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Modeling the impact of a hydropower reservoir on the habitat of a megaherbivore in the Black Volta Basin in Ghana, West Africa

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The Black Volta watershed is approximately 134 000 km2 in size at the gauge at Bamboi. It is part of the main 414 000 km2 Volta system. The Volta river was dammed at Akosombo in 1965 resulting in the largest man-made lake in the world, the Volta Lake.

The Bui dam is a new 400 MW scheme currently under development on the Black Volta River in the Bui national park in Ghana. The reservoir created by the Bui barrage is expected to impact (through inundation) the habitat of two species of hippos know to exist in the park, the Hippopotamus amphibius and the Choeropsis liberiensis. Computer-based models present a unique opportunity to assess quantitatively the impact of the new reservoir on the habitat of the target species in this case the H. amphibious. Until this undertaking, there were very few studies documenting the habitat of the H. amphibious let alone model it. The work and subsequent presentation will show the development of a habitat model for the Hippopotamus amphibius.

The Habitat Information retrieval Program based on Streamflow Analysis, in short HIPStrA, is a one dimensional (1D) in-stream, spatially explicit hybrid construct that combines physico-chemical evidence and expert knowledge to forecast river habitat suitability (Hs) for the Hippopotamus amphibius. The version of the model presented is specifically developed to assess the impact of a reservoir created by a hydroelectric dam on potential dwelling areas in the Bui gorge for hippos. Accordingly, this version of HIPStrA simulates a special reservoir suitability index (Rsi), a metric that captures the "hippo friendliness" of any lake or reservoir.
The impact of measured and simulated flood events as well as low flows, representing extreme events is also assessed. Recommendations are made for the operating rules of the reservoir in the post-construction phase of the dam.

A great deal of work has been done on the effects of stream flow changes on fish especially salmonids. Very little work however has been done assessing the impact of hydropower schemes on aquatic mammals especially in Africa. HIPStrA is the first attempt at developing a computer-based habitat model for a large aquatic megaherbivore. The need for energy for development, the availability of large rivers and a rich biodiversity base in Africa makes a case for careful and ecological smart exploitation. The overarching aim of the study is the sustainable development of hydroelectric power through the use of methodologies and tools to rigorously assess changes in instream conditions that impact aquatic mammals.