

## Impact of agricultural activities-motor vehicles and e-waste on sediment characteristics of the Serin River, Malaysia\*

LING Teck Yee, Cornellia MUREK, LEE Nyanti

(Faculty of Resource Science and Technology, University Malaysia Sarawak, Kota Samarahan 93400, Malaysia)

**Abstract:** Sediment is a sink for organic materials, nutrients and heavy metals and sediment condition affects the overlying water. Though Serin River is a source of drinking water, agricultural and waste disposal activities in the watershed may impact the sediment of the river. Therefore, the objective of this study was to investigate the organic matter, nutrients and heavy metals in the sediment of the Serin River. Five stations were selected for sediment sample collection. Results of the study show that organic matter (OM) ranged from 0.7% to 5.9%, TP was 100-366 (mg/kg), TAN was 16-141 (mg/kg), TON was 550-3019(mg/kg), and TKN was 566-3160 (mg/kg). Sediment oxygen demand (SOD<sub>20</sub>) ranged from 5.6 to 14.2 (g O<sub>2</sub>/m<sup>2</sup>/d). Among the five stations OM, TKN, and SOD of the sediment were second highest at the two stations downstream of animal (fish, chicken and pig) farming. TP and TAN were the second highest at the station downstream of fish farming and third highest at the station downstream of pig farming. Zn, Cu and Cd ranged from 132-357 (mg/kg), 26.7-96.7 (mg/kg) and 4.0-19.3(mg/kg). According to USEPA guideline, sediments at four stations were heavily polluted with Zn, Cu and Cd whereas the station that was farthest upstream, near a village, was slightly polluted with Zn and Cu. This study indicates that animal farming has an impact on the organic matter content, nutrients (N and P), oxygen demand and heavy metals of the sediment. Motor vehicles and discarded e-waste also contributed to the heavy metals in the sediment. Farm effluents and storm water should be treated and e-waste recycled to protect the water quality of the river for its designated use.

**Key words:** sediment oxygen demand; sediment characteristics; heavy metals; e-waste

### 1. Introduction

River sediment is a sink for organic materials, nutrients and heavy metals. Sources of organic materials include waste discharged into the water bodies and naturally occurring aquatic plants and animals<sup>[1]</sup>. The Serin River is a source of drinking water. However, agricultural activities including pig, chicken and fish farming and cultivation of crops may impact the sediment quality. Studies indicated that the water at the tributary that received animal farm effluent showed low dissolved oxygen and high nutrient content<sup>[2]</sup>. However, no study has been conducted on the sediment of that river.

Organic materials in the sediment may exert a demand on the oxygen of the overlying water resulting in low dissolved oxygen which can threaten the lives of aquatic organisms. According to Nelson, et al.<sup>[3]</sup>, the Klang River in Malaysia was reported to show low dissolved oxygen due to the high oxygen demand of sediment that rests on the bottom during neap tides and was resuspended during spring tides. Organic phosphorus liberated by bacterial communities will result in an increase in total phosphorus in the upper layer of sediment which may lead to eutrophication<sup>[4]</sup>. For aquaculture, negative effects include organic pollution and eutrophication due to excessive buildup of nutrients and waste<sup>[5]</sup>. Xiangxi River in China was reported to have high concentrations of phosphorus in

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Cornellia MUREK (1987- ), female, research assistant; main research field: environmental chemistry. E-mail: cornellia\_m@yahoo.com.

LEE Nyanti (1959- ), male, Ph.D., associate professor; main research field: aquaculture and fish ecology. E-mail: lnyanti@frst.unimas.my.

**Corresponding author:** LING Teck Yee (1960- ), female, Ph.D., associate professor; main research field: engineering science. E-mail: tyling@frst.unimas.my.