ASCERTAINMENT OF HYDROPOWER POTENTIAL SITES IN HUNZA RIVER BASIN USING LOCATION ANALYSIS ALGORITHM

ADVISOR

DR. MUHAMMAD WASEEM

Submitted by

ENGR. ASIM QAYYUM BUTT
(2016-MS-HPE-02)

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
University of Engineering and Technology, Lahore, Pakistan

2019

ABSTRACT

Hydropower is one of the most environmentally friendly forms of energy with the least emissions of greenhouse gases among all the types of new and renewable energy. In addition, about 70 percent of economically feasible hydropower potential still exists to be developed in the world, especially in developing country like Pakistan. It is also expected that hydropower generation could potentially provide sufficient amounts of alternative energy, especially in Pakistan, where efforts are being made to reduce the use of fossil fuels and there is an abundance of potential sites. The success of hydropower development depends on its economic efficiency determined by the performance characteristics of power generation according to types of hydropower plant and their location and constraint criteria. Since the performance characteristics considerably depend on the geographical and hydrological conditions, hence, accurate location analysis is critical for Hydropower development. Although there are abundant of potential sites available in northern area, however, lack of natural consensus and optimal approach, Pakistan is still facing severe issues of water scarcity, and energy shortage. Hence, in current study, the search for Hydropower potential sites in Hunza river basin has been carried out using proposed location search algorithms (LSA), which includes weighted average performance evaluation of alternatives. Thirteen Sites/alternatives were selected from upstream to downstream of Hunza River. Head is calculated by elevation difference between proposed intake point and turbine location. The calibrated Area Ratio Method was used to calculate discharges at each proposed site and then the percentile discharge was calculated from Flow Duration Curves. Multi-criteria decision making (MCDM) method was applied to make decision matrix considering the location and constraint criteria and then

normalizing the decision matrix, relative weights were assigned to all criteria by Rank sum weighted method and the sites were ranked on the basis of the final score. Based on final score in LSA approach, Site 13 (36.084 N, 74.292 E), Site 4 (36.617 N, 74.852 E) and Site 9 (36.307 N, 74.665 E) were concluded as the best locations among all thirteen alternatives. Moreover, this study could be step forward for the future preliminary study of hydropower development in Pakistan.