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Selection of hydropower plants based on socio-environmental assessment and the use of fuzzy logic

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When you are prospecting a hydroelectric potential or, in a next step, making the inventory of a watershed or river, one has to evaluate, in a preliminary way, the technical, economic, environmental and social developments and the possible arrangements prospected.
However, on these steps, the specific knowledge of the sites is still very low, and the possibilities of arrangements are enormous. It has to be made a selection to allow a deeper understanding of the hydro-energy sites, and the sequence of studies, such as the development of basic designs, development of structural calculations, energy, etc.., leading to an evaluation consistent economic.
The preliminary assessment is based mainly on designer's experience, but even this is not sufficient for a comprehensive selection. One has to establish attributes that can be evaluated according to some perspective. This paper presents a methodology most adequate treatment of uncertainties inherent in the task described, is the difficulty of establishing the attributes and compose them properly, due to the complexity of classifying them. We seek to work with qualitative variables, rather than simply quantitative. Characterizations will be discussed technical-economic and socio-environmental impacts of hydroelectric projects.
The model adapts to market developments, which are common in the development of plants. The basic math is fuzzy logic, which, combined with a significant database on plants and expert analysis, leads to the selection of appropriate tooling alternatives, the level of prospecting or inventory. When analyzing a hydroelectric this can be characterized based on its merits (technical-economic characteristics and socio-environmental), which may be classified broadly into "good, average and bad".
Regarding the technical-economic characterization, this is accomplished by analyzing the physical characteristics of the arrangement of hydropower projects, such as declivity, reservoir area, power, dam length and height (constructive volume) and stretch with reduced flow. These combined features create quality indexes technique called: hydraulics (IQH), dam (IQB), capture-refund (IQCR), deviation (IQD), flood (IQI) and power (IQP). It's noteworthy the difficulty to obtaining these physical characteristics of these stages of exploitations studies (prospectation and/or inventory). So, is a normally used estimated value, which strengthens the position of using less conventional methods as the use of Fuzzy Sets.
The socio-environment characterization was based on the characteristics of the Matrix for the Evaluation of Environmental Impacts, that includes characteristics of aquatic and terrestrial ecosystems, territorial organization, way of life and economic base, creating indexes of environmental quality: resource water and aquatic ecosystems (IQRH), physical environment and terrestrial ecosystem (IQMF), territorial organization (IQOT), population way of life (IQMV) and economic base (IQBE).
Obtained the indices of quality (technical and environmental), and combined among themselves (with the aid of fuzzy logic) were evaluated and analyzed dozens of hydroelectric dams on the study and obtained preliminarily, the levels of these exploitations.
They were given three approaches to obtain the final index of quality of development areas (combination of technical and environmental indices): technical overview (larger weight in the index - technical IQTAP), environmental vision (greater weight on the environmental index - IQAAP) and technical-environmental (weighting of the indices - IQTAAP). The simulation results proved to be consistent and effective in preliminary assessment of development areas, obtaining as a result, a preliminary ranking of the arrangements and exploitations studied, thus facilitating the later studies of viability.