Field Study of Riparian Zone along Sarawak River at Bintawa, Kuching

Darrien Y.S. Mah and Allan P.P. Pui
Department of Civil Engineering, Faculty of Engineering, Universiti Malaysia Sarawak
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Abstract – Natural riparian zones are increasingly valued in recent years as they provide a variety of beneficial functions to the environment and possess substantial economic value. In this regard, it is necessary to call for simultaneous protection of the environment and promotion of economic growth. In this writing, a field methodology is presented for the purpose of riparian wetland conservation; it is used to investigate the riparian health through studying vegetation cover, human activities and groundwater table. Healthy riparian zones can be achieved through the balancing of riverbank human activities with maintaining the functionality of wetlands, which can be done by assessing the groundwater level a nd the amount of lush vegetation. A functioning riparian zone is found with a mean of 12% human activities in the range of 0 to 17.86%, within an area along the water edge measuring 100 m x 100 m. It is only natural that the higher the percentage of the wetland vegetation that is flourishing, the more the riparian zone is functioning well.

Keywords**:** Anthropogenic, Ecosystem, Floodplain, Riverbank, Urbanisation, Wetlands.

I. BACKGROUND

A riparian zone is an area of transition between land and water [1]. It supports some of the most productive ecosystems as rivers are conduits to support a diverse selection of vegetation and wildlife [2]. In most parts of the world, riparian zones are extensively modified. When humans live close to streams, riparian zones are exposed to exploitation and alteration. This disturbance would begin to affect the delicate ecosystem balance that once existed naturally. The frequent and intense disturbances due to increasing human activities may create problems in maintaining the balance of ecosystem functions.

One important question is raised: "How much change can riparian zones tolerate in relation to human disturbances?" In response to that, studies are therefore needed to understand the implications of human-related activities on riparian zones [3]. Indicators can be developed to gauge the health of wetland ecosystems [4].

II. METHODS

This study has been carried out at Bintawa, located east of Kuching City. Bintawa is a light industrial estate sandwiched between the Sarawak River in the north and residential houses along its southern fringe. The main objective is to detect and assess changes of this stretch of riparian zone. The selected location is suitable for this study due to the presence of natural vegetation and human disturbances within the riparian zone. Three selected indicators—human activities, vegetation cover and groundwater table can be easily assessed. Hence, with the known conditions and functions of the existing riparian zone, these three indicators—vegetation cover, groundwater table and human activities within the system provide clues about the impacts of human disturbances on the riparian conditions. Figure 1 below shows how the assessment is done.

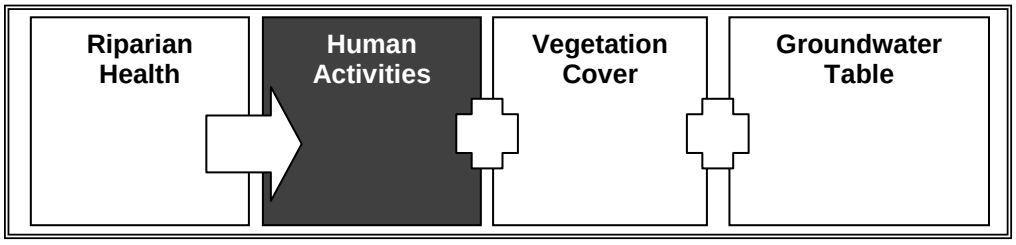

Figure 1: Framework to Assess Human Impacts on Riparian Health

Darrien Y. S. Mah is with the Department of Civil Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia. (Tel: 082-583207, Fax: 082-583409, e-mail: ysmah@feng.unimas.my).
Allan P.P. Pui is a Civil Engineer who graduated from the Faculty of Engineering, Universiti Malaysia Sarawak.

For this study, 100 m x 100 m sampling plots are delineated to assess vegetation cover and human activities, a method common to biologists [5]. Although the range of riparian width varies, 100 m x 100 m plots are preferred rather than smaller plots as the former cover adequately the vegetation and human activities along the river edge. Twenty-three (23) plots are marked out along the riverbank, as shown in Figure 2. Assessment is basically carried out by analysing the spatial relationships between the earth's features and events [6]; this is done by utilising the Environmental System Research Institute (ESRI)'s ArcView GIS software. Based on the layout of vegetation cover and human activities within the sampling plots such as concrete drains, roads, parking lots and buildings, the GIS produces a mapping of distribution, abundance and interspersion of the two land uses [7].

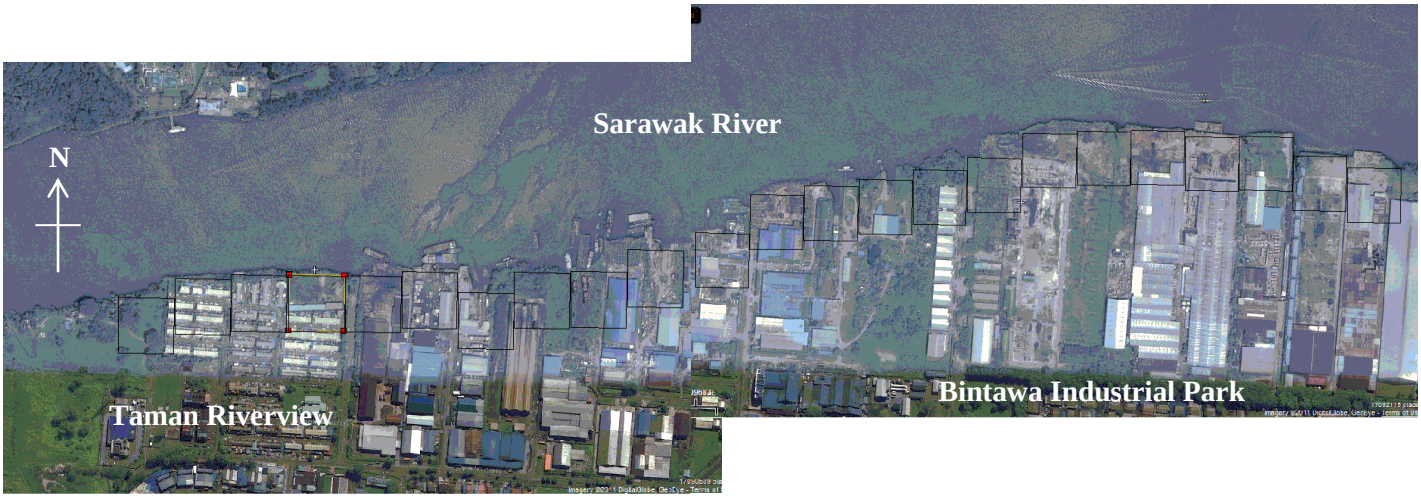

Figure 2: Study Area with Delineated Sampling Plots

III. Results and Discussion

Observation at Site

Bintawa is a mixed-use area comprising factories, garages and residential houses. Most of the industrial establishments are constructed with riverside embankments and jetties along the riverbank of Sarawak River, as shown in Figure 3. These developments have negatively affected the natural riparian zone. The soil type of the riverbank is naturally peat soil. However, the construction of embankments with building materials such as concrete, stone, and timber has changed the soil characteristics.

The native vegetation consists of coconut palms, nipah palms, areca, and sago palms [8]. Most of the native vegetation has been destroyed by human activities. However, healthy small trees, shrubs and grasses are found along the riparian zone, as shown in Figure 4. These plants are periodically maintained by the City Council. The observed vegetation species are physiologically adapted to a greater amount of groundwater compared with the upland species [9],[10]. The well-being of the riparian zone is perceived to be relatively straightforward given the lushness of vegetation growth in the tropical environment, as demonstrated through the stark contrast between the bare grounds in Figure 3 and the greenery in Figure 4.

Figure 3: Jetties and Riverbank Conditions in Bintawa

Figure 4: Common Vegetation in the Study Area