Specifications & Criteria for Web-based GIS Tool for Hydro

Annex I to Terms of Reference

Base Map: ECOWAS Region / Countries

The complete region of 15 countries (Google Maps) will be shown in the existing base map of ECOWREX.

The deliverable "web-based GIS mapping for hydropower" shall be based on layers which can easily be integrated into ECOWREX observatory. In the following the requested layers will be described.

http://www.ecowrex.org/mapView/index.php?legend=true&layers=layerSHydro&country=&lang=en

# Suitable Structure of Hydropower Resource Mapping

⊞ Base Map
⊞ Country Info
⊞ Infrastructures
⊟ Renewable Energy Potential
    ⊟ Resources
        ☐ Solar DNI Energy Resource
        ☐ Solar GHI Energy Resource
        ☐ Wind Energy Resource
        ⊟ Hydropower Resources
            ☐ Precipitations & Climatic Zones
            ⊟ Rivers & Resources
                ⊞ Volta Basin
                ⊞ Niger Basin
                ⊟ XYZ Basin
                    ☐ Single River Channels
                    ☐ Power Generation Potentials
                    ☐ Suitability for Plant Sizes
                    ☐ Suitability for High/ Low Pressure Machines
                    ☐ Suitability for Plant Types
                    ☐ Suitability for Any Other Combination of Above Criteria

existing

to be delivered

Layer for Precipitations & Climatic Zones

Hydropower Resources
- ☑ **Precipitations & Climatic Zones**
- Rivers & Resources
  - Volta Basin
  - Niger Basin
  - XYZ Basin
    - ☐ Single River Channels
    - ☐ Power Generation Potentials
    - ☐ Suitability for Plant Sizes
    - ☐ Suitability for High/ Low Pressure Machines
    - ☐ Suitability for Plant Types
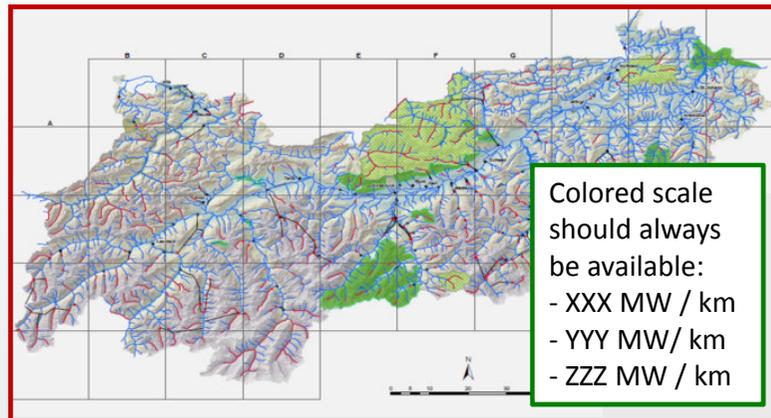   - ☐ Suitability for Any Other Combination of Above Criteria
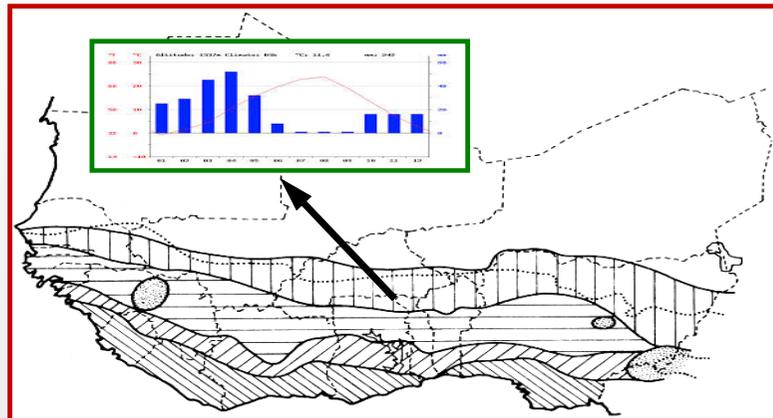
Mouse click on climatic zone!
Adequate chart with average monthly precipitation data appears.

Source of precipitation data and year of data publication shall be shown.

Layer of Single River Channels in River Basins

Colored scale
should always
be available:
- XXX MW / km
- YYY MW/ km
- ZZZ MW / km

⊟ Hydropower Resources
   ☐ Precipitations & Climatic Zones
   ⊟ Rivers & Resources
       ⊞ Volta Basin
       ⊞ Niger Basin
       ⊟ **XYZ Basin**
          ☑ **Single River Channels**
          ☐ Power Generation Potentials
          ☐ Suitability for Plant Sizes
          ☐ Suitability for High/ Low Pressure Machines
          ☐ Suitability for Plant Types
          ☐ Suitability for Any Other Combination of Above Criteria
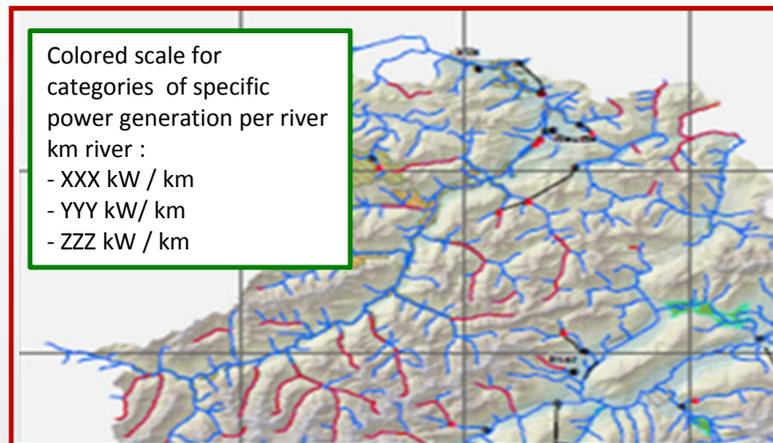
- After selection of adequate river basin: Complete river section networks in the selected basin will be shown as a layer above the ECOWREX base map.
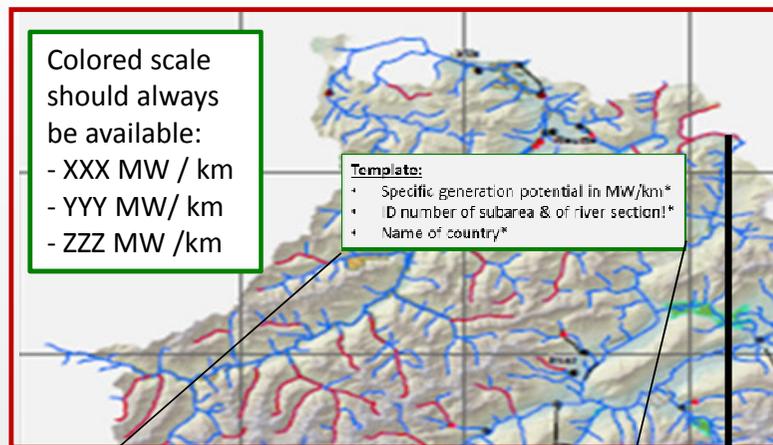
Zooming in Single River Channels of River Basins

Colored scale for categories of specific power generation per river km river :
- XXX kW / km
- YYY kW/ km
- ZZZ kW / km

⊟ Hydropower Resources
    ☐ Precipitations & Climatic Zones
    ⊟ Rivers & Resources
        ⊞ Volta Basin
        ⊞ Niger Basin
        ⊟ **XYZ Basin**
            ☑ **Single River Channels**
            ☐ Power Generation Potentials
            ☐ Suitability for Plant Sizes
            ☐ Suitability for High/ Low Pressure Machines
            ☐ Suitability for Plant Types
            ☐ Suitability for Any Other Combination of Above Criteria

After zooming-in the end user will see a detailed structure of single river sections.

The Consultant is requested to describe how he wants to visualize the river networks within the river basins. For better orientation of the end user the river basin shall be structured and visually divided into subareas with ID numbers or similar. In addition each river section should be assigned to a country.

Single River Channels of River Basins

Colored scale should always be available:
- XXX MW / km
- YYY MW/ km
- ZZZ MW /km

Template:
- Specific generation potential in MW/km*
- ID number of subarea & of river section!*
- Name of country*

□ Hydropower Resources
  ☐ Precipitations & Climatic Zones
  □ Rivers & Resources
    ⊞ Volta Basin
    ⊞ Niger Basin
    □ **XYZ Basin**
      ☑ **Single River Channels**
      ☐ Power Generation Potentials
      ☐ Suitability for Plant Sizes
      ☐ Suitability for High/ Low Pressure Machines
      ☐ Suitability for Plant Types
   ☐ Suitability for Any Other Combination of Above Criteria

Template:
- Specific generation potential in MW/km*
- ID number of subarea & of river section!*
- Name of country*

After click on a specific river section a template with the following data of the river section will be displayed.

Summary Table for all River Sections in a Basin

Summary Table

Name of selected basin:
Identification number of selected river section:
Some nice information:

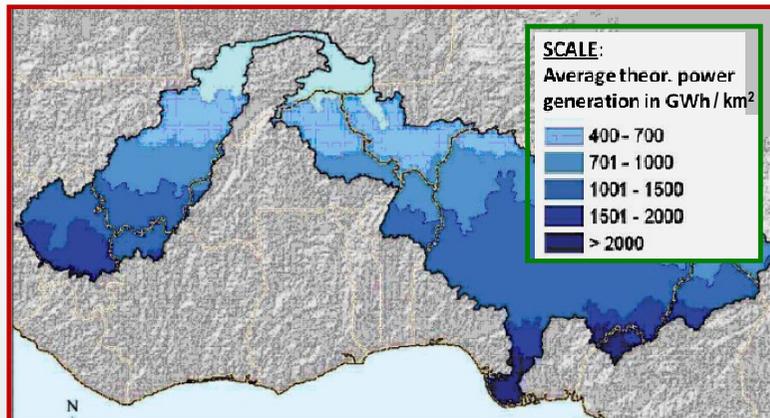River profile from selected river section till river mouth
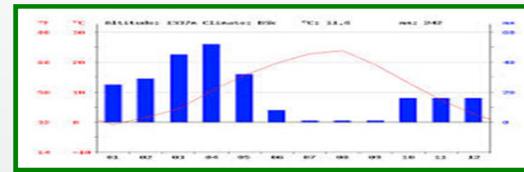
Average monthly flow data for the selected river section

ID number of river section	Name of country	Specific generation potential MW in km	Yearly average discharge in m3/s	Upstream area in km2	River section length in km	Elevation max. in m	Elevation min. in m	Slope in m/km
ABC123	**Niger**	**20**	**25**	**150**	**8**	**804**	**780**	**3**
ABC124	Niger	30	35	180	5	780	740	8
ABD111	Ghana	80	50	200	10	900	820	8
ABE100	Benin	2	10	30	5	400	370	6

River section which was selected is displayed in the first line

All other river sections of a basin can be found by scrolling or search function.
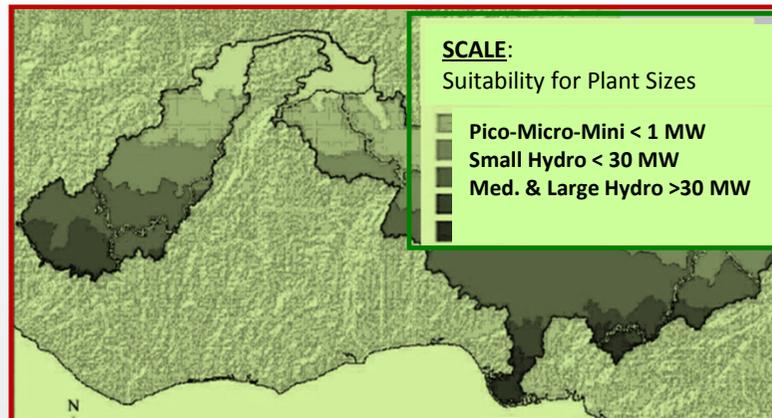
Layer with Subareas: Power Generation Potentials

- ⊟ Hydropower Resources
  - ☐ Precipitations & Climatic Zones
  - ⊟ Rivers & Resources
    - ⊞ Volta Basin
    - ⊞ Niger Basin
    - ⊟ **XYZ Basin**
      - ☐ Single River Channels
      - ☑ **Power Generation Potentials**
      - ☐ Suitability for Plant Sizes
      - ☐ Suitability for High/ Low Pressure Machines
      - ☐ Suitability for Plant Types
      - ☐ Suitability for Any Other Combination of Above Criteria

- No further mouse click options. Visualization of attractiveness of subareas only by colors of the scale.

Layer with Subareas: Suitability for Plant Sizes

SCALE:
Suitability for Plant Sizes

Pico-Micro-Mini < 1 MW
Small Hydro < 30 MW
Med. & Large Hydro >30 MW

N

☐ Hydropower Resources
  ☐ Precipitations & Climatic Zones
  ☐ Rivers & Resources
    ⊞ Volta Basin
    ⊞ Niger Basin
    ☐ **XYZ Basin**
      ☐ Single River Channels
      ☐ Power Generation Potentials
      ☑ **Suitability for Plant Sizes**
      ☐ Suitability for High/ Low Pressure Machines
      ☐ Suitability for Plant Types
      ☐ Suitability for Any Other Combination of Above Criteria

- No further mouse click options. Visualization of attractiveness of subareas only by colors of the scale.
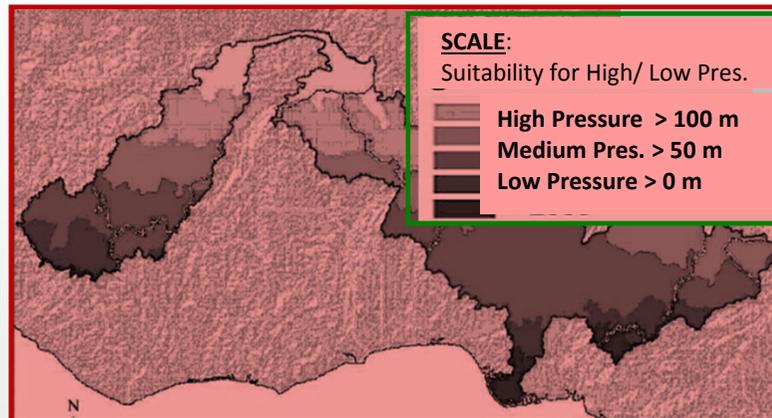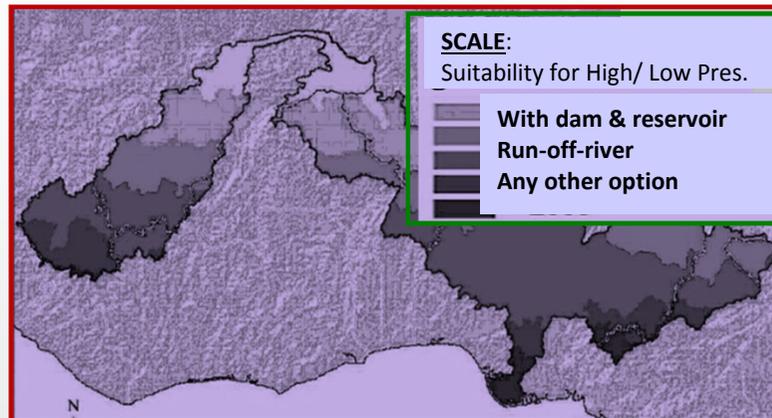
Layer with Subareas: Suitability for Low/ High Press.

SCALE:
Suitability for High/ Low Pres.

High Pressure > 100 m
Medium Pres. > 50 m
Low Pressure > 0 m

☐ Hydropower Resources
    ☐ Precipitations & Climatic Zones
    ☐ Rivers & Resources
        ⊞ Volta Basin
        ⊞ Niger Basin
        ☐ **XYZ Basin**
        ☐ Single River Channels
        ☐ Power Generation Potentials
        ☐ Suitability for Plant Sizes
        ☑ **Suitability for Low/ High Pressure Machines**
        ☐ Suitability for Plant Types
        ☐ Suitability for Any Other Combination of Above Criteria

- No further mouse click options.

- The Technical Consultant is asked to suggest scale values for low, medium and high head. If reasonable he shall use a combination of Plant Size and Pressure criteria.

Layer with Subareas: Suitability for Plant Types

Map legend:

SCALE:
Suitability for High/ Low Pres.

- With dam & reservoir
- Run-off-river
- Any other option

Resource tree:

- ⊟ Hydropower Resources
  - ☐ Precipitations & Climatic Zones
  - ⊟ Rivers & Resources
    - ⊞ Volta Basin
    - ⊞ Niger Basin
    - ⊟ **XYZ Basin**
      - ☐ Single River Channels
      - ☐ Power Generation Potentials
      - ☐ Suitability for Plant Sizes
      - ☐ Suitability for Low/ High Pressure Machines
      - ☑ **Suitability for Plant Types**
      - ☐ Suitability for Any Other Combination of Above Criteria

- No further mouse click options.

- The Technical Consultant is asked to suggest scale values for low, medium and high head. If reasonable he shall use a combination of Plant Size and Pressure criteria.
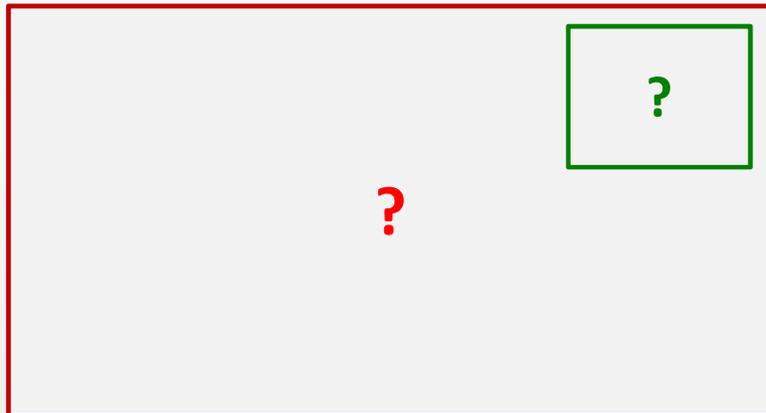
Layer with Subareas: Suitability for Further Criteria

☐ Hydropower Resources
    ☐ Precipitations & Climatic Zones
    ☐ Rivers & Resources
        ⊞ Volta Basin
        ⊞ Niger Basin
        ☐ **XYZ Basin**
            ☐ Single River Channels
            ☐ Power Generation Potentials
            ☐ Suitability for Plant Sizes
            ☐ Suitability for Low/ High Pressure Machines
            ☐ Suitability for Plant Types
            ☑ **Suitability for Any Other Combination of Above Criteria**

- No further mouse click options.

- The Technical Consultant is asked to suggest any other evaluation criteria for displaying various degrees of attractiveness of the defined subareas.

Theor. Power Generation Potential by Countries

Country Name:
- Pico-Micro-Mini in xMW
- Small Hydro in yyMW
- Medium and Large Hydro: zzzMW

⊟ Hydropower Resources
  ☐ Precipitations & Climatic Zones
  ⊟ Rivers & Resources
     ⊞ Volta Basin
     ⊞ Niger Basin
     ⊟ XYZ Basin
       ☐ Single River Channels
       ☐ Power Generation Potentials
       ☐ Suitability for Plant Sizes
       ☐ Suitability for Low/ High Pressure Machines
       ☐ Suitability for Plant Types
       ☐ Suitability for Any Other Combination of Above Criteria
☑ **Countries & Resources**

- After mous click on adequate country a template with at least three categories of theoretical power generation capacity appears (see picture above).

- The Technical Consultant is asked to suggest any other evaluation criteria for displaying various degrees of attractiveness of the defined subareas.