VI. RAPPORTS NATIONAUX PRÉSENTÉS A L'ASSEMBLÉE DE TORONTO

(suite)

SUDAN

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Hydrological Records on the Nile and its Tributaries in the Republic of the Sudan

Sudan depends for its prosperity on water from the Nile and its tributaries. Without good hydrological records that water cannot be efficiently used. This report is therefore devoted to a brief description of the most important gauge sites. As each is mentioned for the first time the year from which records are continuously available is given in brackets. The use to which this information is being put is described in a paper presented to the Hydrological Section of this conference on planning the Nile Valley as a whole.

The lakes at the source of the White Nile (Bahr el Jebel) are not in Sudanese territory, but they are so important hydrologically that the principal gauges must be mentioned. The first of these is at Entebbe (1899) on Lake Victoria; there are a number of others round the lake, but this is usually taken to be the master gauge. The next important gauge is at Masindi Port (1915) where the main stream leaves Lake Kyoga. The master gauge on Lake Albert is at Butiaba (1912); readings began here early in 1904 but there were long interruptions in 1910 and 1911.

The first gauge in the Sudan is on the frontier at Nimule (1923). The series of rapids that starts here ends at Juba (1925) which is the most important town in the Southern Sudan. At Mongalla (1905) the river enters the great clay plain of the Upper Nile; from here on there are no effective tributaries until the confluence of the Sobat far to the north.

The Sudd Region proper can be considered to start at Bor (1906). The name is derived from the Arabic word for a block, and it is so called because before the days of regular navigation the channel was often blocked by masses of floating vegetation. From here on the river winds slowly through interminable papyrus marshes, and the losses due to spill are very heavy. Gauge readings here were interrupted for nearly a year in 1915-16.

It is intended to reduce spilling in the Sudd Region to negligible amounts by a bypass channel which will start at Jonglei and be known as the Jonglei Canal. For this reason the gauge at Jonglei (1931) is important. Travelling downstream, we come to Shambe (1904) which is a small village in the heart of the Sudd Region. About 120 kilometres further north the Bahr el Zeraf is fed through the Cuts (1927) which are parallel artificial channels with gauges at the head and tail.

The Sudd Region can be considered to end at Buffalo Cape (1927) on the Bahr el Jebel and Fangak (1924) on the Bahr el Zeraf. At Lake No (1924)

the Bahr el Ghazal joins the main stream, which is known from here to Khartoum as the White Nile. In spite of its large catchment area the Bahr el Ghazal makes a negligible contribution to the discharge of the White Nile. This is the result of very large losses in marshes to the west of the Bahr el Jebel. One day it will, no doubt, be possible to reduce these losses greatly. The problem has, however, not been studied in detail. The rivers concerned have very flat slopes in their lower reaches, and for this reason alone the solution will not be simple.

The most important gauge on the Bahr el Ghazal is at Wang Kai (1928) near the confluence of the Bahr el Arab. On the various tributaries the principal gauges are at Nyamlell (1934) on the Lol; at Wau (1907) on the Jur; at Tonj (1933) on the river of the same name; at Gel (1944) on the river of the same name; at Mvolo (1943) on the Na'am; and at Mundri (1943) and Yirol (1933). In general gauge stations in the catchment of the Bahr el Ghazal are much more sparsely distributed than on the main stream of the Nile.

About 120 kilometres east of Lake No the main stream receives the only tributary between Mongalla and Khartoum that makes a significant contribution to its discharge. The Sobat is formed by the confluence of the Pibor and the Baro on the Ethiopian frontier. Gambela (1906) is an important gauging point on the upper Baro in Ethiopia. The Pibor is formed at Pibor Post (1925) by the confluence of three rivers; later it is joined by the Akobo River at Akobo (1925). On the Sobat proper there are important gauges at Nasir (1923) and Doleib Hill (1904); the latter is often called Hillet Doleib.

Twenty kilometres or so from the Sobat confluence we reach Malakal (1905), which is the administrative capital of the Upper Nile Province. Between Malakal and Khartoum the principal gauges are at Kodok (1907) in the country of the Shilluk; at Melut (1907) and Renk (1907) in the country of the Dinka; at Rabak (1907) where the main railway line to the west crosses the White Nile a few kilometres south of Kosti, which is the largest river port in the Sudan; at Dueim (1907) in whose neighbourhood there are large numbers of pumps drawing water from the White Nile; and finally at Jebel Aulia (1915) where there is a storage dam across the river just over 40 kilometres south of Khartoum.

At Lake Tana, where the Blue Nile starts, gauge readings are available from 1921 to 1933 with a gap in 1926. Unfortunately no other gauge records have been published for the Ethiopian section of the Blue Nile. In the Sudan the first important gauge is at Roseires (1903); it is a few kilometres north of the site of the proposed storage dam for which plans are now almost ready. At Sennar (1907) the dam was finished over 30 years ago; it serves the double purpose of storing water and enabling the million-acre Gezira Irrigation Scheme to be commanded.

Between Sennar and Khartoum the Blue Nile receives the only two tributaries of any importance which join it in the Sudan. The first is the Dinder which is gauged at Abu Hashim (1907) and Hillet Idris (1924). The second is the Rahad which is gauged at Mafaza (1908 with gaps in 1911 and 1919) and Abu Haraz (1922); the latter is near Wad Medani (1907) which is the headquarters of the Sudan Irrigation Department.

At Khartoum (1900) the Blue and White Niles join to form the Main Nile, which does not receive a single tributary in its three-thousand-kilometre course to the Mediterranean Sea. It is believed to be the longest stretch of river in the world of which this can be said. Between Khartoum and the mouth of the Atbara River the most important gauge is at Hugna (1954); it is at the northern end of the 20-kilometre-long Sabaloka Gorge and near

a possible site for a power dam. The gauge at Shendi (1909) is important for basin irrigation in the district.

The town of Atbara (1908) lies at the confluence of Atbara River with the Main Nile. In the Sudan the river is gauged at El Showak (1937) and Khashm el Girba (1906). The headwaters are in Ethiopia, and unfortunately no gauge records have been published. The Setit, which joins the Atbara proper at El Showak, is in fact the main stream. It has recently been proposed to dam the Atbara at Khashm el Girba in order to irrigate by gravity an area of at least half a million acres to the north. The Atbara is not a perennial river, but no other affluent of the Main Nile carries water every year.

At Shereik (1954) the gauge marks the tail of the Fifth Cataract, which could be developed for hydro-electric power. At Abu Hamed (1909) the main line of the railway, which has followed the river since Khartoum, cuts straight across the desert to Wadi Halfa. A branch line follows the river to Merowe (1908) near which there is an excellent site for a dam which could be used either to store water or to generate power. From El Bauga to Merowe the river is constantly interrupted by cataracts, but a placid reach now begins and continues until Kerma.

At short distance south of Kerma there is a gauge at Argo (1909). Kerma itself marks the beginning of a series of cataracts which continues until Wadi Halfa. On this reach there are gauges at Dal (1954) and Semna (1954) both of which are promising power sites. The last gauge in the Sudan is at Wadi Halfa (1890). To complete this account it may be mentioned that the most important gauges in Egypt are at Aswan (1871) in Upper Egypt; Assiut (1903) in Middle Egypt; and El Leisi (1906) not far from Cairo. The first of these is near the site of the famous Aswan Dam.

This catalogue of gauges is by no means complete, but it will perhaps have sufficed to show how thoroughly the basin of the Nile is covered by a network of gauges in Uganda, Sudan and Egypt. At all important sites the gauges have been carefully calibrated by means of regular current-meter observations. Most of the gauges mentioned in this report were originally installed by the Egyptian Irrigation Department, which still continues to read them regularly and to compute discharges. The results are published in 'The Nile Basin' which is the standard work on the subject in eight volumes with various supplements.

Gauges up to 1927 are recorded in Volume III of 'The Nile Basin' and discharges up to the same date in Volume IV. Supplements, each covering five years, carry the published records forward to 1947. They give, for both gauges and discharges, ten-day, monthly, and annual means. The metric system is used throughout. For those who are interested in general information about the River Nile and its potentialities for irrigation the Ministry of Irrigation and Hydro-Electric Power in Khartoum has recently published a pamphlet on 'Sudan Irrigation' with twenty large pages and a complete set of maps.