

THE UPPER NIGER RIVER

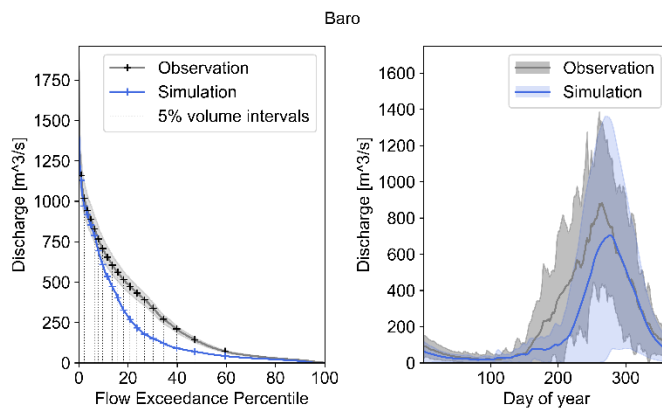
SPOTLIGHT

“ There is a great number of projected dams in West Africa, especially on the Niger river upper basin in Mali and Guinea [...]. No doubt that if these dams are eventually constructed, the Niger river regime will be highly modified, including a large reduction of the flooded area in the inner delta in Mali”

| Mahé et al. 2013 |

RIVER BASIN HYDROLOGY

River discharge characterization

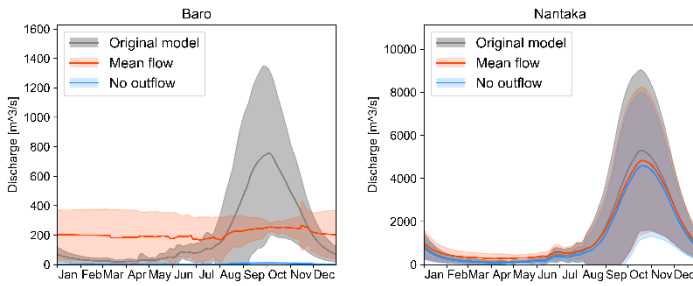


Description: Flow duration curve and discharge climatology at Baro, the downstream station closest to the planned Fomi dam. The plots show the simulated discharge versus the historical in-situ gauge data. Taking into account recent climate change, which has resulted in a decrease in discharge volume, the model captures the climatology satisfactorily although mean discharge is underestimated at Baro and overestimated further downstream in the basin. Model performance in the Bani tributary is not satisfactory, which requires further investigation, including into the quality of in-situ discharge data for the particular river and in of the remote sensing climate forcing.

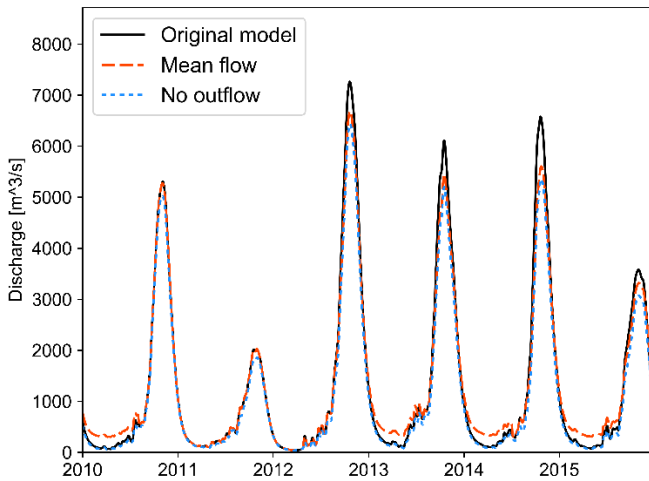
FAST FACTS

- The Niger is Africa's third longest river, spreading over ten countries and covering 7.5% of the African continent
- The source of the upper Niger is located in the Guinea Highlands and meets its tributary, the Bani river at the inlet to the Inner Delta in Mali
- The Niger Basin is a key source of water supply in West Africa and supports one of the most fragile developing regions in the world
- Development plans in the basin include ambitious water diversion plans, including the construction of a 90 MW hydropower dam in Fomi
- The dam is expected to improve food production efficiency and electricity supply, however the impacts on the downstream Inner Delta must be assessed
- The Inner Delta is one of the world's largest Ramsar sites and the second largest wetland in Africa
- The delta is also a biological hotspot and acts as a buffer for floods, providing protection against coastal erosion by storm [2]
- It also provides key services for human activities including forestry, recreation and breeding and is home to numerous historic cities, including Djenné and Bandiagara, both of which are on UNESCO's world heritage list [3]
- 1 Million people are dependent on the floodplain resources [4]

Construction of Fomi dam impact

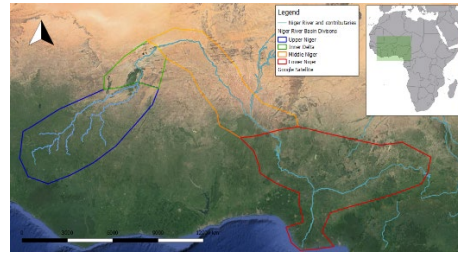


Description: Simulation of the impact of Fomi dam on first downstream station, Baro, and at the inlet to the Niger Inner delta at Nantaka, based on two scenarios. In the first example, the dam is operated using a very simple rule-set maintaining a constant discharge equivalent to the mean discharge at Fomi prior to dam construction. The reservoir will likely also be used for water supply, however no information is available on irrigation demands. The "no outflow" scenario is thus an extreme scenario where all water in the reservoir is reserved for irrigation.



Scenario	Average Discharge	Maximum Discharge / Minimum Discharge [m ³ /s]	Mean percent change in daily flows
No reservoir	1 493	10 470 / 24	-
Mean flow outflow	1 494 (+0.05%)	9 669 (-7.7%) / 24 (-0.05%)	+43%
No outflow	1 298 (-13.1%)	9 419 (-10.0%) / 19.9 (-16.8%)	-15.3%

Description: Hydrograph at Nantaka for the three scenarios: no reservoir, mean flow operation and no outflow operation, shown here for the period 2010-2015. The peak discharge is reduced by between 800 and 1050 m³/s depending on the two scenarios. As seen in the hydrograph, the scenario applying mean discharge, results in flow in the river all year round, including in the dry season for most years. The two scenarios are extreme scenarios, but some water will be retained and removed at Fomi – either for irrigation or due to seepage and evaporation, thus some combination of the impacts of the two scenarios is expected at the Inner Delta.



Basemap of the Niger river. The Upper Niger is outlined in dark blue [5]

References

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- [4] Thompson, J. R., Crawley, A., and Kingston, D. G. (2017). Future river flows and flood extent in the Upper Niger and Inner Niger Delta: GCM-related uncertainty using CMIP5 ensemble. *Hydrological Sciences Journal*, 0(1080).
- [5] Slott, E. L. and Hansen, I. L. (2017), Hydrologic-hydrodynamic modelling of the Upper Niger River Basin – A case study, Department of Environmental Engineering, Technical University of Denmark.

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