Investigation into Water Level, Volumetric Flow Rate and Economical Aspects and their Effect on the Optimum Capacity of a Hydropower Plant on the Nkusi River in Uganda

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In 2014 the Intergovernmental Panel on Climate Change recommended the reduction of total annual anthropogenic emissions . One recommended solution is to diversify into more carbon-neutral electricity generation. Hydroelectric power offers a scalable alternative to fossil fuels. In light of this my extended essay is an: Investigation into water level, volumetric flow rate and economical aspects and their effect on the optimum capacity of a hydropower plant on the Nkusi River in Uganda. After a visit to the river to collect data, the next step in the investigation was to find a relationship between the depth of the river and its flow. Therefore depth measurements throughout the whole year could be converted into flow data. To create an independent variable, the graph of the power based on the flow was restricted at different values of power. This simulated the effect altered power plant capacities would have on the work done over a year. These values for work were then used, along with the price of electricity at different capacities, to find the annual income each power plant would generate. The cost of building each power plant was then calculated and the ratio of income and cost was graphed against capacity to illustrate my conclusion. The essay concludes that the optimal capacity for maximized return on investment on the Nkusi River at the point chosen was 1.5MW. This is subject to change if a different point on the river had been used, if the flow rate changed or the government altered their subsidies. A similar analysis of data from other rivers including in Norwegian ones would also be valid and help reduce dependence on fossil fuels and aid in economic development.

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