CHAPTER 8
WHITE NILE SUB-BASIN
OVERVIEW

The White Nile Sub-basin is shared by Ethiopia, South Sudan, Sudan.

White Nile Sub-basin encompasses approximately 1,938 sq.km total wetland area, which is almost 0.7% of the sub-basin area and with 64% permanent wetlands.

Wetlands of the White Nile Sub-basin are located along the course of the White Nile.

Gebel Auliya wetland in Sudan has a large permanent wetland area of 86% and is mainly surrounded by a densely populated agricultural area.

Transboundary White Nile Floodplains in South Sudan are characterized by larger floodplains consisting of seasonal wetland grasses and in times of large flooding also shrubland, the vicinity of the wetland in the South is low populated.

Major uses are pastoralism, agriculture, fisheries, fresh water, fuelwood, carbon sequestration, water production.

Hotspots are proposed hydropower plants projects.

Impacts are environmental concerns in water level change and sedimentation of water bodies.
The wetlands of the White Nile Sub-basin are located along the curse of the White Nile in South Sudan and Sudan. The 265,257 sq.km large sub-basin encompasses 1,938 sq.km total wetland area, which is almost 0.7% of the area.

The White Nile Sub-basin is part of the Eastern Nile Basin and starts at the confluence of the Bahr el Jebel and the Baro-Akobo-Sobat River. The Sudd provides the base flow for this sub-basin and the Sobat river contributes seasonally. This sub-basin lies within Ethiopia, Sudan and South Sudan.

The White Nile Sub-basin reaches from the highlands of Ethiopia to the Jebel Aulia Dam near Khartoum, which is in the ecoregion Sahelian acacia savanna. The Baro and the Sobat River mark the Southern border of the sub-basin.

The White Nile reach between Malakal and Khartoum is about 840 km long. Across this distance the White Nile drops only 13 meters in altitude, to about 400 m a.s.l. at Khartoum. In this stretch tributaries to the White Nile are small and sporadic (ENTRO, 2009). At Malakal, the mean annual flow of the White Nile is 30.50 bcm and at Gebel Auliya is 25 bcm. The difference can be attributed to evapotranspiration losses in the floodplains of the White Nile (#53) and the Gebel Auliya reservoir (#54, ENTRO, 2009).

The White Nile Floodplains (#53) are characterized by larger floodplains consisting of seasonal wetland grasses and in time of large flooding also shrubland.

The Gebel Auliya (#54) has a large permanent wetland area of 86%. The Gebel Auliya wetland is surrounded by mainly agricultural area.

The White Nile Sub-basin provide a long stretch of navigable waters due to the relatively stable flow and flat slope (NBI, 2017).

<table>
<thead>
<tr>
<th>WETLAND COMPLEX</th>
<th>TOTAL WETLAND AREA (SQ.KM)</th>
<th>PERMANENT WETLAND AREA (SQ.KM)</th>
<th>PERMANENT TO TOTAL WETLAND AREA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gebel Auliya</td>
<td>894</td>
<td>773</td>
<td>86</td>
</tr>
<tr>
<td>White Nile Floodplain</td>
<td>672</td>
<td>223</td>
<td>33</td>
</tr>
</tbody>
</table>

Photo: HYDROC GmbH
Climate & hydrology

There is high spatial variation of rainfall in the White Nile Sub-basin. Semi-arid conditions increase from upstream to downstream. The rainy period is from May to October. Average annual precipitation is 700 mm at Malakal and drops to 170 mm at Gebel Auliya. Precipitation in the whole sub-basin exceeds potential evapotranspiration only in July. The average maximum monthly actual evapotranspiration in September does not exceed 80 mm monthly average (NBI, 2016).

During floods, the White Nile River bed is inundated, but in dry season the river is confined to its channel. Swamps, 200-300 m wide, line the riverside, locally expand to maximal 20 km in width. The Gebel Auliya Reservoir contains and regulates the flow of the White Nile. Below Khartoum the White Nile receives the Athbara River on the right bank, its final major tributary, and follows a course locally and narrowly fringed with swamps through bare areas until it enters Lake Nubia at Ambikol in Egypt (Hughes & Hughes, 1992).
The wetlands of the White Nile Sub-basin are located along the curse of the White Nile. The White Nile between Malakal and Khartoum flows in a relatively confined bed. It is fringed by papyrus and reed areas also including islands, floodplains, and the shores of the Gebel Auliya dam.

The soil of the White Nile Floodplain is a black coloured Vertisol, which is cracking in nature and is challenging for agriculture (NBI, 2016).

### WETLAND POPULATION IN THE WHITE NILE SUB-BASIN

<table>
<thead>
<tr>
<th>Country</th>
<th>Sub-basin</th>
<th>City</th>
<th>Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudan</td>
<td>White Nile Floodplain</td>
<td>Melut</td>
<td>Talawdi</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Blue Nile</td>
<td>Aroma</td>
<td>Kasala</td>
</tr>
<tr>
<td>South Sudan</td>
<td>Gebel Auliya</td>
<td>Kassala</td>
<td>Shuwaq</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WETLAND SITES</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
</tr>
<tr>
<td>54</td>
</tr>
</tbody>
</table>

Number of people per grid square:

- 0: 26-50
- 1-5: 51-100
- 6-25: 1001-2500
- 250-5000
- more than 5000

Country: Sudan, Ethiopia, South Sudan
Sub-basin: White Nile Floodplain, Gebel Auliya
Water body: River
Seasonal wetland: 53
Permanent wetland: 54
City: Melut, Talawdi, Aroma, Kasala, Shuwaq
Town: Kassala

Photo: HYDROC GmbH
The Jonglei Canal project was proposed to reduce the water losses in the Sudd region. The project was stopped in 1984 due to civil war in Sudan (Amam et al., 2018).

The expected benefit of the Jonglei Canal would be to save water, reduce flooding, gain an increase of land and to provide a navigation link between the three countries (e.g. El-Moghraby and El-Sammami, 1985; Howell et al., 1988).

Recently, Upper Nile countries proposed plans for water development projects which might reduce flow to the Sudd region and the potential water savings from Jonglei Canal. Environmental concerns from local tribes are for example a reduction in swamp size. This might directly effect the White Nile flow (e.g. Ahmad, 2008).

Hydraulic simulations (Aman et al., 2018) indicate that the Jonglei Canal would reduce the swamp area of 7% but could increase to 16% by implementing the upstream development projects.
MANAGEMENT STATUS AND CONCLUSION

Major hotspots

- Upper Nile countries proposed plans for water development projects which might reduce flow to the Sudd region and the potential water savings from Jonglei Canal, environmental concerns from local tribes are e.g. a reduction in swamp size with effect to the White Nile flow amount.
- Hydraulic simulations indicate that the Jonglei Canal would reduce the swamp area of 7% but could increase to 16% by implementing up-stream development projects.

Major potentials

- Benefit of the Jonglei Canal would be to save water, reduce flooding risk, gain an increase of land and to provide a navigation link between the three countries.

Management initiatives

- Integration up-stream development project should happen in a sustainable manner, with green infrastructure-oriented management plan and a coordinated communication strategy between different stakeholders and their interests.