Building a climate service for hydro-power resources: Application to Mpatamanga project in Malawi

Hiba Omrani, Lila Collet, Sara Octenjak, Roberta Boscolo, Lucy Mtilatila, Piotr Wolski, Omari Hamisi, Amos Mtonya, Audrey Valery, Charlotte Jouet, Patricia Nayeja, Alberto Troccoli
FOCUS-Africa
A H2020 project (2020-2024)

- Developing sustainable tailored Climate Service in the Southern African Development Community (SADC) region.
- Eighth case studies for:
  - Four sectors:
  - Five countries: Malawi, Tanzania, South Africa, Mozambique and Mauritius
- EDF leads case study N°7 on Water and Energy in Malawi:
Energy & Water in Malawi

Country context

The country heavily relies on hydropower, which is projected to be increasingly exposed to large climate fluctuations:

- In Malawi, total generation capacity is 439 MW (~88% from hydroelectricity)
- Current Access Rate 10.8% (Rural: 1% Urban: 46%) → 30% by 2030

Case study 7 focuses on the impact of climate change on the hydro-power resources for the Mpatamanga project in Malawi, a one billion cost project which will increase by 80% the total installed generation capacity of the country (350 MW). EDF has signed on September 2022 a binding commercial Agreement to undertake the co-development of the Mpatamanga hydropower project together with the Government of Malawi, the International Finance Corporation (IFC) and Scatec.
Energy & Water in Malawi
The hydro-climatic context

➤ Shire river outlet:
  • Lake Malawi provides 80-90% of water flow
  • Shire river catchment provides 10-20% of water flow

➤ Lake Malawi level: below 471.5 m a.s.l --> no discharge

➤ Lake Malawi water contribution:
  • 55% : Malawi
  • 41% : Tanzania
  • 4% : Mozambic

Bhave et al., J. of Hydrology (2020)
Energy & Water in Malawi
State of the art

Bhave et al. (2020): By 2030, one model predicts a water level below the lake discharge threshold.

- Need to be updated with the latest climate projections
- Need to use a multi-hydrological modeling framework

FOCUS-Africa SC7:
- Future water resources sustainability in a climate change context.
- Impact of future water needs (share with agriculture) on the lake level.
- Evaluate the risk that the lake level drops (sustainably) below the critical threshold.
Energy & Water in Malawi
The frame-work

Service Design & Development (Implicated parties)

Fellow user: Electricité de France (EDF) International Division

Service Delivery

Service Adoption

EDF R&D

WEMC

DCCMS

WMO

BSC

WITS

EDF R&D

EDF
The field mission
Malawi: 02-08 October 2022
Meeting with stakeholders

Field visits
The field mission
Learnings: Water-Energy-Food nexus
Energy & Water in Malawi
The updated framework

Service Design & Development (Implicated parties)

Service Delivery

Service Adoption

Fellow user: Electricité de France (EDF) International Division

UCT  EDF R&D
WITS  WEMC  DCCMS
BSC  WMO

EDF R&D

EDF

SCATEC  ESCOM  Gov's Project Implementation Unit (PIU)
Ministry of Energy  EDF  EGENCO  World Bank
Ministry of Natural Resources & Climate Change  Ministry of Water and Sanitation  Malawi Energy Regulatory Authority
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.
THANK YOU
## List of hydropower stations in Malawi

<table>
<thead>
<tr>
<th>Hydroelectric station</th>
<th>Type</th>
<th>Capacity (MW)</th>
<th>Year completed</th>
<th>River</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kapichira</td>
<td>Run of river</td>
<td>128</td>
<td>2014</td>
<td>Shire</td>
</tr>
<tr>
<td>Nkhula A</td>
<td>Run of river</td>
<td>24</td>
<td>1966</td>
<td>Shire</td>
</tr>
<tr>
<td>Nkhula B</td>
<td>Run of river</td>
<td>100</td>
<td>1980</td>
<td>Shire</td>
</tr>
<tr>
<td>Tedzani I</td>
<td>Run of river</td>
<td>20</td>
<td>1973</td>
<td>Shire</td>
</tr>
<tr>
<td>Tedzani II</td>
<td>Run of river</td>
<td>20</td>
<td>1977</td>
<td>Shire</td>
</tr>
<tr>
<td>Tedzani III</td>
<td>Run of river</td>
<td>52.7</td>
<td>1996</td>
<td>Shire</td>
</tr>
<tr>
<td>Tedzani IV</td>
<td>Run of river</td>
<td>18</td>
<td>2020</td>
<td>Shire</td>
</tr>
<tr>
<td>Wovwe</td>
<td>Run of river</td>
<td>4.35</td>
<td>1995</td>
<td>Wovwe</td>
</tr>
<tr>
<td>Mpatamanga</td>
<td>Reservoir</td>
<td>350</td>
<td>2025</td>
<td>Shire</td>
</tr>
</tbody>
</table>