

Developing Climate services for Energy through the FOCUS-Africa project: hydropower resources application in Malawi



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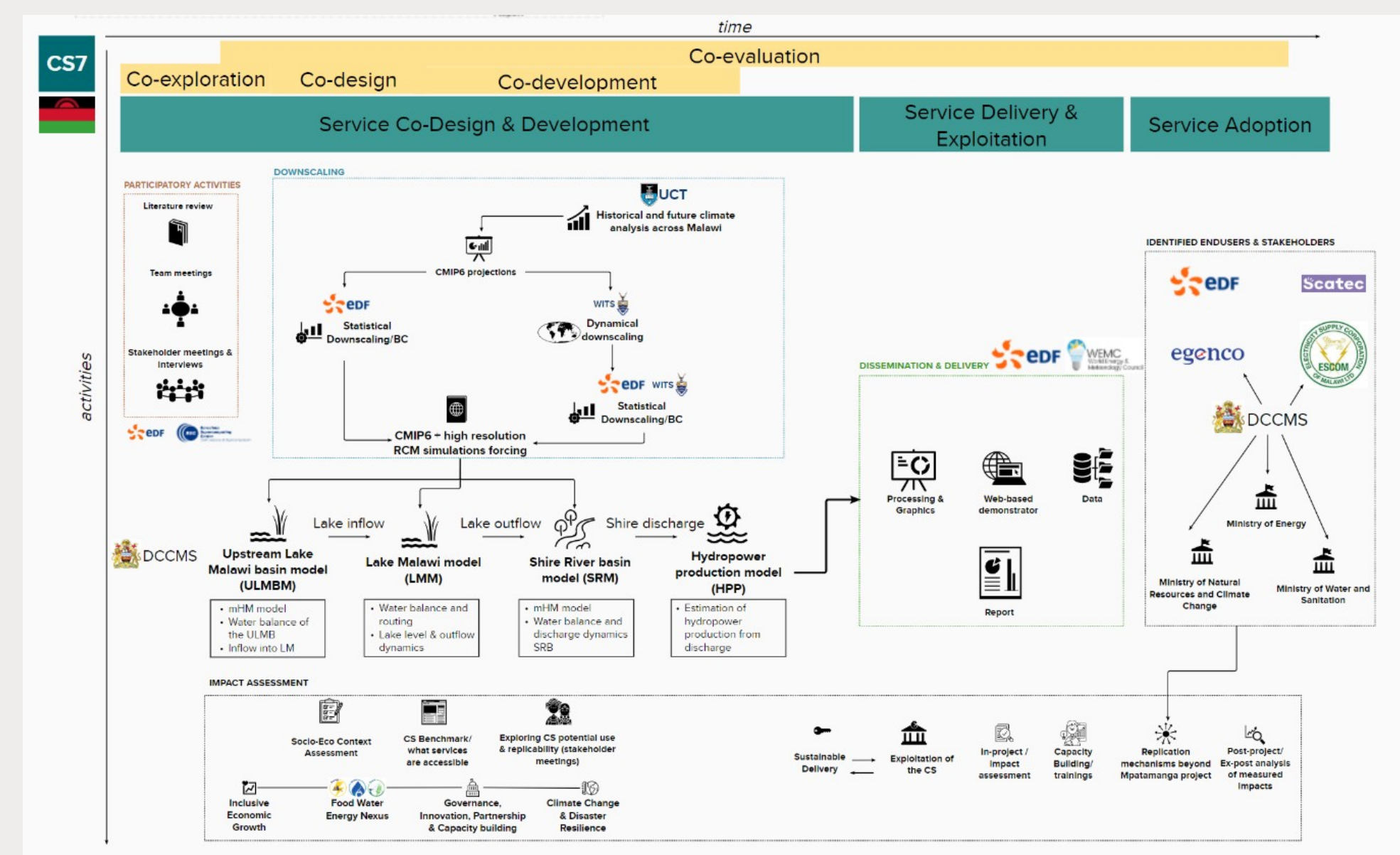
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1. Introduction

Malawi is heavily dependent on hydropower, which accounts for 88% of the country's total generating capacity. However, the electricity access rate of about 11% remains very low with a large disparity between rural (1%) and urban areas (46%). The local government plans to increase access to electricity to 30% by 2030.

This study focuses on the impact of climate change on the hydropower resources in Malawi and in particular for the Mpatamanga project. Located on the Shire River, the Mpatamanga hydropower project (350 MW) is the first project of its kind in Malawi. It will increase by 80% the total installed generation capacity of the country. And is expected to provide electricity to approximately two million people and help to save 520,000 tons of CO2 emissions per year.

5. The climate service



6. Conclusions

The country mission was fundamental to understand the local context and the real needs for the climate information. It allowed us to identify the strong interconnections between the different socio-economic sectors and the need to build a climate service that take into account all these aspects in order to be useful for all end-users and not only the energy sector. Training the local stakeholders to use and to maintain the climate service is also very important for the prosperity of the climate service beyond the lifetime of the European project.

2. General context

Lake Malawi provides up to 90% of the Shire River's water flow. Below a lake level of 471.5 m (asl), there is no water discharge.

Recent studies have shown (Bave et al., 2020 and Mtilatila et al., 2020) that climate change could have a strong impact on water resources and the lake level which can drop below the critical threshold in a sustainable way under certain climate change scenarios.

3. Objective

Part of FOCUS-Africa project, the main goal of this case study is to build a climate service which provides a tailored and comprehensive climate information to inform the different stakeholders about the climate risks on the water resources in Malawi. For the energy sector the climate service will focus on :

- Future water resources sustainability in a climate change context.
- Evaluate the risk that the lake level drops (sustainably) below the critical threshold.
- Impact of future water needs (share with other sectors) on the Lake Malawi level.

4. The country mission

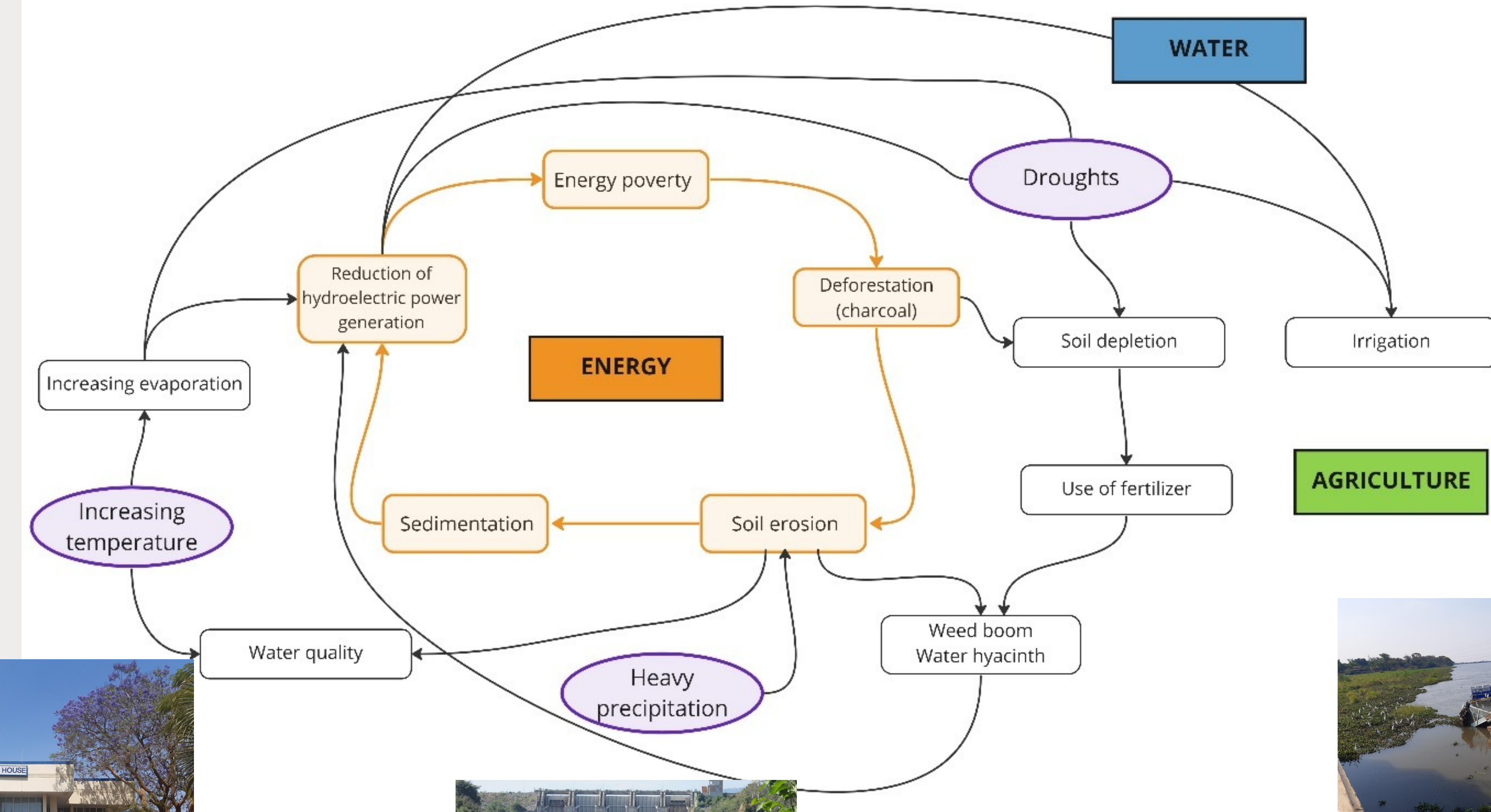
The FOCUS-Africa country mission to Malawi took place in October 2022. The mission included partners active in two case studies within the FOCUS-Africa project for Energy & Food Security.

Interviews with representatives from 8 stakeholder institutions and visits to the Mpatamanga project site, several weather and gauging stations, Nkhula hydroelectric power station and the Liwonde barrage provided the team with a much deeper understanding of the local socio-economic context, the country's energy sector and the interlinkages among energy, water and food in Malawi.



With less than 11% access rate to electricity, Malawi is one of the hotspots of energy poverty in Africa and in the world. Energy poverty has led to large-scale deforestation for charcoal mining leading to severe soil degradation increasing the risk of soil erosion and depletion.

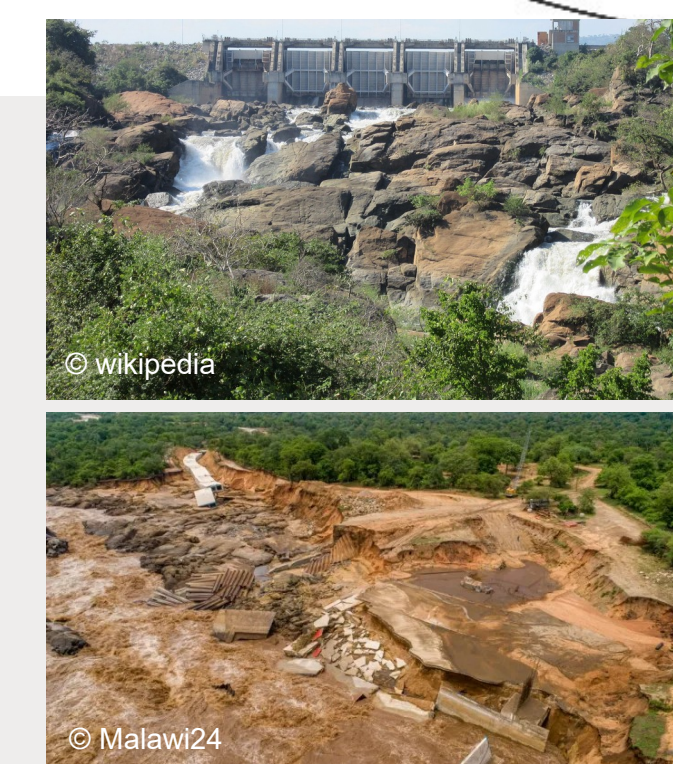
Water-Energy-Food nexus



Excessive sedimentation in the Shire River have reduced the water flow and contributed to substantial disruptions in electricity generation, forcing shutdowns for repairs and maintenance and ultimately reducing electricity supply and reliability.



Drinking water quality depends on temperature and water turbidity. Heavy precipitation and deforestation cause strong erosion, which causes high water turbidity. This increases the risk of developing water contamination by infectious diseases such as cholera, which decreases water treatment capacities and therefore also decreases the production of drinking water. Additionally, the increasing water temperature leads to the proliferation of infectious diseases at temperatures above 25 °C.



On 24 January 2022, the Tropical Storm Ana hit the Kapichira dam and power station causing huge damage and leading to an estimated lost of 130 MW in generation capacity, equivalent to about 30% of national output. Assessing the impact of climate change on the future evolution of this type of event is fundamental.



Present in most parts of the Shire River the water hyacinth (Namasipuni) is an issue for the hydropower generation. Among the fastest-growing plants, the water hyacinth impede power generation by blocking the turbines and conducting to frequent power interruptions. In a climate change context the increasing temperature may be favorable to the development of the water hyacinth (You et al. 2013)