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A concept for sustainable and digitalized hydropower going beyond the sustainable hydropower sustainability tool

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The EU energy policy has the ambitious objective to become the first carbon-neutral continent in the world. In order to achieve this objective hydropower will have to play an essential role as energy source and energy storage in pump storage facilities. Hydropower is a clean, low carbon, and cost-efficient energy source that can be exploited sustainably if an adequate management system is implemented. Nevertheless, in the past, hydropower operations have led to conflicting interests over water usage, impacts on aquatic flora and fauna, and significant socio-economic implications. In order to avoid and mitigate possible negative consequences of hydropower plants the **Hydropower Sustainability Assessment Protocol** (HSAP, <https://www.hydr sustainability.org/>) provides a helpful tool to minimize related impacts. In this presentation we will delineate how the 26 topics of the HSAP could be complemented in order to provide a fully digitalized sustainability framework for hydropower. In particular, we will outline innovative solutions for the most challenging topics of sustainable hydropower plants, including i) energy supply securing with a high share of renewable energies ii) climate change impacts on water resources and hydropower production, ii) altered flow and changed turbidity dynamics in rivers, iii) long-term downstream effects on river beds and groundwater exchange, iv) degradation of river ecology, v) socio-economic impacts on local stakeholders, vi) adequate assessment of the water-energy-food nexus, vii) near real time digitalisation framework to streamline information. Through the digitalization of the HSAP a standardized and transparent flow of information will be guaranteed. Within the presented digitalized framework, all data will be processed to standardize, harmonize and synthesize results and information from all working tasks into a data lake. We may apply this framework to demonstration hydropower plants of different types to improve their sustainability, efficiency and management.