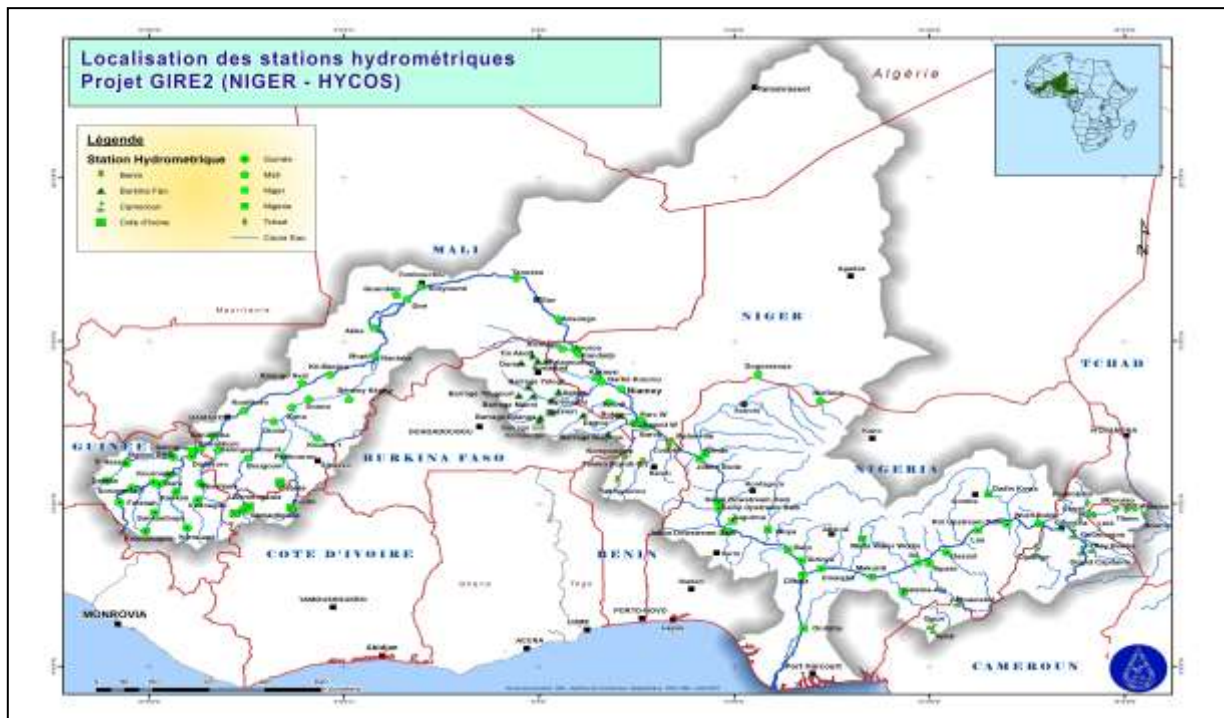
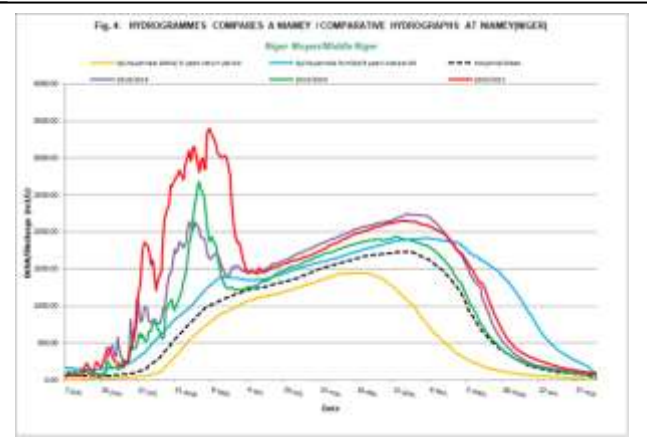




**ANNUAL HYDROLOGICAL REPORT OF THE NIGER BASIN  
YEAR 2020/2021**



The annual hydrological report 2020-2021

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## INTRODUCTION

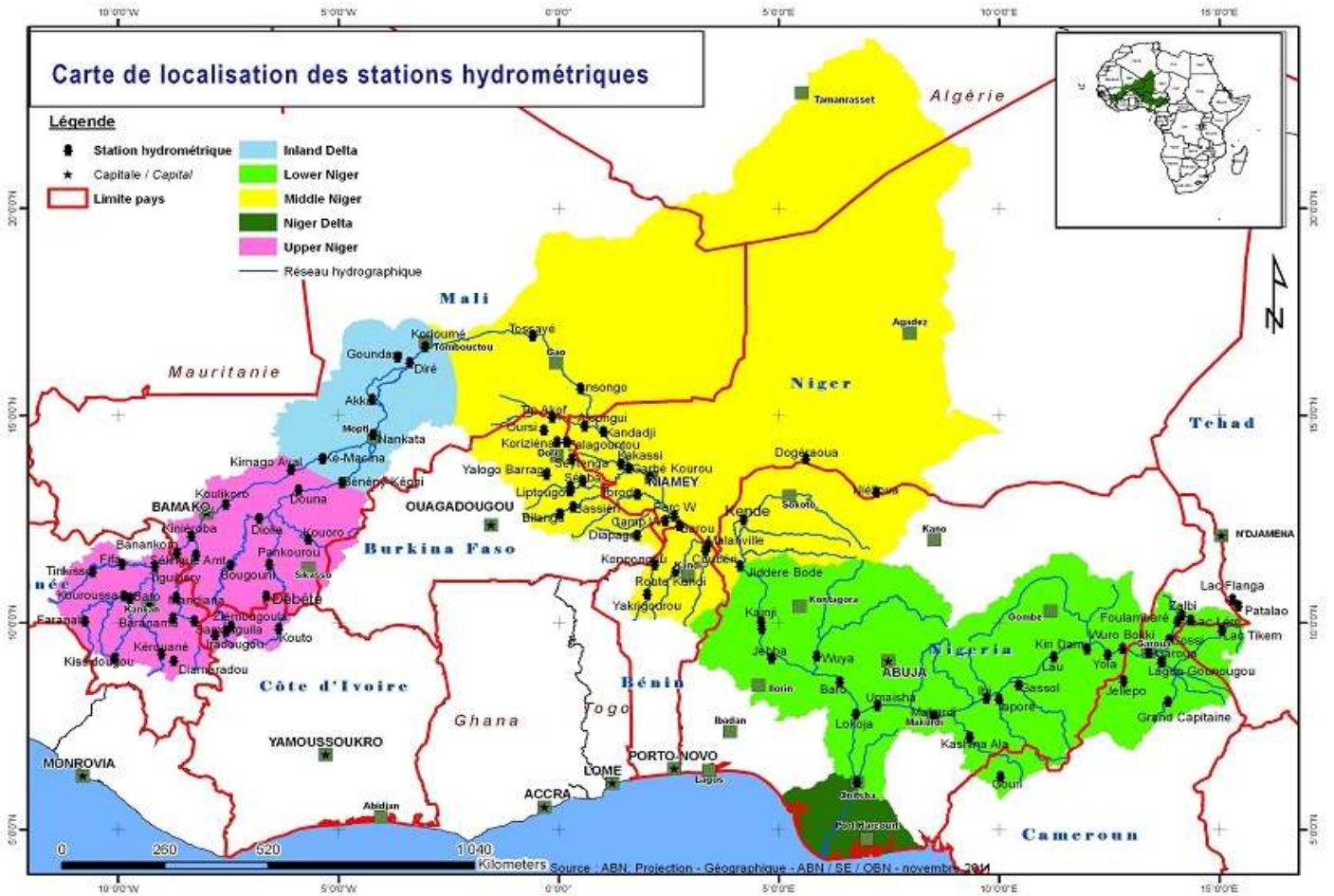
The Niger River has its source from the Fouta-Djalón Plateau more than 1000m altitude in Guinea and successively flows through Mali, Niger, Benin and Nigeria where it empties into the Atlantic Ocean after a span of around 4200 km. It is the third longest river in Africa (after the Nile and the Congo), the 14th in the world and the 9th by its drainage basin (2,170,500 km<sup>2</sup>). The active watershed covers an area of approximately 1,500,000 km<sup>2</sup> shared by the nine (9) countries within the Niger Basin Authority catchments: Benin (2%), Burkina Faso (4%), Cameroon (4%), Côte d'Ivoire (1%), Guinea (6%), Mali (26%), Niger (23%), Nigeria (33%) and Chad (1%). The River Benue which rises from Adamawa Plateau, Cameroon, to join the main course of River Niger at Lokoja in Nigeria, this is one of its most important tributaries.

The hydrological year of the River Niger starts from June 1<sup>st</sup> of a year to May 31<sup>st</sup> of the following year. The annual assessment of the River Niger flow in hydrological year 2020/2021 analyzes the flow situation at designated stations of the different sub-basins: Koulikoro (Mali) for Upper Niger, Diré (Mali) for the Inner Delta; Niamey (Niger) for Middle Niger and Lokoja (Nigeria) for Lower Niger (See Fig.1).

The monitoring of River Niger flow during the hydrological year 2020/2021 was carried out under the framework of the activities of the Niger Basin Observatory from 113 hydrometric stations belonging to the hydrological observation networks of National Hydrological Services (NHS) of NBA's nine (9) member countries. These stations were equipped with gauge scales, some of which are associated with Satlink-type data collection platforms (PCD) (data transmission by satellite) or electronic Liminigraphs (transmission by GSM). All these hydrometric stations have a gauge reader who takes reading daily and monitors the equipment.

The databases of the NHSs and the Executive Secretariat of the NBA are managed by HYDROMET software to facilitate the exchange of data. The data received were duly analyzed and stored in the hydrometric database of the NBA Executive Secretariat.

Fig.1. Map showing the hydrometric stations in the Niger Basin



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## ANALYSIS OF THE EVOLUTION OF FLOWS IN THE NIGER BASIN

The analysis of the evolution of the hydrological flows 2020/2021 was carried out on the hydrometric stations from the following four (4) sub-basins: The Upper Niger and the Inner Delta represented respectively by the stations of Koulikoro and Dire in Mali, the Middle Niger sub-basin at Niamey station in Niger and the Lower Niger sub-basin at Lokoja station in Nigeria.

Figures 2 to 5 presents the comparative hydrographs of the hydrological year 2020/2021 with the hydrological years of 2019/2020, 2018/2019, the dry and wet five-years return periods as well as to the statistical average of the flows during the same period (June 1<sup>st</sup> to May 31<sup>st</sup>). While Figures 6 and 7 illustrate the management of the Sélingué dam in Mali and Kainji dam in Nigeria.

The situation of the cumulative volumes of water during the hydrological year at the various hydrometric stations of the sub-basins were summarized in the table attached in the appendix.

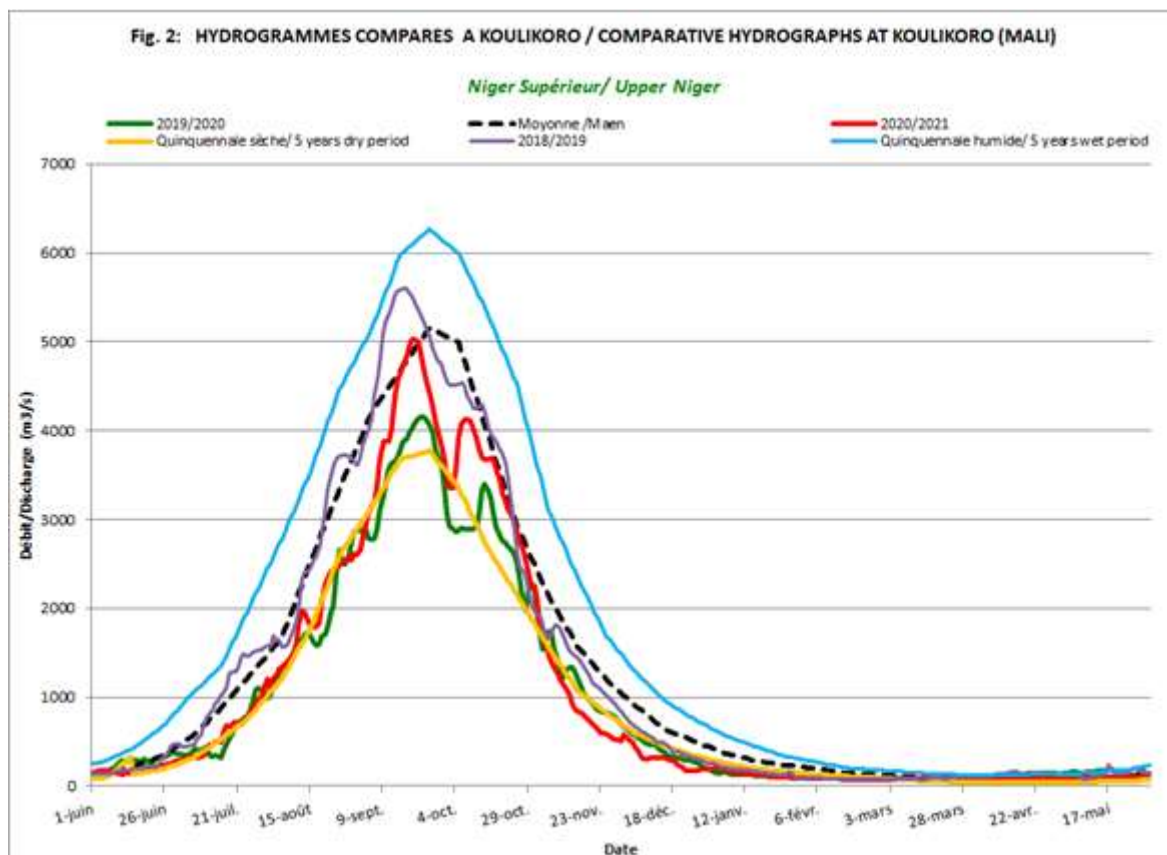
### 1.1 Upper Niger: Koulikoro Hydrometric Station

Upper Niger is the upstream part of the River Niger watershed which extends to the Inner Niger Delta (DIN). Upper Niger watershed is shared between Guinea, Côte d'Ivoire and Mali. The existing multi-purpose dam at Sélingué is the main structure for regulating and supporting the low flow situation in the Upper Niger Basin.

The average flow rate at Koulikoro station during the 2020/2021 hydrological year was 999 m<sup>3</sup>/s, corresponding to an average flow volume of approximately 31.5 billion m<sup>3</sup>. The Koulikoro station recorded a maximum daily flow of 5,023 m<sup>3</sup>/s on September 19<sup>th</sup>, 2020 and a minimum daily flow of 66 m<sup>3</sup>/s on March 4<sup>th</sup>, 2021.

The total flow volume at the Koulikoro station for 2020/2021 hydrological year was less than those of the years 2018/2019, the five years wet and the interannual average (1980 -2019). On the other hand, this volume was slightly greater than the five-year dry period and that of the 2019/2020 hydrological year during the same period as shown in table1.

The 2020/2021 hydrological situation in this sub-basin was characterized by a slightly deficient hydraulicity (value equal to 0.8) compared to the interannual average.



## 1.2 Inner Niger Delta (DIN): Diré Station

The Inner Niger Delta, located in Mali between upper Niger and middle Niger, is a large wetland whose wet surface was estimated between 35,000 to 40,000 km<sup>2</sup> during the flood period depending on the year. During low and high flow periods, the DIN is useful for many purposes. It acts as a buffer for flooding from Upper Niger. The water from Upper Niger stays up to 2 to 3 months in the DIN before flowing to Middle Niger. The DIN also promotes both evaporation and infiltration in significant rate.

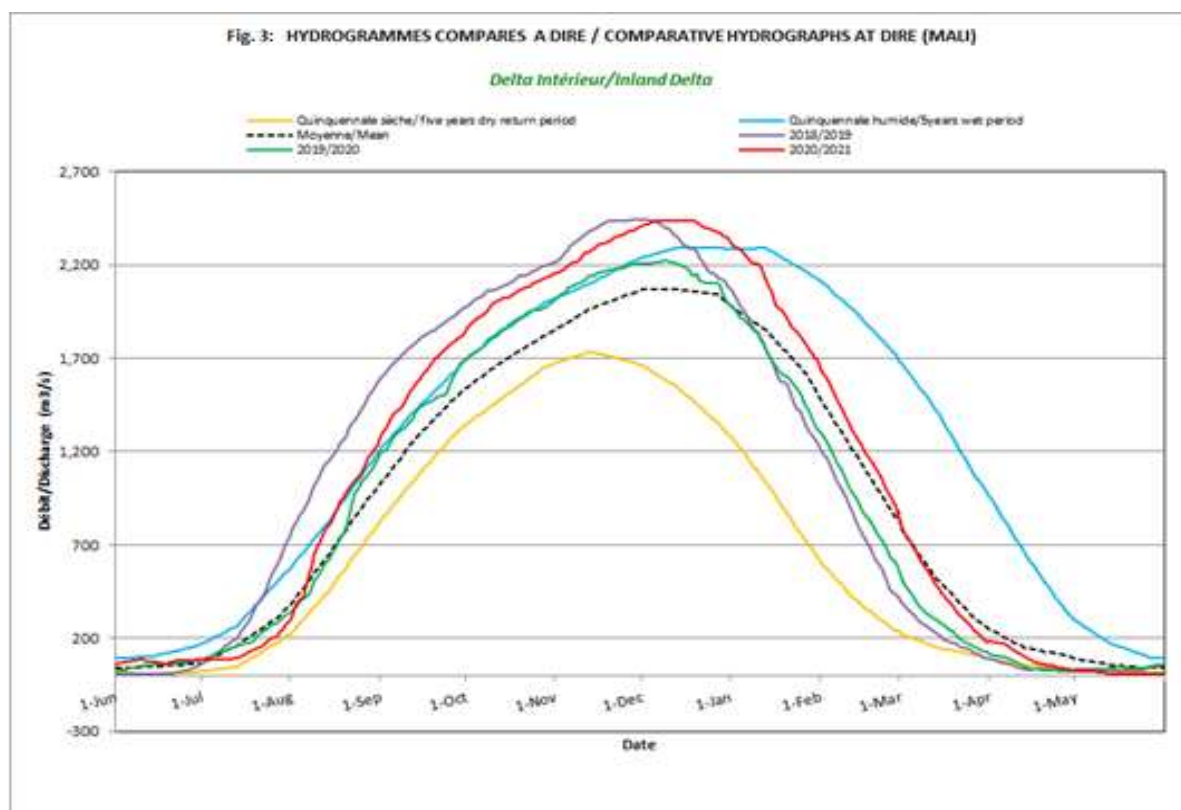
The average flow rate at the Diré station during this 2020/2021 hydrological year was 1100 m<sup>3</sup>/s, corresponding to an average flow volume of approximately 34.7 billion m<sup>3</sup>. The Diré station recorded a maximum daily flow of 2437 m<sup>3</sup>/s on December 6<sup>th</sup>, 2020 and a minimum daily flow of 7m<sup>3</sup>/s on May 31<sup>st</sup>, 2021.

The total flow volume at the Diré station for the 2020/2021 hydrological year was greater than that of the 2018/2019 hydrological year, the five – years dry but less than the five-years wet during the same period as shown in table1. The

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2020/2021 hydrological situation at the DIN station was characterized by high hydraulicity (value equal to 1.42) due to inflows from the Bani, the main tributary on the right bank of the Niger from Côte d'Ivoire and Mali.



### 1.3 Middle Niger: Niamey station

The Middle Niger is the portion of the River Niger watershed located between the exit from the DIN and the border with Nigeria. The watershed is largely dependent on flows from the DIN and in-flows from tributaries of Burkina Faso.

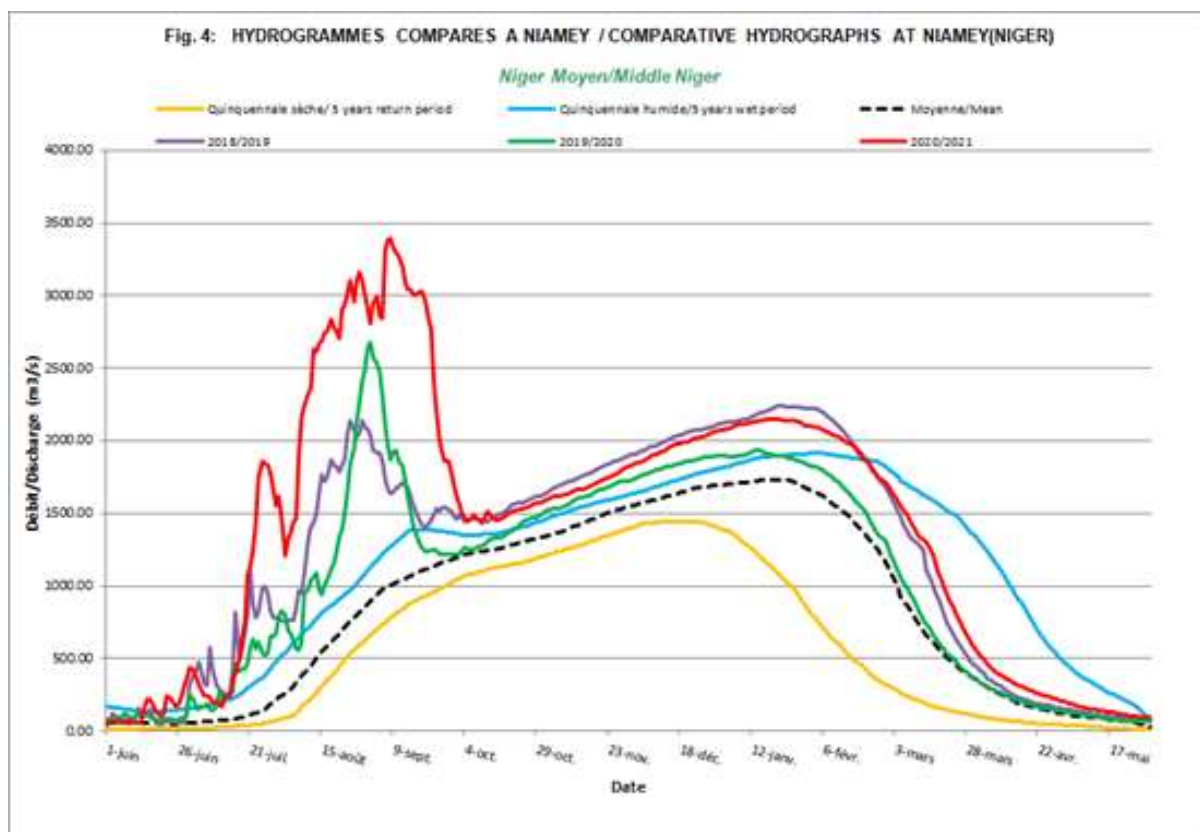
The average flow rate at the Niamey station during the 2020/2021 hydrological year was 1418 m<sup>3</sup>/s, corresponding to an average flow volume of approximately 44.71 billion m<sup>3</sup>. The Niamey station recorded a maximum daily flow rate of 3398 m<sup>3</sup>/s on September 8<sup>th</sup>, 2020 and a minimum daily flow rate of 58 m<sup>3</sup>/s on June 11<sup>th</sup>, 2020. The minimum flow rate remained above that of the low flow alert threshold of 10 m<sup>3</sup>/s.

The total flow volume recorded at the Niamey station in Niger during the 2020/2021 hydrological year was greater than that of the 2018/2019 hydrological year and the five years wet during the same period as shown in table 1.

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The 2020/2021 hydrological situation in Middle Niger was characterized by very high hydraulicity (value equal to 1.86) due to the inflows of the tributaries of the Dargol, Gourouol, Sirba and Goroubi rivers which originate in Burkina Faso.



#### 1.4 Lower Niger: Lokoja station

The Lower Niger is a part of the River Niger Basin which starts from the Nigerian border up to the Maritime Delta and considers the tributary of the left bank, the River Benue which has its source from Adamawa Plateau in Cameroon. The inflows from the largest tributary (River Benue), representing about 58% of the average flow at the Lokoja station over the period 1980-2019. In Lower Niger, the multi-purpose dams of Kainji, Jebba and Shiroro which were located at the upstream of the Lokoja station provides water regulation and low-flow support for the Niger River.

The average flow rate at the Lokoja station during the 2020/2021 hydrological year was 7,570 m<sup>3</sup>/s, corresponding to an average flow rate of approximately 238.74 billion m<sup>3</sup>. The Lokoja station recorded a maximum daily flow rate of

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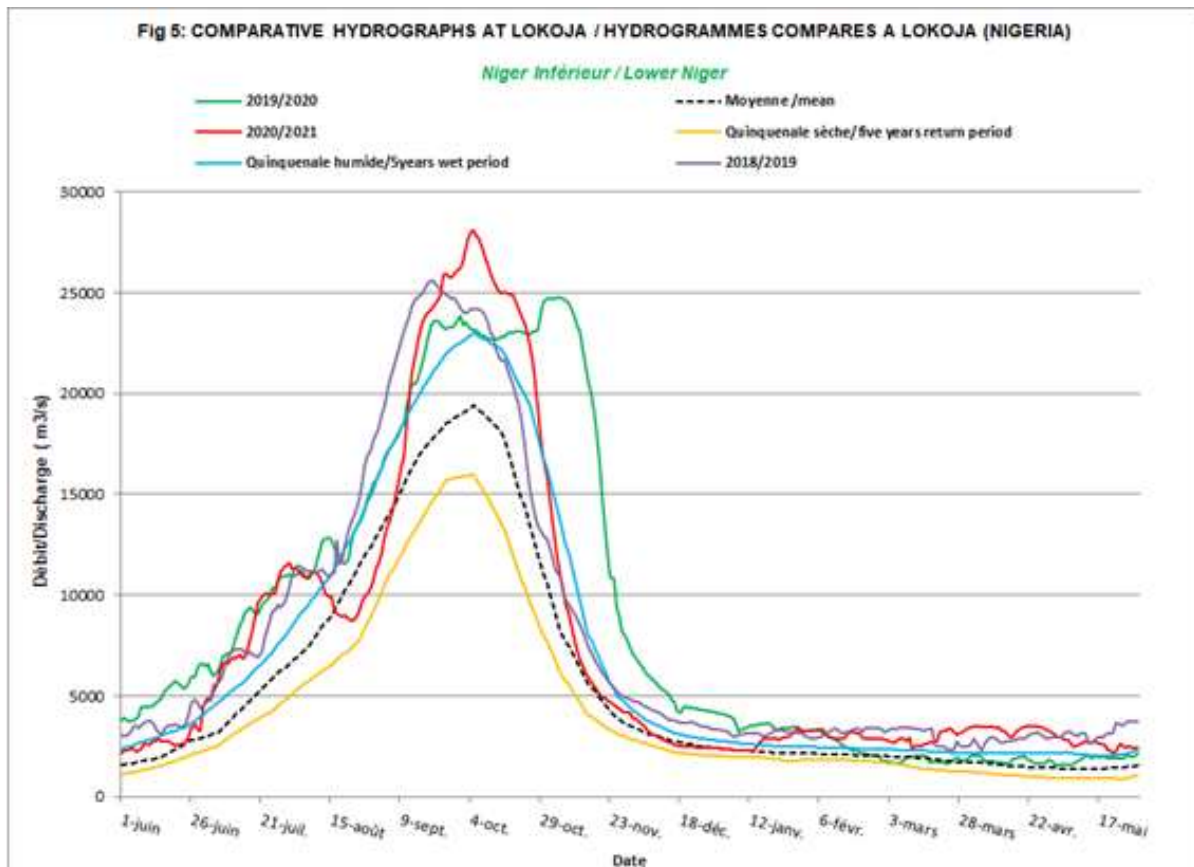
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28,082 m<sup>3</sup>/s on October 5<sup>th</sup>, 2020 and a minimum daily flow rate of 2,131 m<sup>3</sup>/s recorded on June 1<sup>st</sup>, 2020.

The total flow volume during this hydrological year was greater than the five years wet and dry and interannual average during the same period as shown in table.

The 2020/2021 hydrological year's situation in Lower Niger was characterized by high hydraulicity (value equal to 1.35) due to inflows from left bank tributary of the River Benue which has its source from Cameroon.



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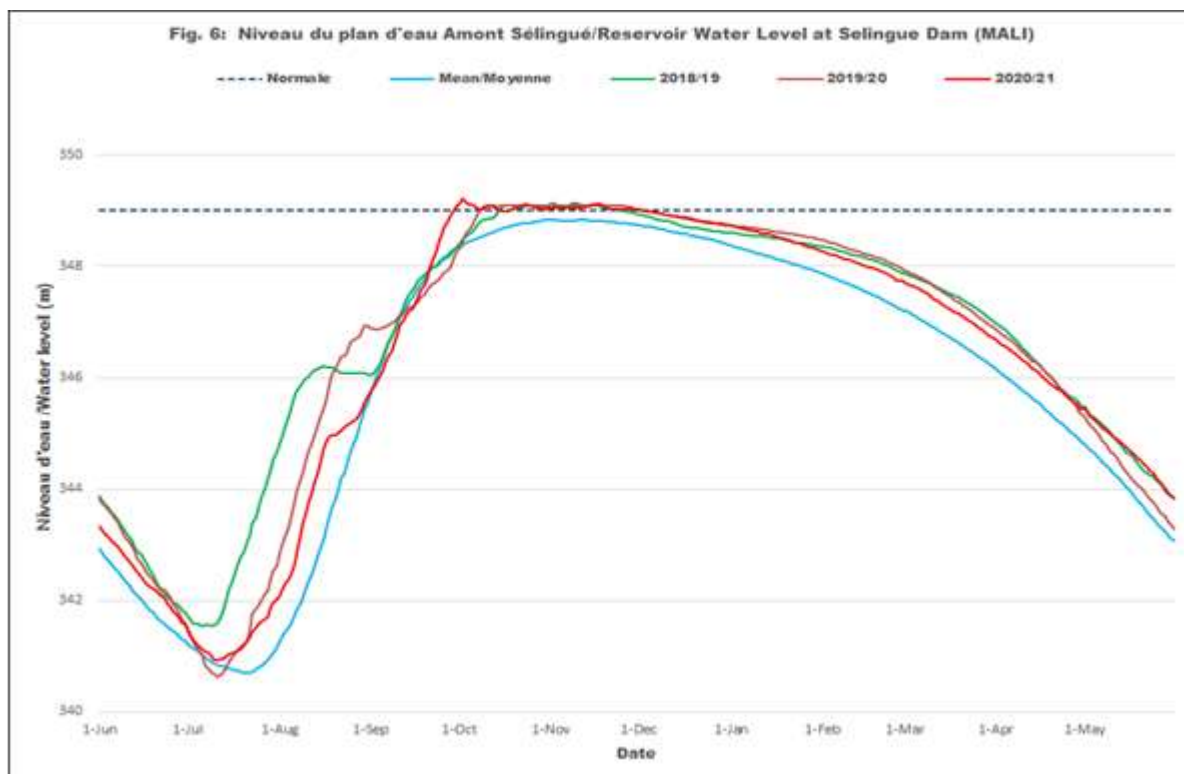
## 2. SITUATION OF DAMS

### 2.1 The Sélingué Dam in Mali

The Sélingué dam is a multipurpose structural dam built on the Sankarani river, a tributary of the right bank of the River Niger with a capacity of 2.347 billion m<sup>3</sup> and an installed capacity of 47.6MW for hydroelectricity power generation. The annual maximum water level of 349.22m was recorded on October 2<sup>nd</sup>, 2020 corresponding to a volume of 2.446 billion m<sup>3</sup> and the annual minimum of 340.92m recorded on July 11<sup>th</sup>, 2020 corresponding to a volume of 278.01 million m<sup>3</sup> with an average annual level of 346.39m.

The normal reservoir level of 349.00m was attained on the September 29<sup>th</sup>, 2020. The dam spilled during the period from September 29<sup>th</sup> to December 3<sup>rd</sup>, 2020 before the start of the emptying of the Dam storage. The lowest recorded water level of the dam was 340.92m corresponding to a storage of 278 Million m<sup>3</sup> equivalent to 11.8% of its total capacity.

At the end of the hydrological year (May 31<sup>st</sup>, 2021), the water level in the Sélingué dam was 343.84m corresponding to a volume of 707.6 Million m<sup>3</sup>, which was equivalent to 30.1% of its total capacity. However, release of water for low flow support continues.



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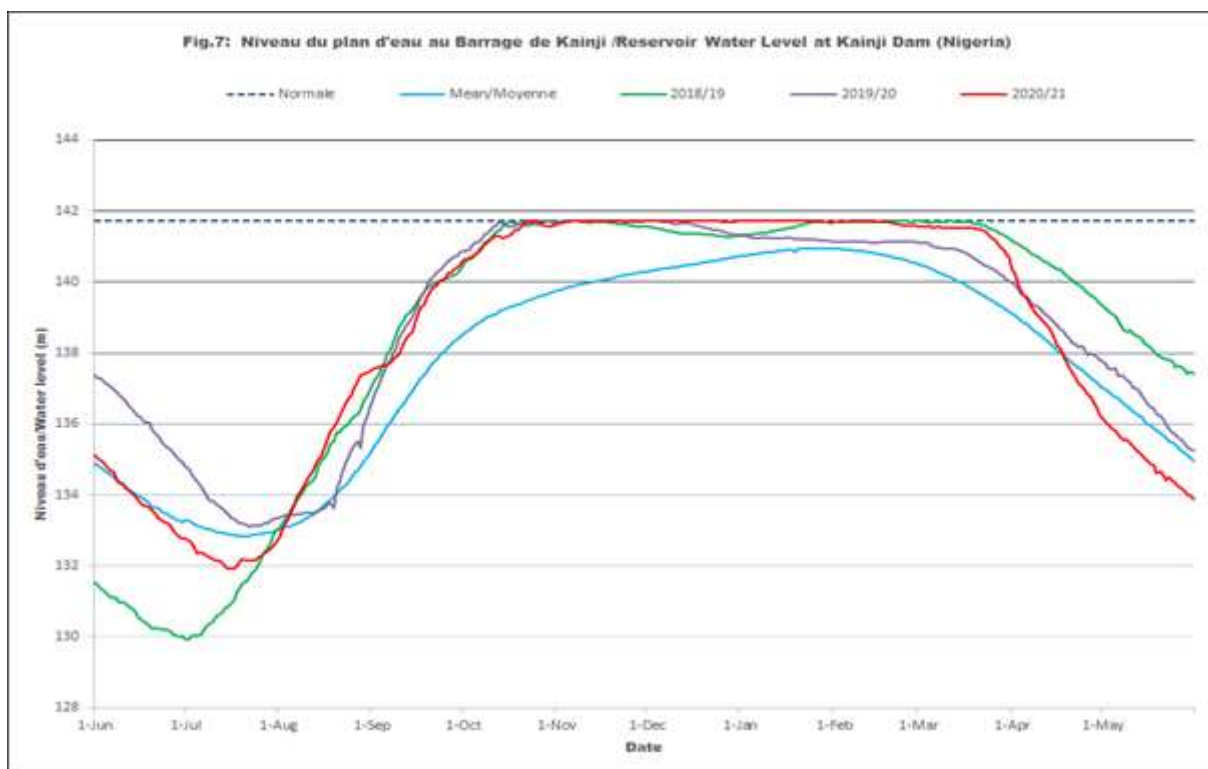
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## 2.2 The Kainji Dam in Nigeria

The Kainji dam is a multi-purpose structural dam built on the River Niger with a capacity of 15 billion m<sup>3</sup> and an installed capacity of 720MW for hydroelectricity power generation. The annual maximum water level of 141.73m was recorded on October 22<sup>nd</sup>, 2020 corresponding to a volume of 15 billion m<sup>3</sup> and the annual minimum of 131.92 m on July 16, 2020 corresponding to a volume of 5.562 billion m<sup>3</sup> with an average annual level of 138.58 m.

The normal reservoir water level of 141.73 m was reached on October 22<sup>nd</sup>, 2020. The dam did not spill. However, it maintained its normal capacity from October 22 to February 14, 2021 to February 14<sup>th</sup>, 2021, before the start of the emptying of the Dam storage. The lowest recorded water level of the dam was 131.92m corresponding to volume of 5.562 Billion m<sup>3</sup> or 37.1% of its total capacity.

At the end of the hydrological year (May 31<sup>st</sup>, 2021), the water level at Kainji dam was 133.88m corresponding to a volume of 6.85 Billion m<sup>3</sup>, equivalent to 46% of its total capacity. However, releases of water for low flow support continues.



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## CONCLUSION

The hydrological year at Upper Niger compartment of the Basin was slightly deficient, high at the Inner Delta, very high at the Middle Niger and moderately high at the Lower Niger.

The average flow situation observed at the Inner Niger Delta was due to the inflows from the Bani tributary from Côte d'Ivoire and Mali.

In the Middle Niger, flows from the tributaries of the right bank Dargol, Gourouol, Sirba and Goroubi rivers from Burkina Faso significantly contributed to the wet hydraulicity in this sub-basin of the Niger River.

The Lower Niger experienced a surplus hydrological year due to inflows from left bank tributaries especially the principal River Benue which originates from Cameroon.

The water levels at Selingué dam in Mali and Kainji dam in Nigeria have all reached their full normal reservoir levels respectively and have contributed to support low flow situation downstream.

In summary, the 2020/2021 hydrological year was characterized by some excessive flows causing flooding in the Middle and Lower Niger of the Niger Basin with heights that has never been recorded for more than 100 years. These floods caused loss of lives, properties and thousands of people were made homeless.

The ABN through its Niger Basin Observatory should be more supported in order to provide appropriate and timely information on the hydrological situation of the Niger Basin.

**Table 1:** Cumulated water volumes of hydrological years at reference stations.

<b>STATIONS</b>	<b>ANNEES/YEAR</b>	<b>VOL CUM (10<sup>9</sup>m<sup>3</sup>)</b>
<b>NIGER SUPERIEUR / UPPER NIGER (KOULIKORO)</b>	<b>2020/21</b>	<b>31.50</b>
	2019/20	29.42
	2018/19	39.63
	2017/18	21.36
	2012/13	36.16
	Quinquennal Sec	28.78
	Moyenne/Mean	40.43
	Quinquennal humide	55.65
<b>DELTA INTERIEUR/ INNER DELTA (DIRE)</b>	<b>2020/21</b>	<b>34.70</b>
	2019/20	30.35
	2018/19	33.86
	2017/18	20.76
	2012/13	33.10
	Quinquennal Sec	21.12
	Moyenne/Mean	30.53
	Quinquennal humide	40.23
<b>NIGER MOYEN / MIDDLE NIGER (NIAMEY)</b>	<b>2020/21</b>	<b>44.71</b>
	2019/20	33.43
	2018/19	38.59
	2017/18	25.26
	2012/13	34.75
	Quinquennal Sec	18.72
	Moyenne/Mean	26.81
	Quinquennal humide	35.94
<b>NIGER INFERIEUR / LOWER NIGER (LOKOJA)</b>	<b>2020/21</b>	<b>238.74</b>
	2019/20	275.97
	2018/19	249.31
	2017/18	213.98
	2012/13	271.58
	Quinquennal Sec	136.92
	Moyenne/Mean	177.22
	Quinquennal humide	224.71

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