

Feasibility Study of Small Hydropower Schemes Using RETScreen Software as Decision Support Tool in Giba and Worie Subbasins of Tekeze River, Ethiopia

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Abstract

The untapped small hydropower potential of Ethiopia has not been given much attention yet that can contribute for green power development in poverty reduction and sustainable development. The main objective of this research work is to evaluate the technical and economic feasibility of small hydropower potential sites using RETScreen in Giba and Worie subbasins which are part of the Tekeze River Basin, Ethiopia. Ten (10) SHP potential sites were verified for economic/financial feasibility analysis from Giba and Worie subbasins (20 potential sites). Rainfall records from ten stations in the Giba and six stations in the Worie catchments were used to compute the areal rainfall over the two catchments. Stream flow records from seven gauging stations in Giba and one gauging station in Worie catchments were used for hydrological analysis. The discharge for ungauged hydropower potential sites was transferred/estimated using the runoff coefficient method. Topographic map and Digital Elevation Models were used for analyzing watershed delineation, river networks, location of the potential sites and gauging stations, Thiessen Polygon network construction, area of contributing catchments and measuring civil work components using GIS. The viability of the hydropower potential sites was analysed using RETScreen software. RETScreen is available free, runs on Microsoft Excel platform and uses empirical equations to calculate the output and costs of the renewable energy projects, helps as decision support and capacity building tool. Based on the RETScreen generated results Meskila-1, Meskila-2, Meskila-3, Genfel-1, Genfel-2 and Suluh were feasible with total power of 3591kW, but Genfel-3, Genfel-4, Agulae and Giba dam site are not viable from Giba subbasin. All except site W-7 (783kW) are not viable in Worie subbasin. In general, most of the run-of-river plants are not feasible; though there is suitable gross heads for SHP development, there is high variability of stream flows.

Keywords: Small Hydropower, Financial Parameters, Feasibility, RETScreen