontally. The occurrences of tidal are because of gravitational force from solar system. Hence, tidal energy depends on the rise and fall of sea water level which forms tidal range and this leads to the creation of hydroelectricity [2].

To control the flood and ebb of the tides to drive the turbines and generate electricity, tidal barrage is used. The primary functions include to increase the depth of river, to separate fresh water from salt water, and to reduce the risk of tidal flowing up the river. Still, the usage of tidal barrage to generate electricity is the main reason for it to be built along lagoons that are suitable for tidal power generation [3].

Tidal energy is the subset of hydropower that produces electricity when tidal energy is converted.

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