

## AN ASSESSMENT OF LAND USE SURROUNDING HYDROPOWER RESERVOIRS USING REMOTE SENSING IN SARAWAK, MALAYSIA

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**Abstract:** The existence of a complex river system in Sarawak has contributed to the abundance of its water resources. The State is drained by 22 major river basins and has a combined installed capacity of hydropower potentials of approximately 20,000 MW of sustainable energy. However, little has been documented on land use around these hydropower dams. The current study is aimed at understanding the general land use composition surrounding the existing and planned hydropower reservoirs in Sarawak. The land uses surrounding these dams are expected to influence the livelihood, water discharge and water quality of the dams. A total of ten sites were selected and land use surrounding these study sites identified using Remote Sensing and Geographic Information System tools. Temporal assessment on land-use changes was only conducted for Batang Ai. The study found that a total of six sites have higher forest cover (> 50%) compared to built-up and agricultural lands and showed that 85% variation in built-up land is explained by reservoir area. Agricultural land has increased at the mean rate of 2.25% within 500 metres distance from Batang Ai reservoir shoreline. The findings of this study will hopefully contribute to the knowledge of hydropower reservoir planning and management.

Keywords: Reservoir shoreline, forest cover, hydroelectric planning, sustainable energy, green economy, Borneo.

### Introduction

Dams are typically designed to store water and have played an integral role in the early history of many civilisations (Luis *et al.*, 2013). The International Hydropower Association's (IHA) Hydropower Sustainability Assessment Protocol (HSAP or the "Protocol") defines 'reservoir' as "any artificial pond or lake used by the project for storage and regulation of water", and reservoir area as "the area that is inundated when the reservoir is at its maximum expected level and the dry buffer zone above this level" (IHA, 2018). In Malaysia, there are at least 73 man-made lakes that have been created for purposes such as water supply, irrigation, hydropower generation, and flood mitigation (Luis *et al.*, 2013).

The hydropower potential in Malaysia is identified at 29,000 MW (Hosseini & Wahid, 2014). Eighty-five per cent (85%) of the

country's hydropower potentials are found in East Malaysia (Ali *et al.*, 2012). Bakun Dam (2,400 MW), which was built on Balui River of the Upper Rajang River Basin in Sarawak, has the largest hydropower installed capacity in Malaysia. The state of Sarawak, located on the island of Borneo, has a total land area of 124,450 km<sup>2</sup> and is drained by 22 major river basins. Its three largest river basins are Batang Rajang (approximately 50,000 km<sup>2</sup>), Batang Baram (approx. 22,000 km<sup>2</sup>), and Batang Lupar (approx. 6,500 km<sup>2</sup>) (Department of Irrigation and Drainage Sarawak, n.d.). In the year 1981, the Master Plan for Power System Development for Sarawak was completed. Known as the SAMA study (1981), the document identifies the potential combined installed capacity and energy production for hydropower in Sarawak as 20,000 MW and 87,000 GWh, respectively. Currently, 17.3% (3,452 MW) of Sarawak's hydropower potentials have been developed at Batang Lupar