

## **On the optimal tilt angle and orientation of an on-site solar photovoltaic energy generation system for Sabah's rural electrification**

### **ABSTRACT**

An ongoing project to implement a mini standalone solar photovoltaic (PV) generation system of 2.5 kWp capacity at the eco-tourism centre of Liogu Ku Silou-Silou (EPLISSI), Sabah, was initiated in 2019. Since the solar panel support (ground mounting) used in this project will be erected separately, the main goals of this study are to estimate the optimum tilt angle,  $\beta_{opt}$ , and orientation for the solar PV modules. To achieve these goals, the Liu and Jordan isotropic diffuse radiation model was used (1960). Another three isotropic diffuse sky radiation models (Koronakis model, Badescu model, and Tian model) were applied to estimate the optimum tilt angle with the orientation kept facing due south. For verification purposes, the PV power output data obtained from an online PV simulator known as Global Solar Atlas or GSA 2.3 was used and compared to the results of the four isotropic models. The results suggest that the Tian model is more suitable for approximating insolation, as it was proven to have the lowest difference among all models and is in close agreement with the result of the optimum tilt angle provided by GSA 2.3. However, the outcomes demonstrated from the isotropic models propose an error up to 30% (in the range of 31% to 32%) as compared to GSA 2.3.