



Mapping flood hazard and risk in the Congo Basin : the challenges of flood risk management in Africa

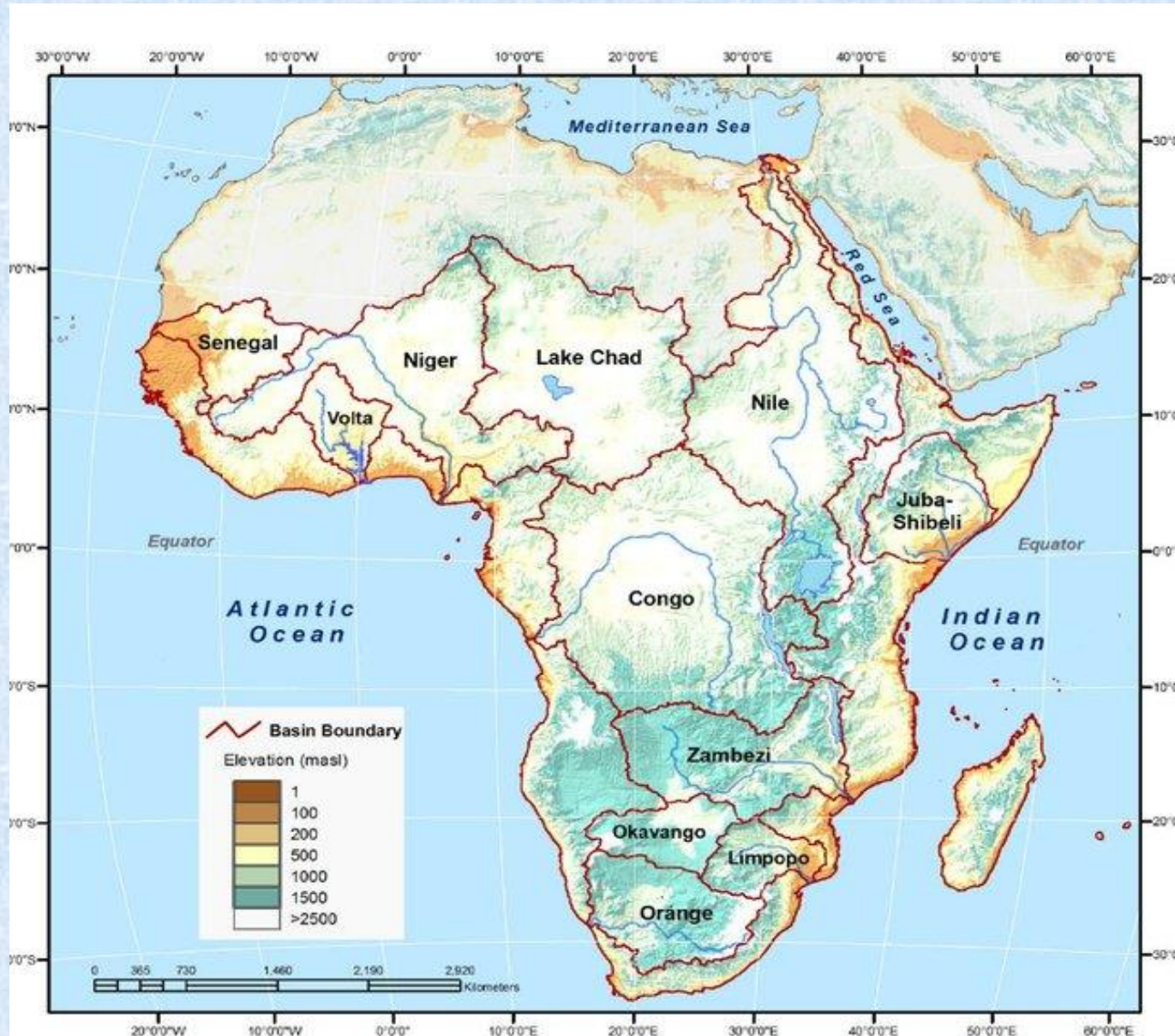
Global Flood Partnership Conference
18 Nov. 2020

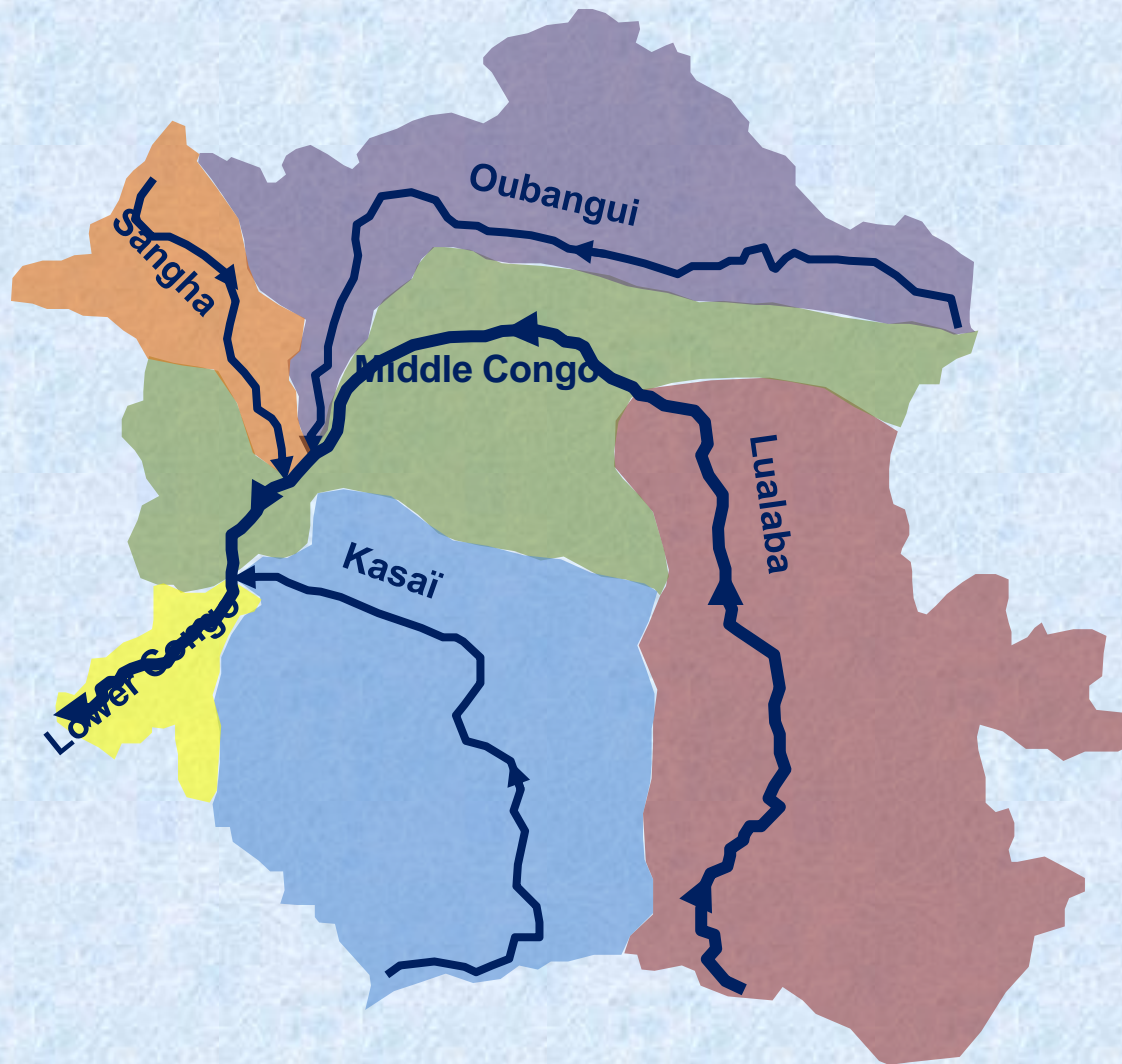
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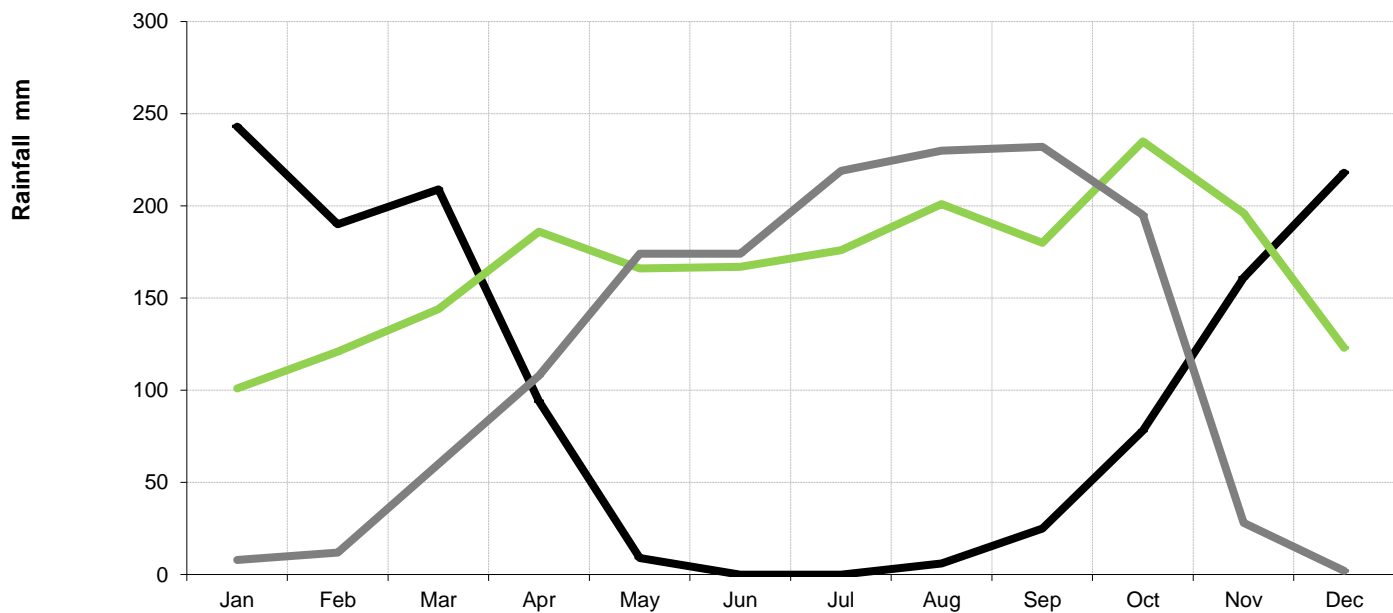
www.crrebac.org , raphtm@yahoo.fr

Major River Basins of Africa





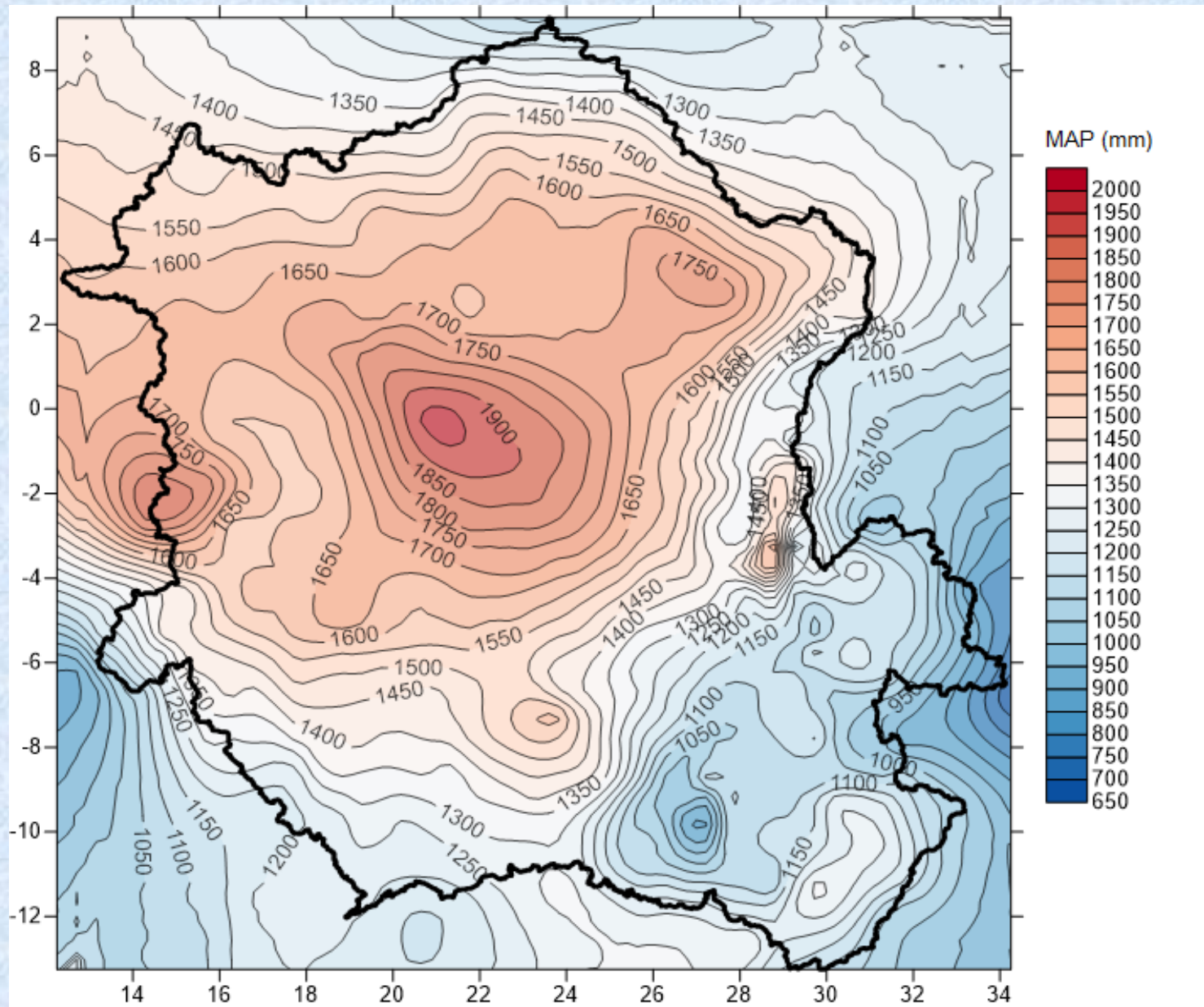
Seasonal distribution of rainfall

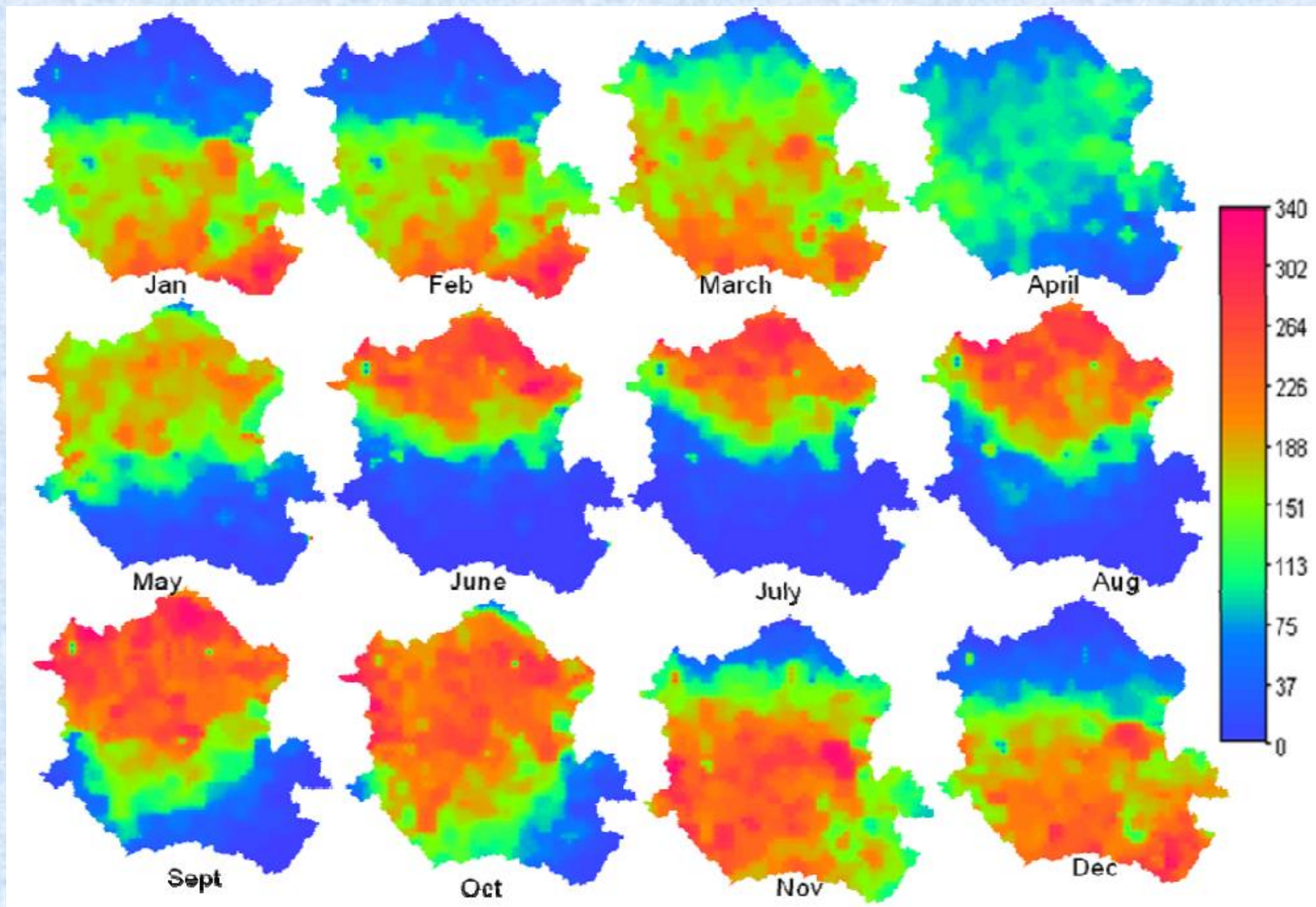


— Rainfall southern basin

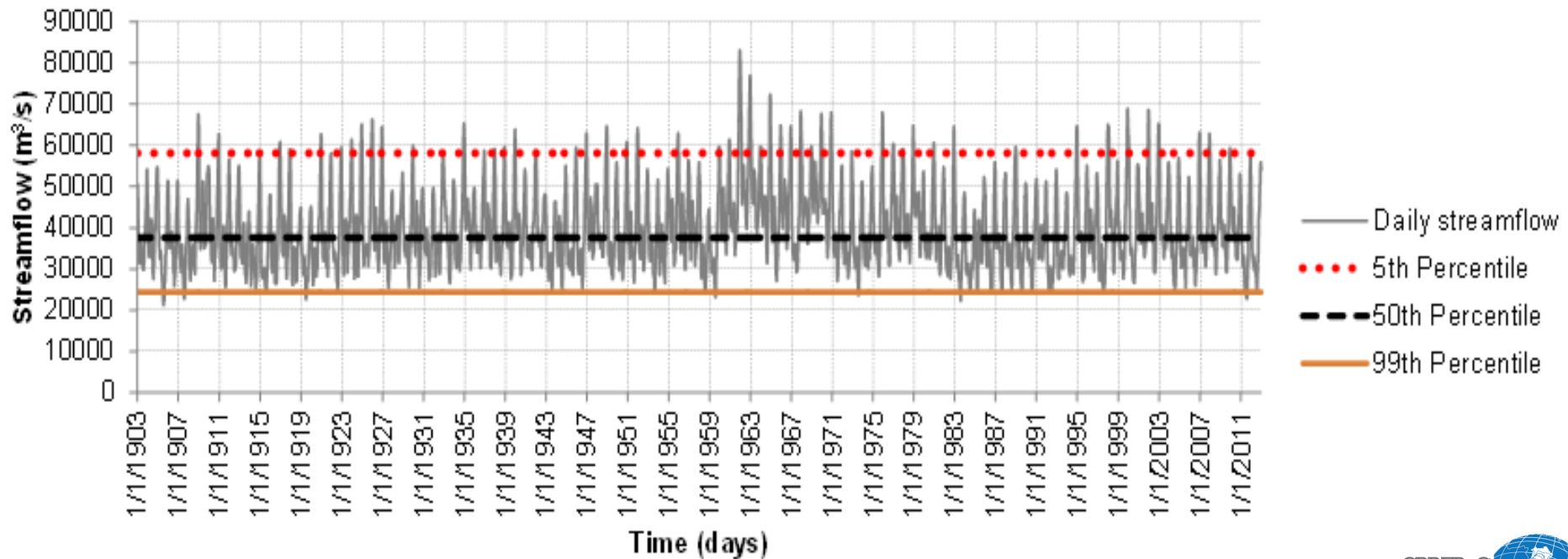
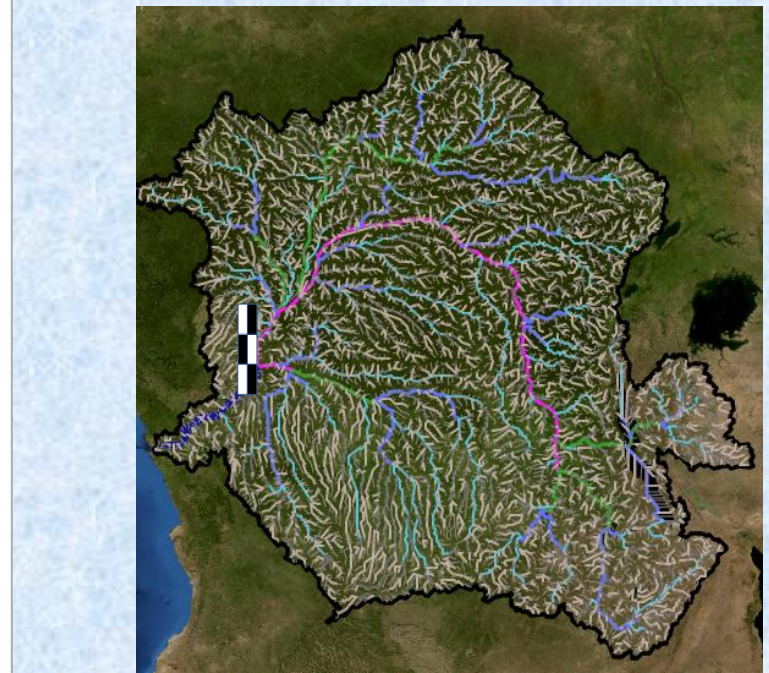
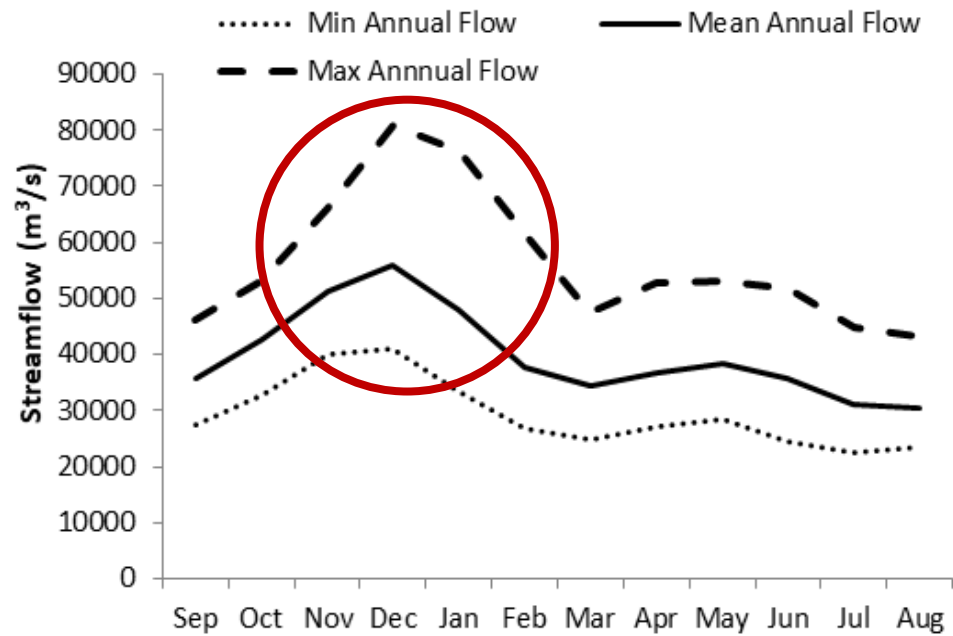
— Rainfall central basin

— Rainfall northern basin

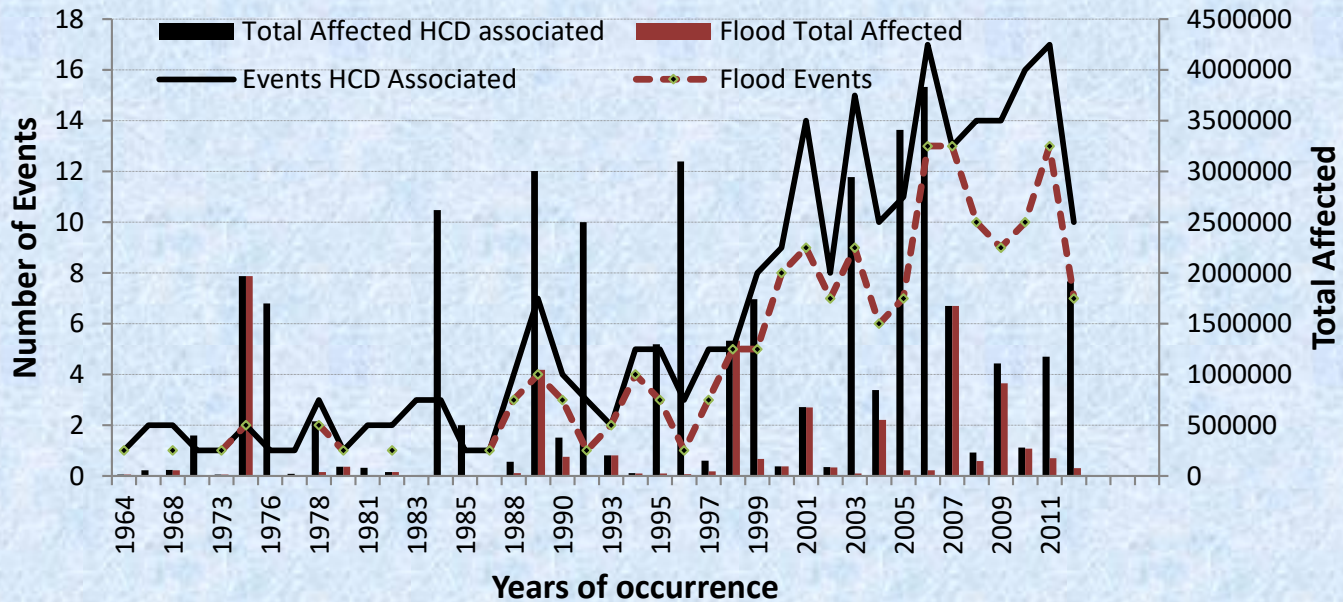
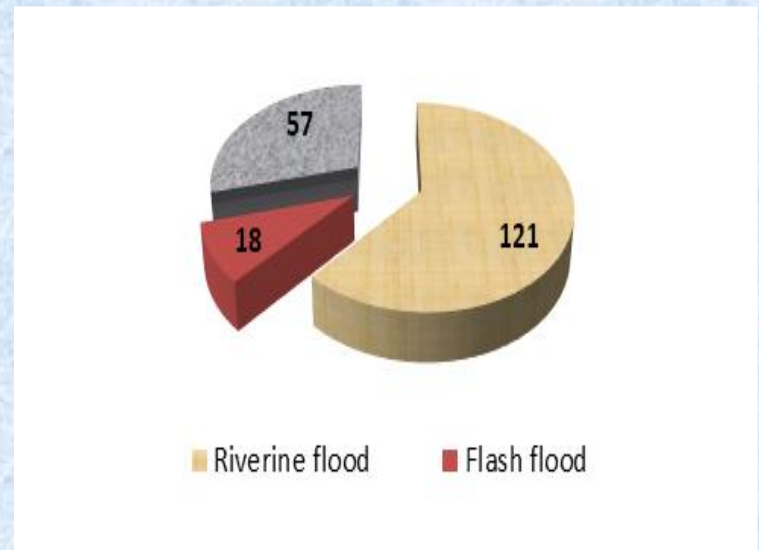
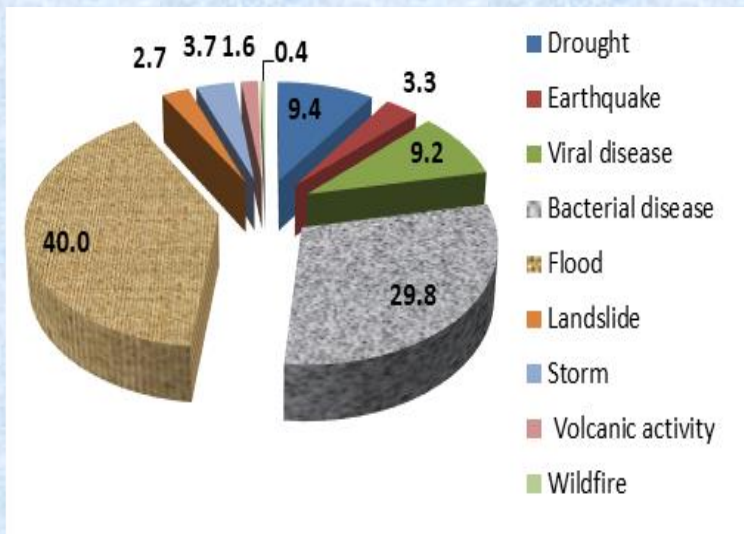




Local and external factors (atmospheric-ocean interactions and the monsoonal processes) that influence variability in rainfall



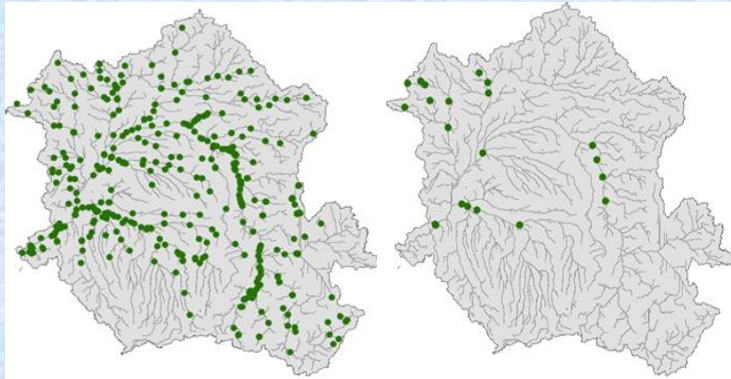
- The region of the Congo River Basin covers a wide range of climatic conditions and is prone to recurrent extreme events and the associated disasters, including floods, droughts, cyclones, and changes in the patterns of rainfall and temperatures.
- Associated with this challenge are rapid population growth, uncontrolled urbanization, deforestation and land degradation, which represent a serious dilemma to sustainable development.
- Climate change may further exacerbate these problems with implications on agriculture, biodiversity, hydropower and health (e.g., water related diseases).



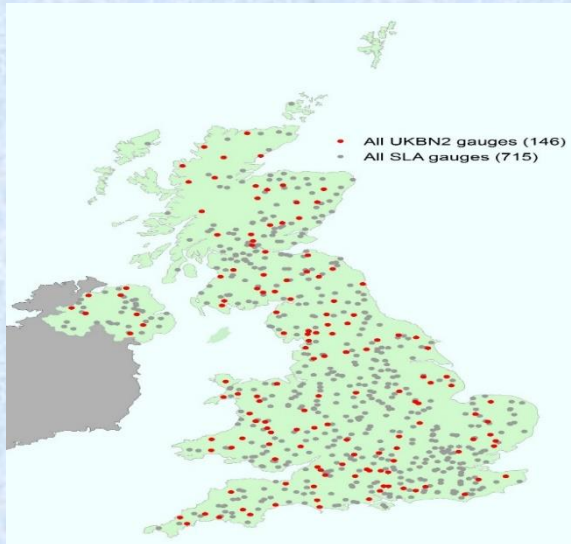
Hydro-climatic events and risks of natural hazards

Challenge of Flood Predictions

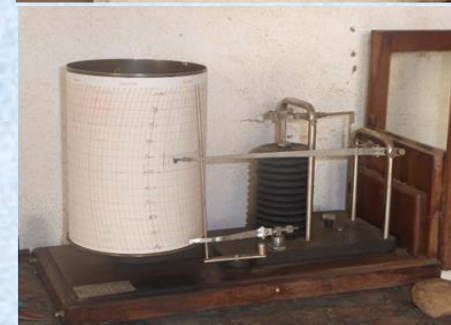
- Monitoring network and data



Before 1960s Current situation



Example of the UK: 242 495 km²



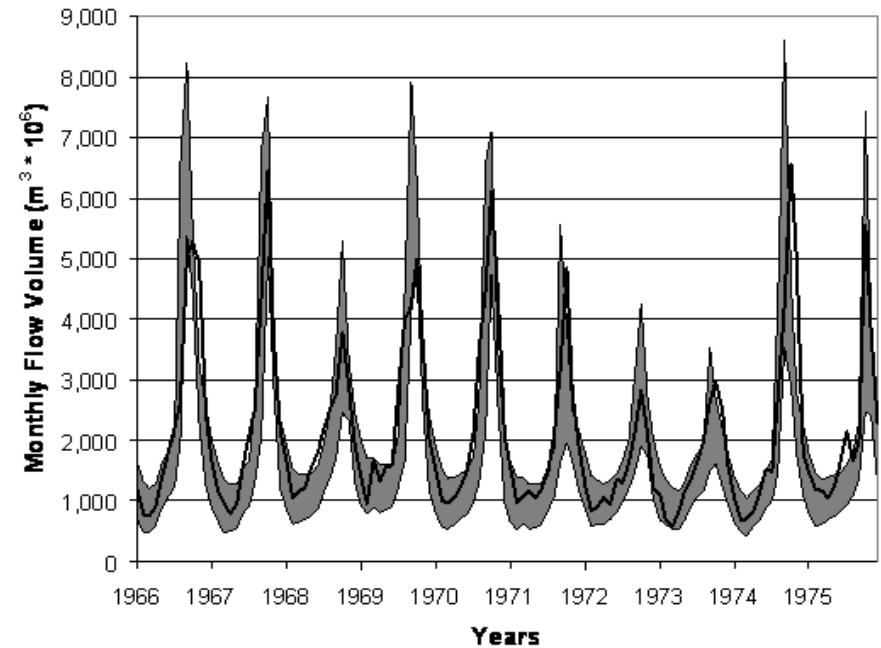
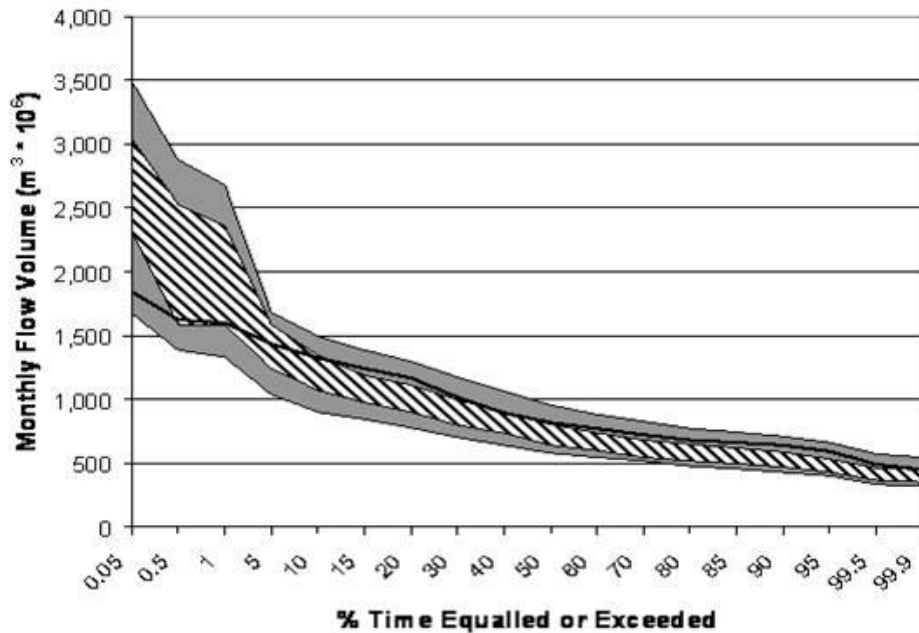
Does the existing historical database enable us to capture time and space scales hydrological processes and variability???

- **Processes**

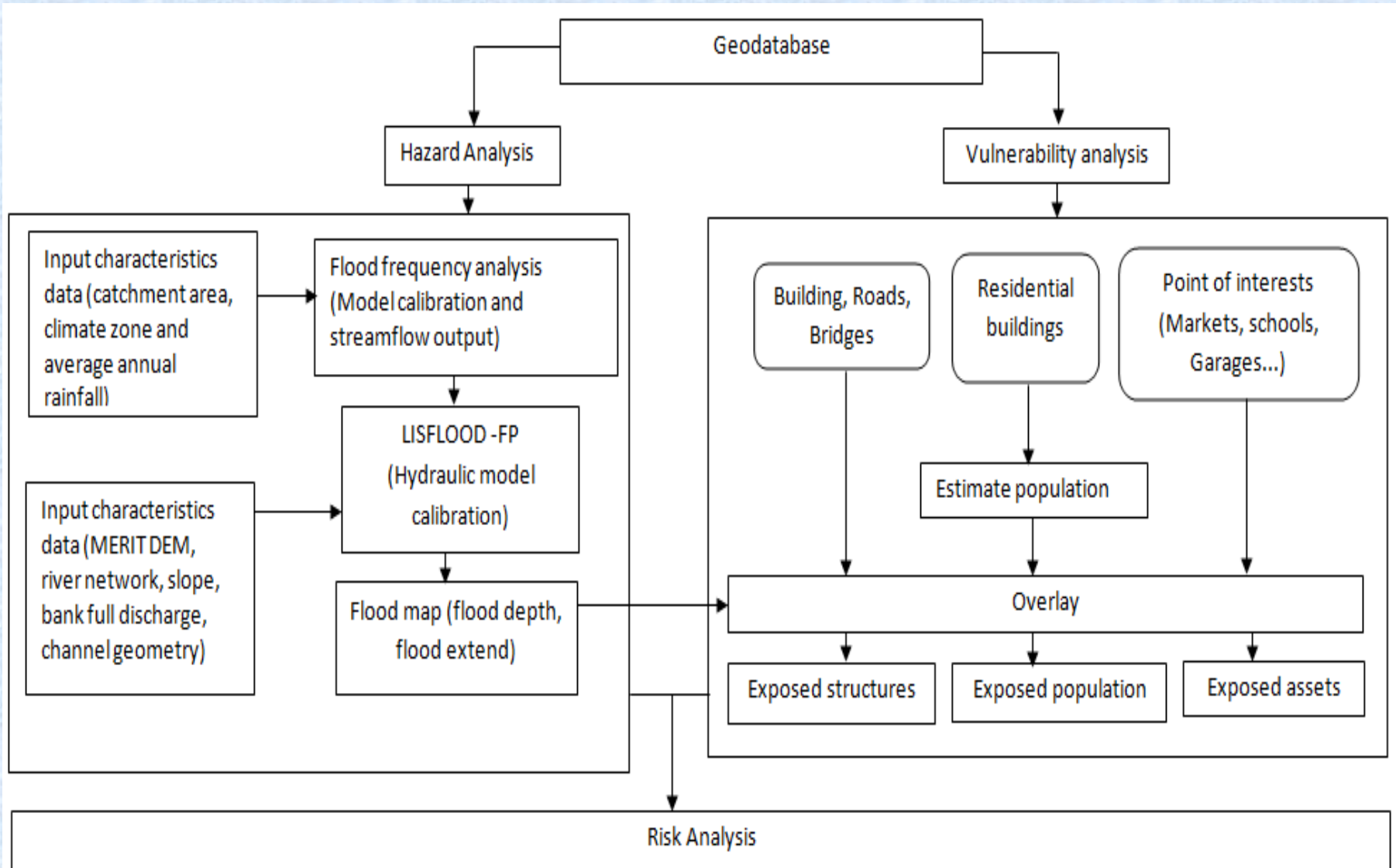
- The Congo Basin represents a climatic transition zone between Northern and Southern Africa, and Eastern and Western Africa, which makes the climate variability remarkably complex.
- The climatology is influenced by many factors, which depend on atmospheric-ocean interactions and the monsoonal processes.
- These factors include migration of the tropical rain belt, Sea Surface Temperatures (SSTs), Atmospheric Jets (Central African Jets), and Meso-scale Convective Systems; the main drivers that modulate climate variability over the region of the basin.
- There is poor knowledge about the interaction of these factors and how will climate change influence the seasonal distribution of rainfall in the basin. This challenge is also associated with the poor knowledge of runoff generation mechanisms over the basin.

- **Methods**

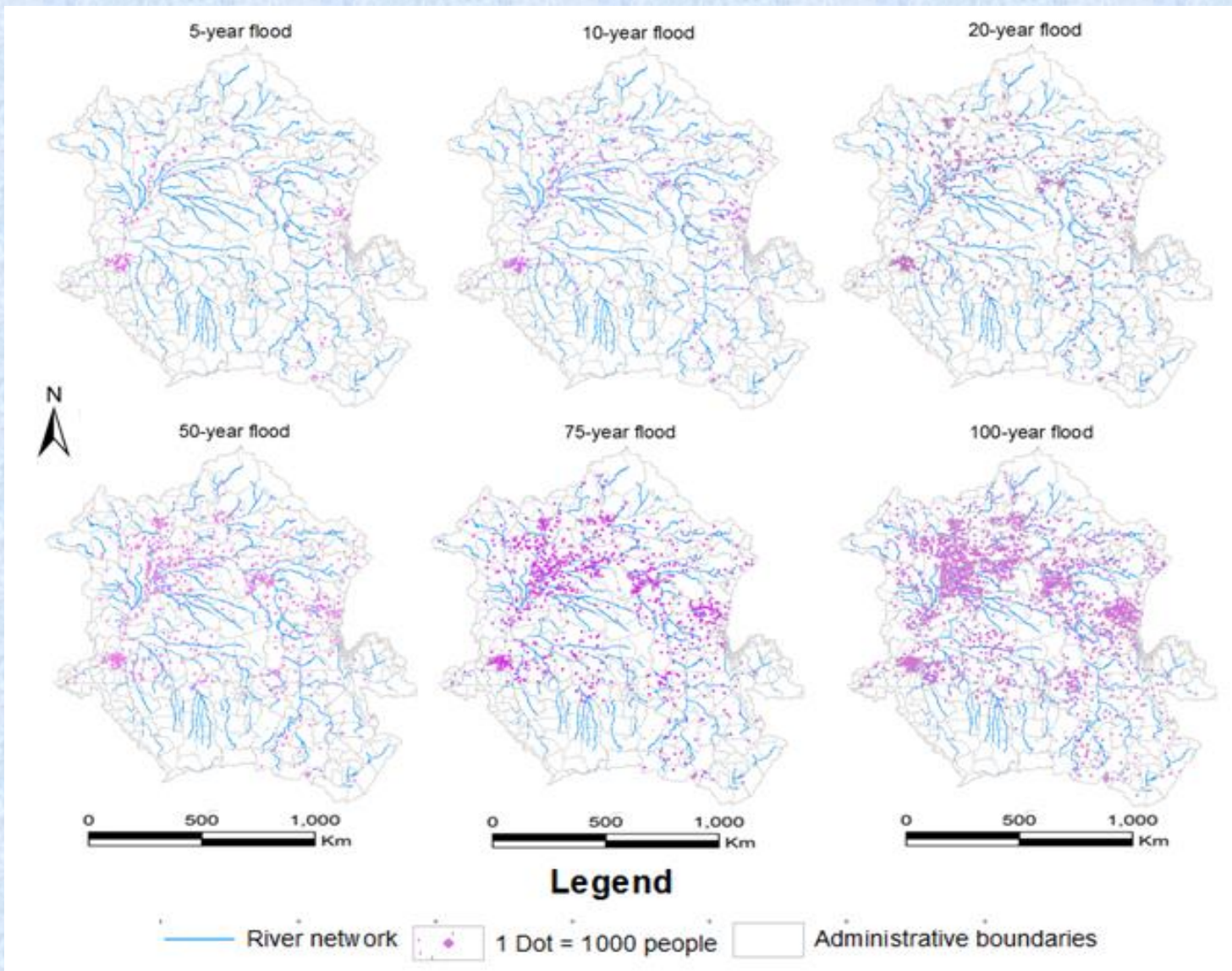
- Rainfall-runoff and hydrodynamic models can appropriately be used to predict flood hazards and risks, but there will always be uncertainty due to a lack of adequate knowledge of the dynamics of hydrological processes, associated with the lack of data at the required spatial and temporal scales of predictions.



Global Flood Predictions in the Congo Basin



Bola, G., Tshimanga, R.M., Neal, J., Hawker, L., Lukanda, M.V., Trigg, A.M., Bates, P. 2020. Multi return periods flood hazards and risks Assessment in the Congo River Basin. Under press: *American Geophysical Union – AGU Willey special issue*



Flood risks maps showing exposed population in case of a: 5-year flood; 10-year flood; 20-year flood; 50-year flood; 75-year flood; and 100-year flood. Bola et al. (2020)

Conclusion

- The challenges of flood management are numerous at the global scale, but with a varying degree from place to place. This variation is associated with the inherent characteristics of the physical environment, the level of socio-economic development, and the social and political organization, which all have an influence on the level of vulnerability towards flood disasters.
- In recognition of the requirements for effective flood forecasting and disaster management systems, analysis of the current status for the Congo River Basin shows that major efforts are needed, with regard to processes understanding, data collection and enabling environment.

