Abstract—In this study, land use effect on river water quality and its subsequent impact on Johor Strait coastal water and green mussel, Perna viridis cultivated at the strait near the fast growing city of Johor Bahru, is investigated. Over the years, changes in land use and increased discharge of domestic, agricultural and industrial waste into the coastal water has severely impaired the water condition and threatened the profitable green mussel aquaculture activity. Cu and Zn concentrations in water were found to be higher at sampling points closer to Johor Bahru city while Sungai Pendas and Sungai Melayu which are less developed yielded lower pollutants concentration. The heavy metal concentrations (in mg/L) are between 0.18 to 0.38 for Zn and 3.24 to 3.44 for Cu. Coastal water recorded Zn concentration (in mg/L) of 0.03 to 0.05 and Cu concentration of 0.25 to 0.33 while green mussels recorded (in μg/g) 18.24 to 40.01 of Zn and 24.29 to 92.52 of Cu.

Index Terms—Johor strait, land use, perna viridis.

I. INTRODUCTION

One way for economic development is through urbanization. Urbanization increases the economic activities and also human population. However, runoff from urban areas is one of the main sources of contaminant such as causing the increase in toxic content, temperature and changing of water chemical composition. Industrialization and urbanization promote develop of socio-economy but they also add to environmental problems, causing large amount of heavy metals to enter soil, water and air yearly through various pathways [1]. Urbanization and industrialization increase water pollution and environmental deterioration prompted needs to study on this matter [2, 3].

Johor Straits is located along the west coast of peninsular Malaysia. Currently, there are rapid land use activities for development near the coastal area of Johor Strait [4]. The effects of changing land use on marine communities are of concern as coastal populations increase at tremendous rates [5]. Land use areas generate both nonpoint and point sources of pollutants. Metals, industrial organic chemicals, nutrients, and pesticides are the main pollutants in the Johor Strait owing to the anthropogenic activities of the agricultural and chemical industries [6]. As areas of natural vegetation are increasingly being used as agricultural and urban land, it is important to evaluate the effect of these transformations on water quality. Pollution of natural environment by toxic chemicals is could give bad impact to human and wildlife via bioaccumulations.

Over the years, the coastal water of Johor Strait which acts as a border between Singapore and Malaysia is being contaminated by pollutants from tributaries like Sungai Perapat, Sungai Bahan, Sungai Melayu, Sungai Skudai and etc. Changes in land use are inevitable because Johor Bahru city centre is undergoing intensive urban development and redevelopment since the early 1980’s. Such intense growth transformed Johor Bahru from pre-war type of shop houses to highrise commercial buildings. Large scale clearing of land for residential, commercial, and industrial development has also taken place.

One of the main aquacultural activities at Johor Straits is the farming of green mussel, Perna viridis. Green mussels occur widely in shallow waters along the west coast of Peninsular Malaysia. They have become a food resource especially in Malaysia, which, at one time, exported them [4]. Green mussels are harvested commercially in the Indo-Pacific region as a human food resource owing to their dense and fast growth. Moreover, the harvesting of green mussels can have economic, ecological, and human health impacts. Green mussels are used as a biomonitoring agent for heavy metals because they are commercially important seafood species worldwide [7, 8].

Mussel cultivation is an important source of income as it generates millions of ringgit per year. It is extensively cultivated in Johor Straits and has been aqua-cultured for a few decades [9]. However, degradation of water quality may affect farmers who make their living through aquaculture of green mussels. Besides, there are also cultivations of other seafood such as fishes that provides income for aquaculture farmers. Therefore, both economic and social impact may occur if the water at Johor Straits is polluted. The aim of this study is to investigate the effect of land use along the Johor Strait which is highly urbanized near Johor Bahru and less urbanized towards the west side. Therefore, the objectives of this study are to determine the effect of different land use on the water quality at tributaries; to correlate Zn and Cu concentration at tributaries and receiving coastal water and to compare the coastal water Zn and Cu concentration with Zn and Cu in green mussels.