

CHAPTER 3

MATERIALS AND METHODS

3.1 INTRODUCTION

In this chapter, the location, geography, geology, the climatic conditions of the study area and the methodologies of wastewater, surface water, sediments and water quality index are described. Moreover, it also includes the methodologies of wastewater treatment by bioremediation. In addition, the selection of monitoring stations, parameters measured, planning of sampling methodology and sampling frequencies, methods of laboratory analysis, statistical analysis, contamination intensity, different procedures, formulas, guidelines to evaluate pollution and kinetics study also discussed.

3.2 STUDY AREA

3.2.1 Location and Geography

Gebeng industrial estate is the study area of this research. It is one of the potential industrial areas of Malaysia. The industrial park is situated between the coordinates of 03 ° 59 ' 12 " N and 103 ° 22 ' 32 " E. Gebeng town is about 20 km far from Kuantan city and near Kuantan port. The two rivers namely Bhalok and Tungguk are flowing through the industrial area which ended into the South China Sea (Sujaul et al., 2013). It prevailed that before industrialization Gebeng was a green valley included into Paya Tanah Merah forest. Now the forests are very much vulnerable and located in the coastal areas.

Industrial development in Gebeng area has been started since 1970s. Initially the small scale industries like wood processing, metal ducting, concrete ducting, pipe coating facility, detergent etc were the main industries. But since 1990s the medium and large scale industries started their journey those are petrochemicals, chemicals, metal builders, polymers, metal works factories, steel industries, air products, energy, oil and gas industries. The heavy industries are active in Gebeng area such as Lynas, MTBE-Petronas, Polyplastics Asia Pacific Sdn. Bhd, BP chemicals, Kaneka, Asturi metal buliders, Eastman chemicals, Kertih, Palm oil factories etc (Hossain et al. 2013).

3.2.2 Climatic Condition

Malaysia is located near the equator. So, its climate is equatorial as well as hot and humid around the year (Swee-Hock, 2007). As Gebeng industrial estate is located adjacent to coast, therefore it belongs to sunny climate (Marshall Cavendish Corporation, 2008). There are two seasons dry (summer) and wet (rainy); dry season extended from April to September, while the wet season extended from October to March. At summer season the high temperature is observed whereas the high rain fall found in wet season. Sometimes the high rainfall has been found that causes surface runoff and the surface soils are washed away and mixed with surrounding watersheds. The average temperature and precipitation of the study area are presented by (Appendix C).

3.2.3 Geology of Gebeng Industrial Estate (GIE)

The soil of GIE is formed with the Quaternary alluvium and peat. Granites are found in bed rock formation in some areas, basalts also found in south west Balok area. Furthermore, sedimentary rocks are reported in Bukit Balok area. In accordance with Quaternary Geological Map the GIE is formed by the alluvium, peat and silts of Beruas and Simpang Formation. The upper parts of the soils are comprised of gravels, clayey sandy gravel, clayey sandy, organic clay and peat. It is reported that the upper alluvium posses very soft and medium plasticity (Lynas, 2008).

3.3 SELECTION OF MONITORING STATIONS

3.3.1 Industrial Wastewater Sampling Stations

The studied wastewater was collected from the point sources. A survey was conducted to select the monitoring stations for industrial wastewater sampling. It was made on the basis of point and non-point sources, location of the industries, type of industries, channel of wastewater discharging and by using GPS. To cover the whole industrial area, the six technical points were selected for wastewater sampling (Figure 3.1).

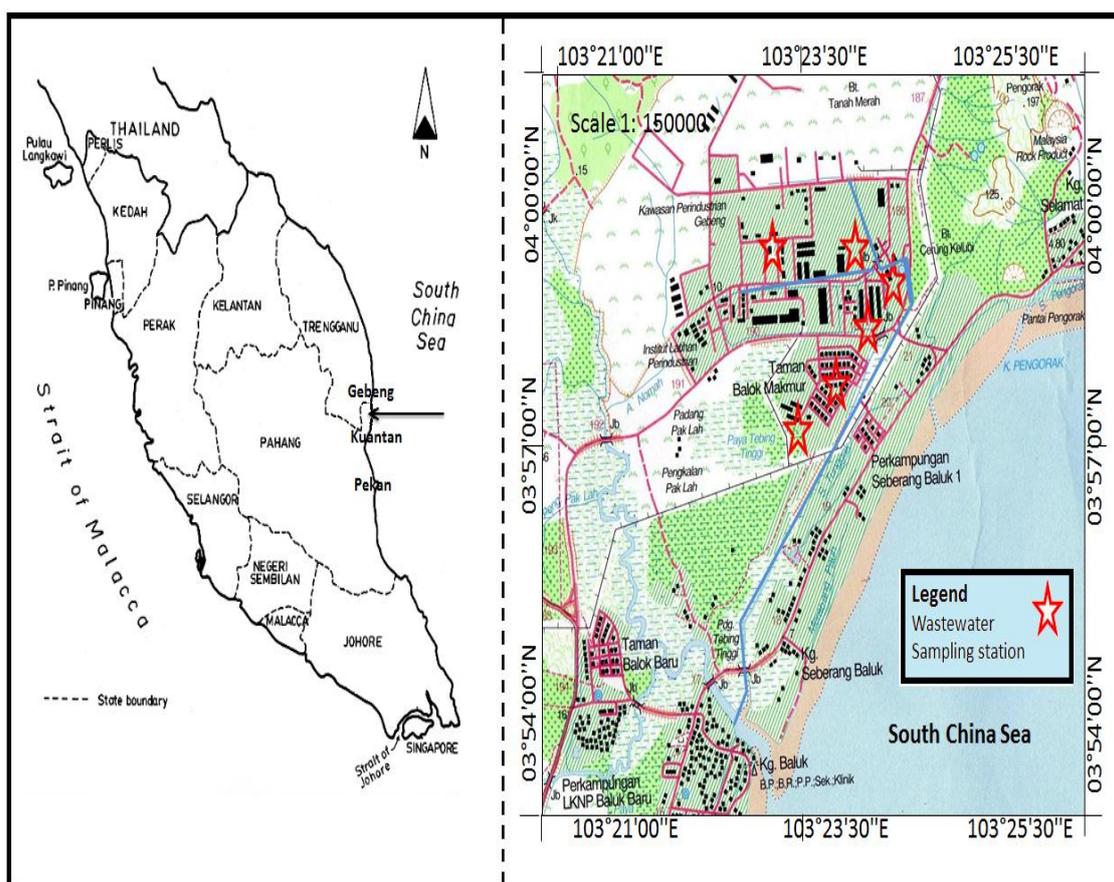


Figure 3.1: Map of the study area showing industrial wastewater sampling stations