

# Environmental impacts caused by the uncontrolled human activities on water resources availability in the Niger Inland Delta

Moussa Ibrahim<sup>a,\*</sup>, Ganiyu Oyerinde<sup>a</sup>, Dominik Wisser<sup>b</sup>, Corentin Somé<sup>c</sup>, Ali Abdou<sup>d</sup>, and Adama Mariko<sup>e</sup>

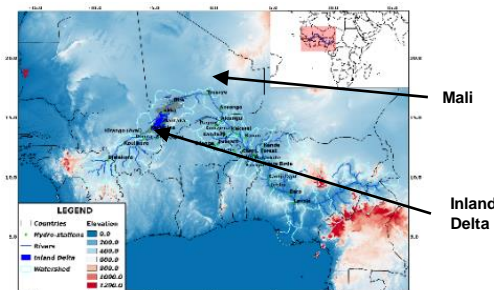
a. WASCAL Graduate Research Programme, Benin, b. Center for Development Research, ZEF, Germany, c. International Institute for Water and Environment (2iE), Ouagadougou, Burkina Faso, d. Regional center AGRHYMET, Niamey, Niger, e. Water and Environment Division - DER Geology, ENI-ABT Bamako, Mali

## INTRODUCTION

The Niger River basin is a significant source of water and food for West Africa. As an agricultural region, the basin is highly dependent on the water availability that is currently under pressure from increased demand with rising populations and climate variability and change. The focus of this analysis, is to assess observed reduction of the main Niger river discharge in the Inland Delta as a result of global change.

## METHODOLOGY

### Study Area



### Data Collection

historical hydro-climatic data of upper, middle and Inland Delta (collected from the Niger Basin Authority and the national services of Hydraulic and Meteorology of Mali) was analysed from 1950 to 2010.

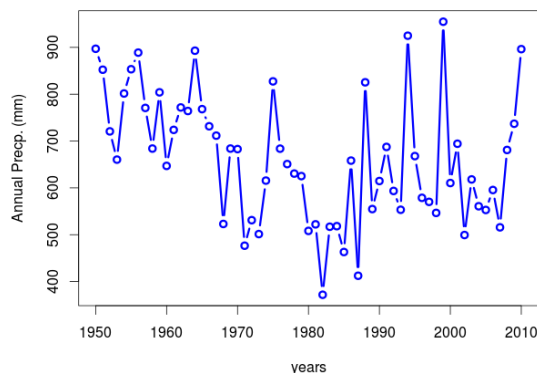
## RESULTS

### Climate Analysis

#### Rainfall

The time series graph shows large variability in annual rainfall. The lowest annual rainfall of 200 mm was recorded in 1983 while the highest (950 mm) was recorded in 2000.

Annual Rainfall variability at Mopti

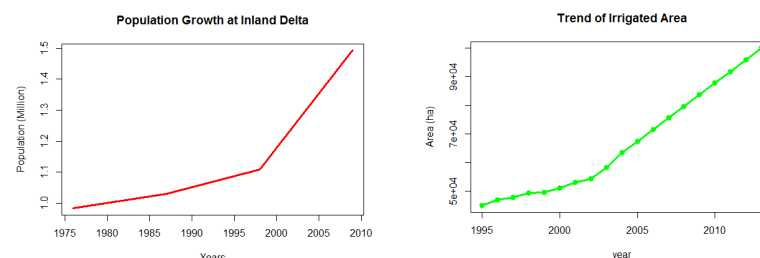


### Temperature

The Inland Delta plays an important role in moderating heat. At Mopti an annual average temperature of 27.8 °C which is lower than recorded temperature at Segou (29 °C) situated farther South, and Tombouctou at North (29.05 °C).

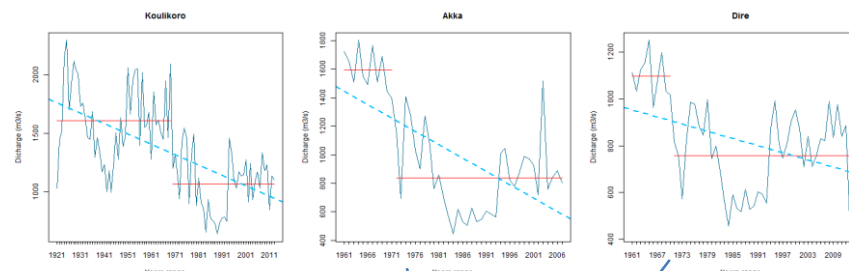
### Drivers of Change of Environment: Human activities

The increase of population and the irrigated area are some of the key factors threatening the water availability within the Inland Delta.



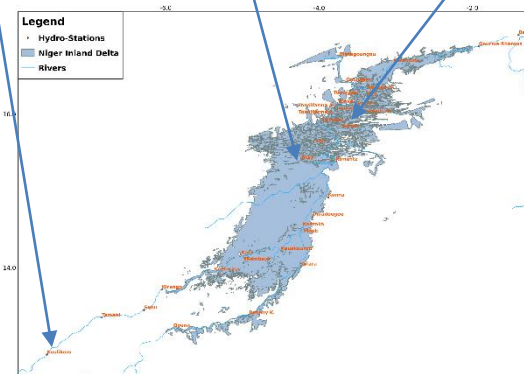
### Trend and Discharge :Change of Environment and Break point

From the graph below all 3 stations highlight break points in the data series at likely the same time. The discharge is seen decreasing, but the change is mainly drastic at the station Akka situated in Inland Delta than those at the upstream and outlet of the delta. This change was mainly due to increased evapotranspiration and abstraction.

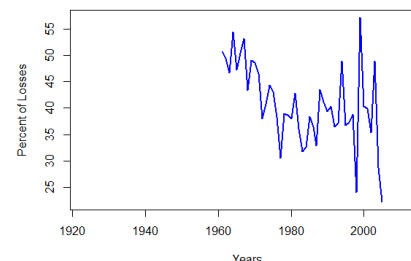


Upper Niger Basin

Inland Delta



Flow Losses



### Change of Environment

An annual average of about 30% losses of Niger river discharge are encountered in Inland Delta.

## CONCLUSIONS

The inner Niger Delta is an anthroposystem where the hydrological regime, dynamics of the environment (flora, fauna and landscapes) and human activities (fishing, agriculture, and livestock) are closely associated. Basic analysis of in situ discharges confirms the impact of the Inland delta area on the discharge of the main river. Hence Based on this analysis, a specific model of Inland delta processes is needed for effective hydrological modeling in the Niger basin.

Satellite image of the Inner Niger Delta (320 x 140 km) 16 October 2001 at the beginning of the flood

