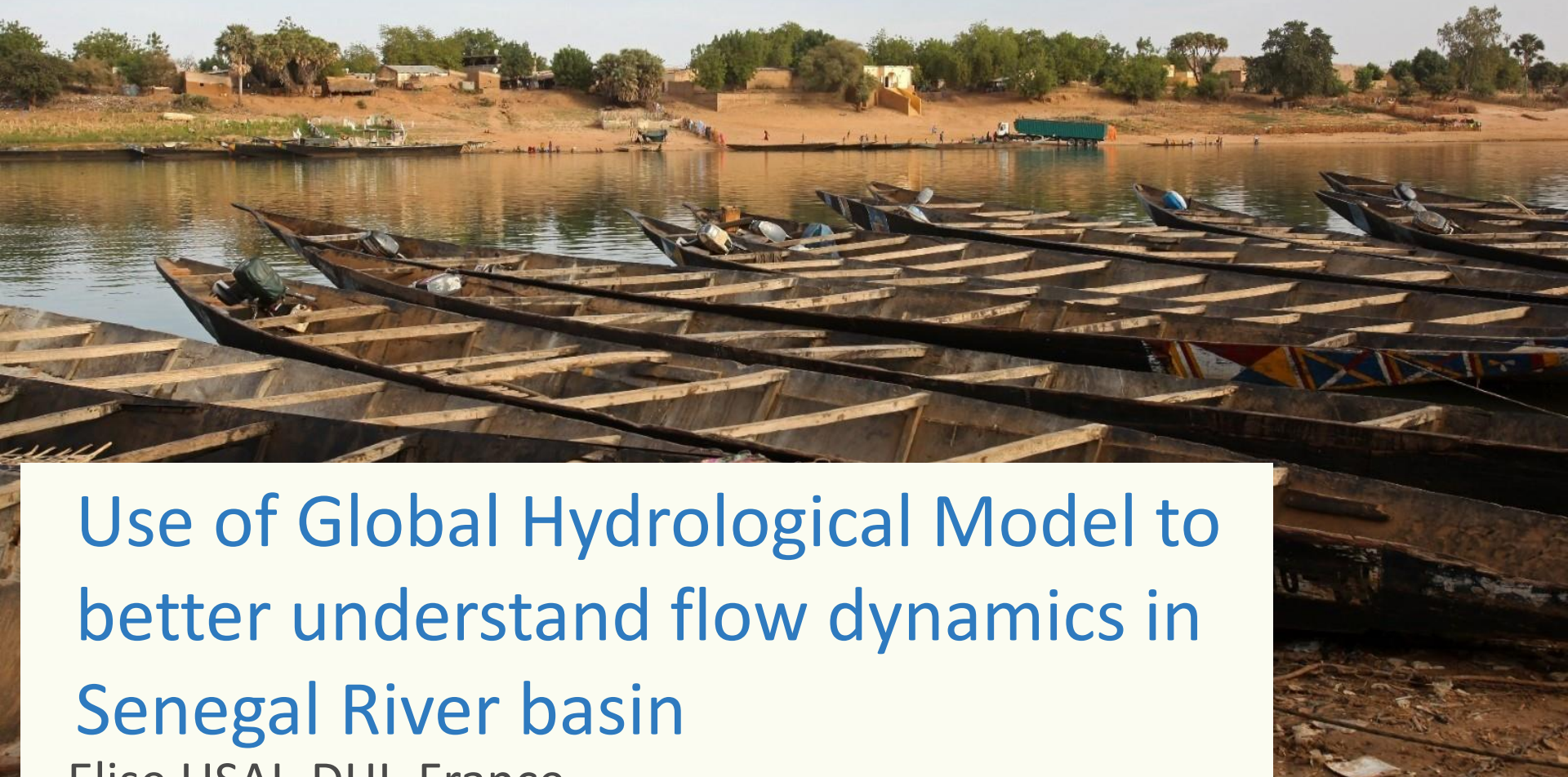




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Use of Global Hydrological Model to better understand flow dynamics in Senegal River basin

Elise USAI, DHI, France

DHI's Global Hydrological Model

- Hydrological assessment in data and resources scarce areas
- Basis for local and detailed assessments for flood and water resource management

Methodology of DHI-GHM



Global datasets

- Topography
- Catchments & rivers
- Land use
- Soil type
- Historical weather data
- Short-medium range weather forecasts
- Seasonal forecasts
- ...



Updated hourly

Forcing →

Estimated Parameters →

Rivers & Catchments →



Distributed NAM models

Rainfall-runoff models
Perform routing at:
1. Grid level
(within grids)

Fast river router

2. Catchment level
(grid → catchment)
3. Basin level
(within catchments)



Value added Global datasets

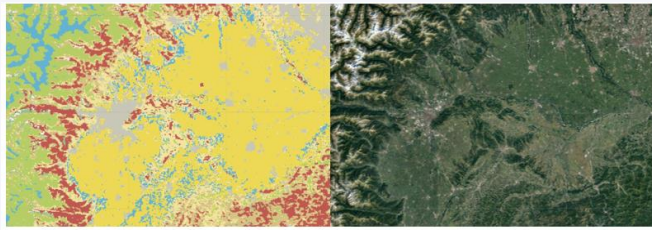
- Total runoff
- Overland flow
- Baseflow
- Interflow
- Surface storage
- Root zone storage
- Snow storage
- Hydrographs
- ...



Updated hourly

Alexandra M. Murray et al., DHI-GHM: Real-time and forecasted hydrology for the entire planet, Journal of Hydrology, 2023, <https://doi.org/10.1016/j.jhydrol.2023.129431>

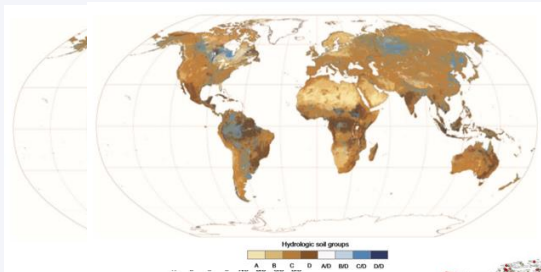
Rainfall-Runoff: Physical parameter estimation from global datasets



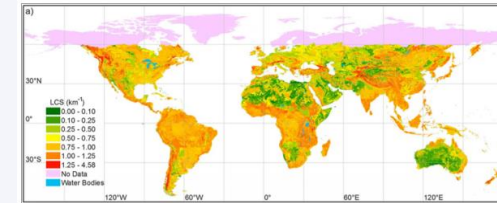
Modis land use



90m DEM



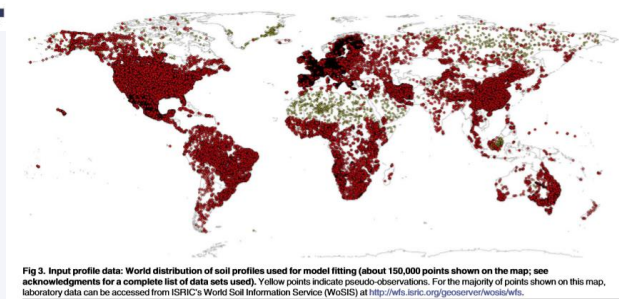
Soil groups



Drainage density



Depth to bedrock



ISRIC soilGrids (soil profile database)

Fig 3. Input profile data: World distribution of soil profiles used for model fitting (about 150,000 points shown on the map; see acknowledgments for a complete list of data sets used). Yellow points indicate pseudo-observations. For the majority of points shown on this map, laboratory data can be accessed from ISRIC's World Soil Information Service (WoSIS) at <http://wfs.isric.org/geoserver/wosis/wfs>.

Application of DHI's GHM on Senegal River Basin

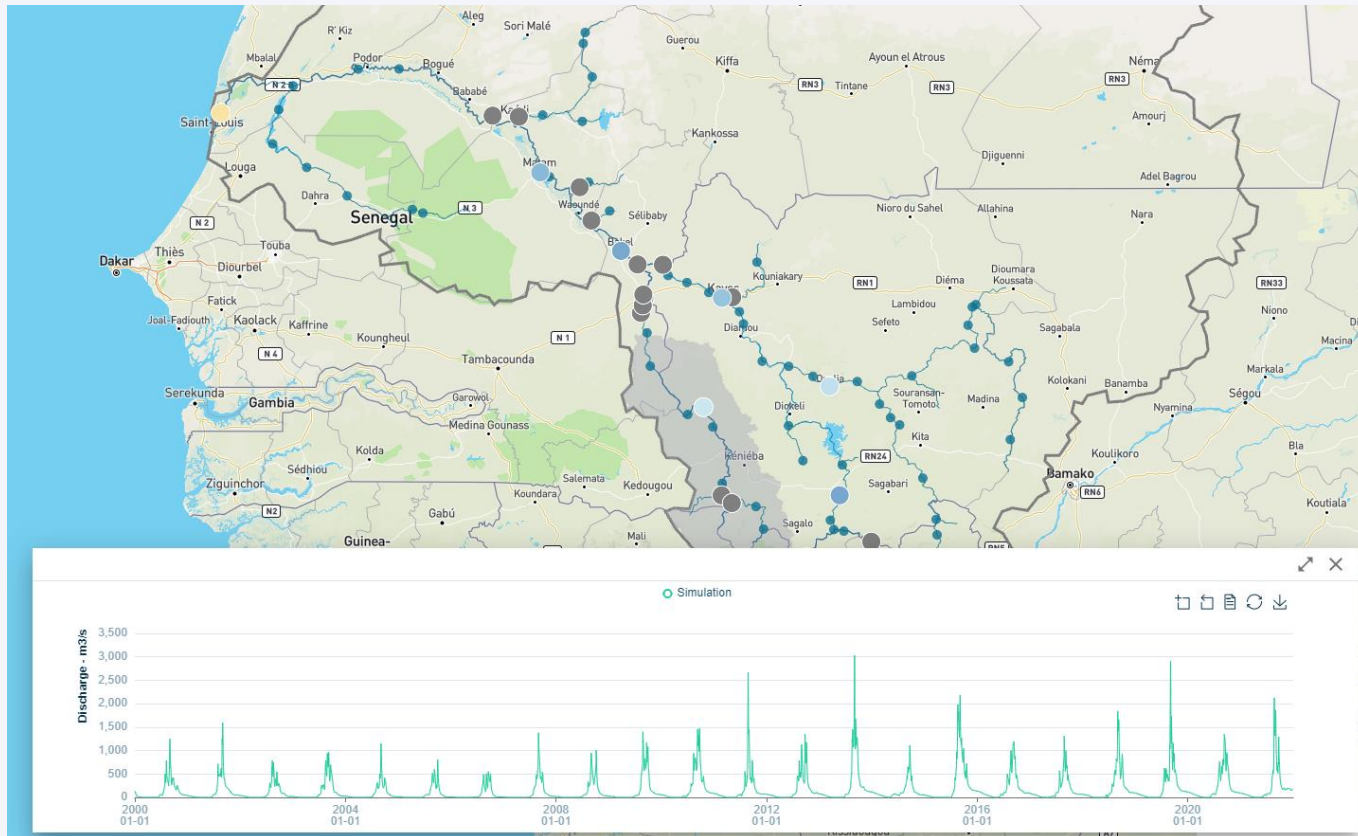
Objectives :

- Improve knowledge on flow dynamics for ungauged rivers to propose new infrastructures to improve resilience against flood and drought events

Methodology :

- Local Hydrological model on Senegal river basin extracted from DHI's Global Hydrological model
- Calibration based on local gauging stations

Application of DHI's GHM on Senegal River Basin



Application of DHI's GHM on Senegal River Basin

Results available ...

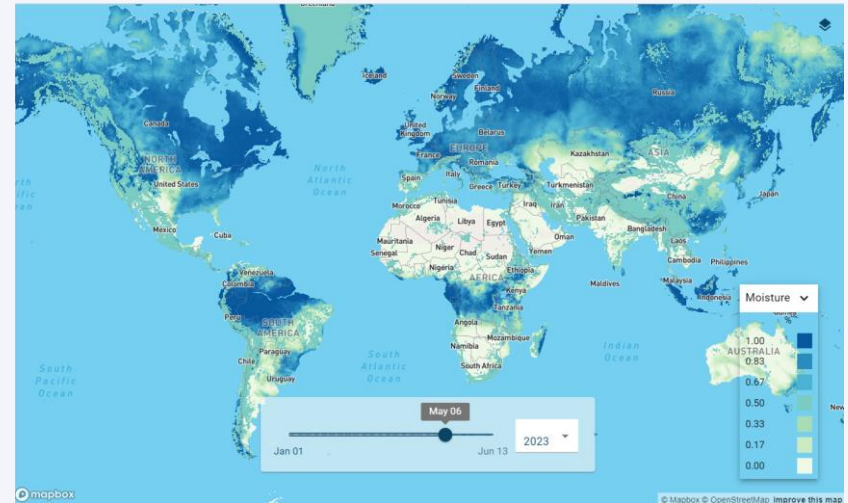
- 20 years discharge time series anywhere on the basin
- Quantification of the daily, monthly and annual flows
- Assess flow return period

... for multiple applications

- Design mitigation measures against floods
- Improve navigation
- Ensure better availability of water resource
- Quantify impact of climate change on water resource availability
- Real time and Forecast from few days up to 9 months ahead

DHI's Global Hydrological Model

- **Data-scarce** areas can be modelled using such a global model approach.
- The global model is a **starting point** for more detailed local modelling.
- DHI-GHM remains very **flexible and agile** to support different areas such as macro-transport (e.g., macro plastics).



Key actionable recommendations

- *Compensate lack of ground data by using a digital solution to better manage water resources*
- *Assess hydrological impacts of climate change anywhere on a basin*
- *Implement early warning solutions for flood and drought*



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THANK YOU!