



Hydrological flow modelling with SWAT: a useful GIS based tool to assess hydropower production.

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Europe's pursuit of climate neutrality by 2050 necessitates innovative strategies in renewable energy deployment. The European Union has championed policies to harness clean energy sources as hydroelectric energy. This study delves in Piedmont region (North-West of Italy), evaluating its residual potential for run-of-river hydroelectric plants.

More in detail, the research focuses on the Sangone catchment, aiming at performing a regional-scale study made to identify the best sites for potential hydroelectric plants. To ensure alignment with European Union biodiversity and environmental conservation directives, particularly the *Habitats Directive* and *Birds Directive*, the research prioritizes sites that are not in areas dedicated to environmental protection.

Moreover, the study includes landscape analysis and evaluation of geological and geomorphological constraints, such as landslide and hydraulic hazard, and technical and economic feasibility of plants.

After that, utilizing freely accessible data encompassing temperature, precipitation, land use, and soil characteristics specific to Piedmont, the study employed the *Soil and Water Assessment Tool* (SWAT). This GIS-integrated hydraulic model extrapolated flow rate metrics for water catchment areas devoid of direct measurement, optimizing site selection for maximal hydroelectric energy yield. The simulation used 17 years of meteorological data from 42 measuring stations and the model was run over the Sangone stream catchment. The model has also been calibrated to simulate runoff in the Sangone catchment. The outputs divide the stream in sections with equivalent potential power production.

Preliminary findings underscore the effectiveness of SWAT by using free data and free tools. It can be a useful planning tool for hydropower implementation by locating sites suitable for run-of-river plants, considering environmental impact and geo-hydrological hazard. As Europe navigates its green transition, such integrative approaches emphasize the feasibility and sustainability of hydroelectricity as a linchpin in the continent's renewable energy matrix.

