Physicochemical Characteristics of River Water Downstream of a Large Tropical Hydroelectric Dam

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1. Introduction

Dam and reservoir construction in river courses are booming all over the world for hydropower generation, flood control, irrigation, and water supply. In Malaysia, there are about 80 dams that have been built where majority of the dams are for water supply in most of the states of Peninsular Malaysia including Sabah while hydropower dams are the most common in the states of Sarawak and Perak [1]. Among them, Sarawak owns the largest hydropower project in Malaysia with an installed capacity of 2,400MW of electricity and the second tallest concrete rock filled dams (205 m) in the world which is the Bakun hydroelectric dam. The dam is situated on the Balui River, a tributary of the longest river in Malaysia, the Rajang River. It is impounded in 2010 and reached its full supply level in 2012 where the flooded area is over 695 km² [2, 3].

The physicochemical parameters of the Bakun dam reservoir have been studied in pre- and postimpoundment condition [2, 3]. However, studies on the tropical regulated downstream river of the dam are limited though it is also subjected to major environmental impacts ranging from downstream morphology to biodiversity of the ecosystem [4–10]. Downstream impacts of the dam can sometimes extend up to a distance of hundred kilometers from the dam site [11], although the intensity of the impacts tends to decline with increasing distance from the dam site [12, 13]. Dams can change downstream hydrology by altering the flow pattern which subsequently change the water quality of the downstream river [14–19]. Thus, it is of scientific importance to investigate and evaluate the water quality changes induced by dam construction and operation.

Despite the substantial size of the Bakun hydroelectric dam and its potential impact on the downstream river, the