Determination of an eligible location for installation of a solar panel system in the University of Kelaniya using GIS

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According to the international energy agency, the role of renewables continue to increase in the electricity, heating and cooling and transport sectors. Newly develop technology in photovoltaic cells that have the potential to dramatically increase solar power generation in the next two decades. Being closer to the equator, Sri Lanka has a great opportunity to have solar energy throughout the year almost 5-6 hours per day. Sri Lankan power supply organizations are mainly depending on diesel, coal and hydro power. Still we do not have enough sources to supply electrical energy throughout the country. All the energy sources except hydro power are not considered as environmental friendly since they emit high amount of carbon to generate power. Being the first Green University in Sri Lanka, University of Kelaniya has initiated many approaches for energy conservation within the University. This study was carried out to find out the most suitable location within the University for installation of a solar panel system using ArcGIS software. For this, surface area of roof of buildings, height of buildings, elevation of the land, disturbance from other structures such as buildings and trees were selected. Map layers were created by using high resolution satellite image. Surface elevation profile was created by using available contour lines. Building layer was digitized from the satellite image using ArcGIS software. After overlaying all layers together suitable roofs were selected for the solar panels to install. In order to find possible energy in the area, meteorological data was collected including minimum and maximum atmospheric temperature, rainfall, and sunshine hours from Welisara meteorological station which is the nearest meteorological station to the University. The mean values of meteorological parameters obtained for the past 8 months were as follows; maximum atmospheric temperature of 28.28 ^{0}C and minimum of 26.02 ^{0}C, rainfall of 171.92 mm and sunshine hours were 7.6 hours. After selecting suitable buildings from the map, visual observation was done to calculate roof area of each building manually. The building with the highest surface area and minimum disturbance from adjacent structures was selected as the best suited location. The best suited location was selected and also it shows the highest monthly average consumption of electricity among other university buildings. Apart from that suitable lands also can be considered. But as the availability of lands in the university premises is a limited factor, priority was given to the rooves of the buildings. It is easy to make 3D view of the University by using 3D Analyst, if there is a higher resolution Digital Elevation Model (DEM). Roof structure and the shape can be used to maximize the efficiency of solar panels. GIS can be used as a supportive tool in optimization of determining the best suited location for the solar panel installation.

Keywords: Meteorological data, Renewable energy, Satellite image, Solar panel installation, GIS