Water uses, asymmetry and vulnerability in the Senegal river

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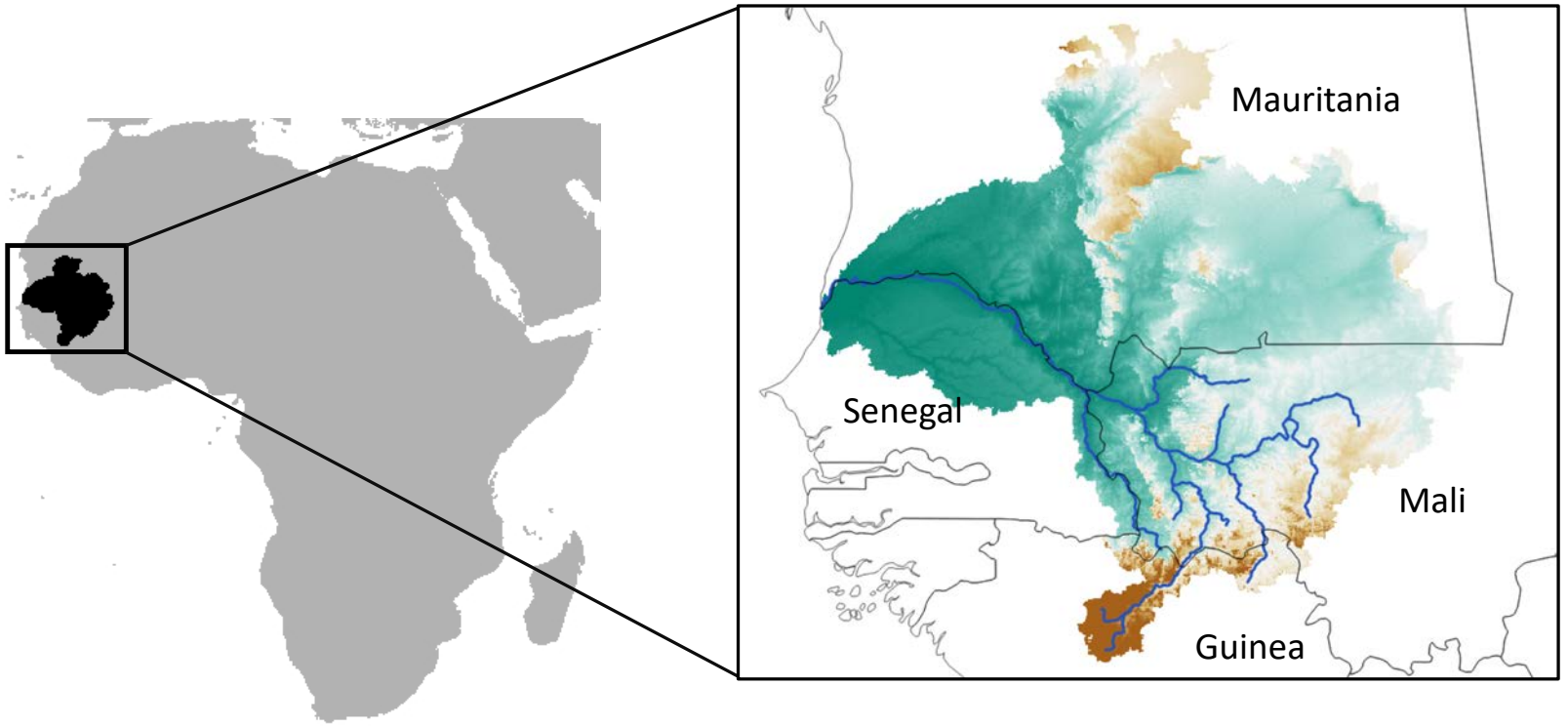
The Senegal River basin

- Located in Western Africa
- Drainage area = 337000 km^2
- Shared by four countries: Guinea, Mali, Mauritania and Senegal

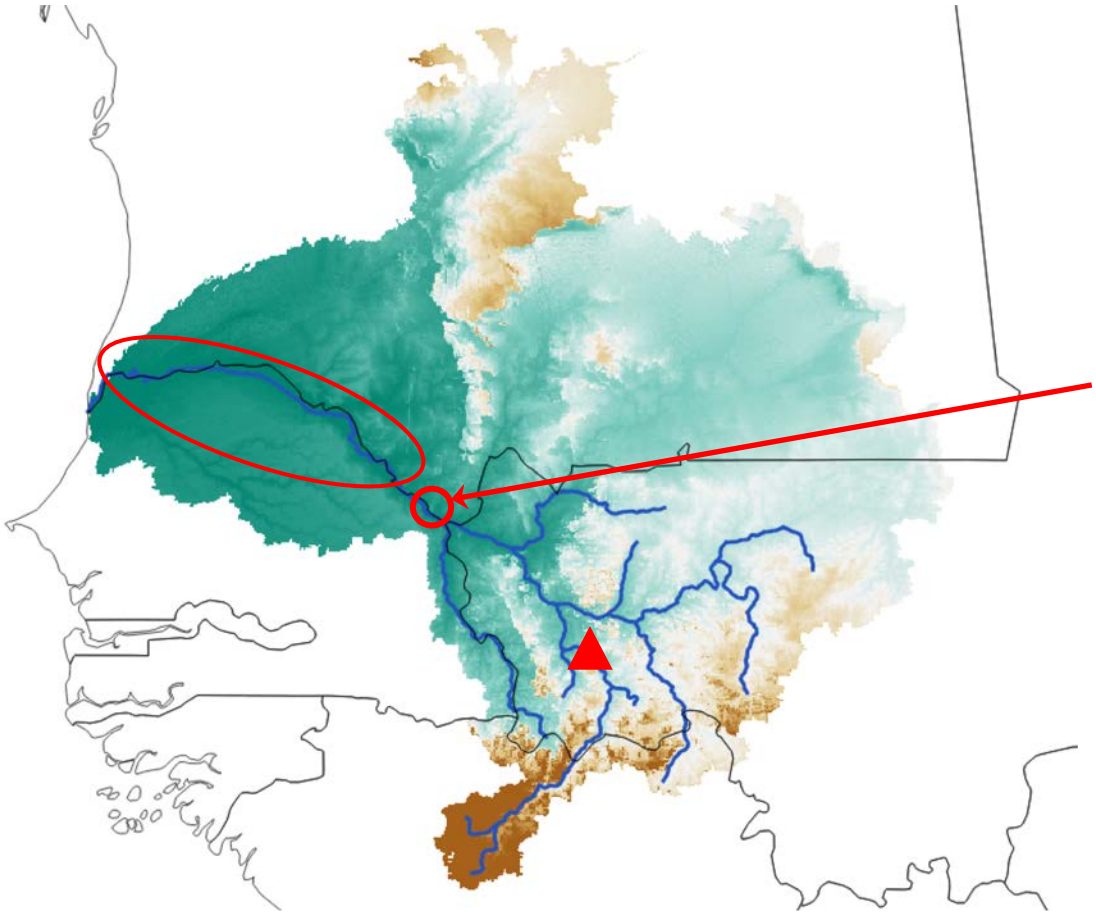


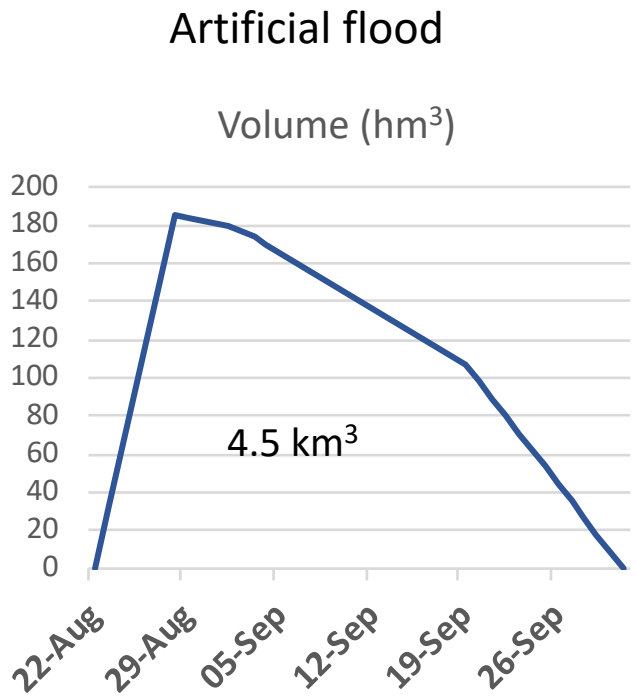
The Senegal River basin

- Traditional uses:
  - **transportation (navigation)**
  - **food production: fisheries + flood recession agriculture + livestock**
- More recently: hydroelectricity
- Significant development potential in the basin
  - **Irrigated agriculture**
  - **Hydropower**
  - **River shipping**
  - **Mining**
- Coordination through the river basin authority: OMVS
  - **Long-term planning (investments)**
  - **Mid-term planning (seasonal water allocation)**

The Senegal River basin

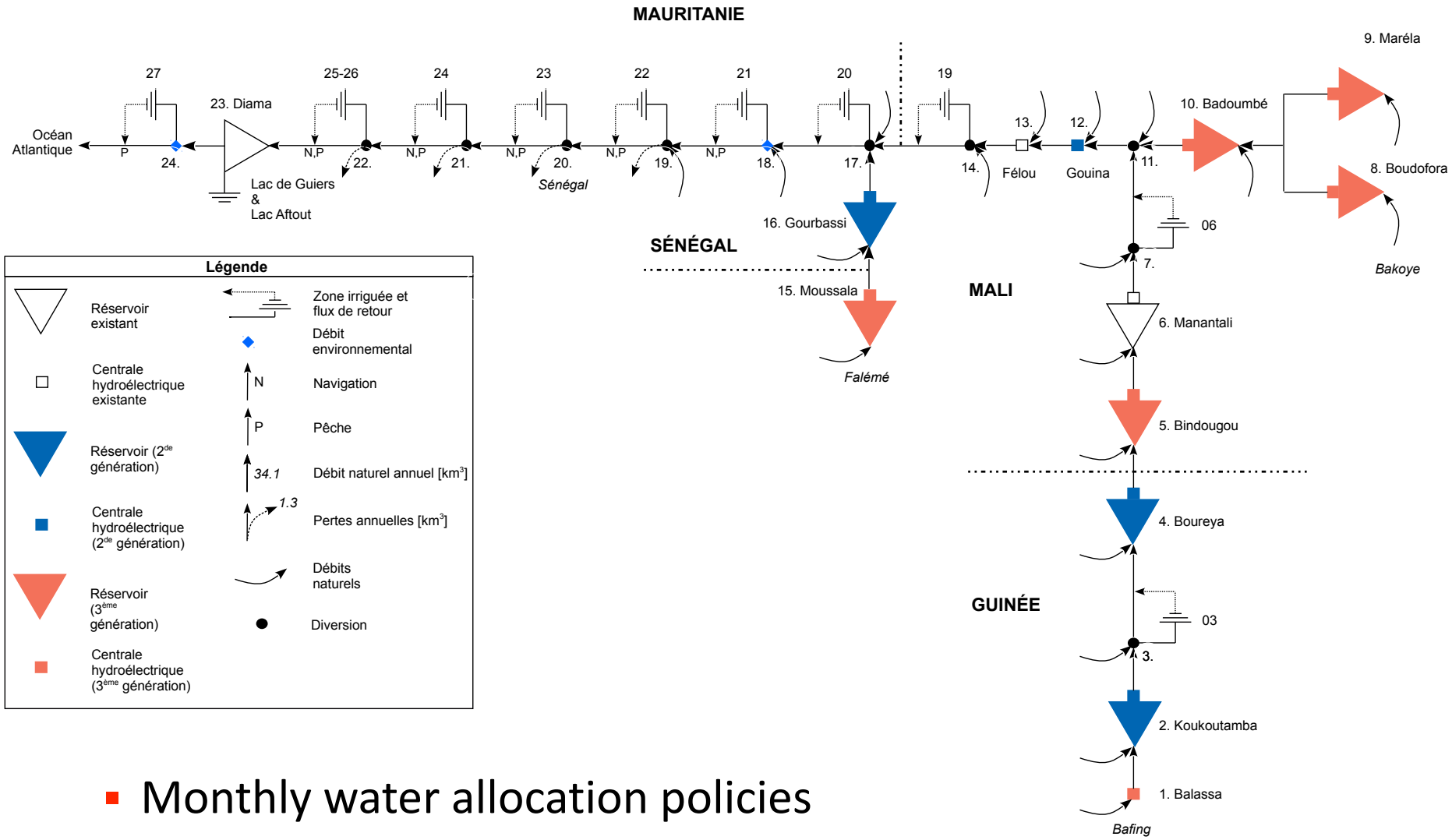
- Food security in the floodplain (Senegal, Mauritania) threatens by upstream reservoir storages (Mali, Guinea)





The Senegal River basin

- Two development "visions"
  - **Traditional uses:**
    - environment, floodplain fisheries, flood recession agriculture
    - riverine communities (politically marginal)
  - **Modern uses:**
    - hydropower, navigation, irrigated agriculture
    - agri-businesses & power utilities & government agencies (politically connected)
- Project "ENHANCED CROSS-BOUNDARY WATER RESOURCE MANAGEMENT IN THE SENEGAL RIVER BASIN"
  - **Inter-country, inter-sectoral, trade-offs assessment & water accounting. Horizons: 2015, 2030, 2050**
  - **Capacity building (GIS, project management, modelling)**
- Project managed by FAO for OMVS (river basin authority)
- Université Laval: Water resources systems analysis
  - **Hydroeconomic modelling of the SRB**



- Monthly water allocation policies
- Hydrologic uncertainty
- Performance indicators: energy, crop production, fish catch, navigation, (domestic water supply)

Scenarios

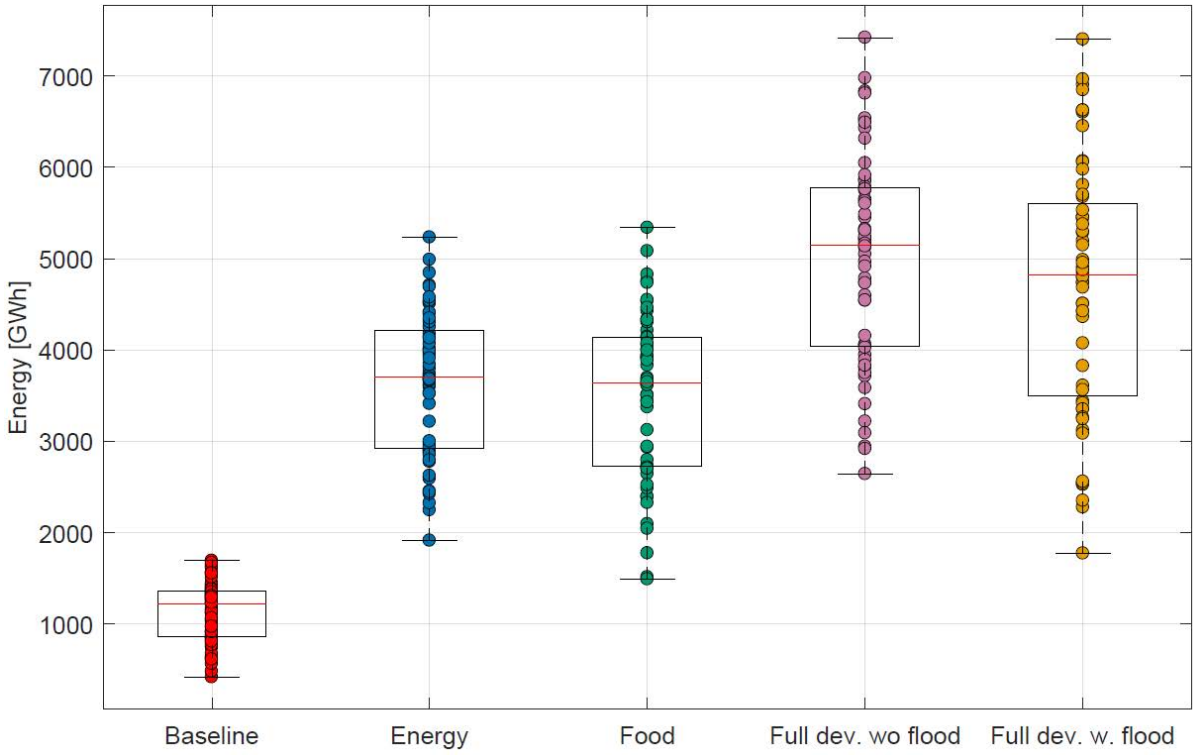
- Development scenarios represent alternative levels of water resources' commitment in the basin

Baseline 2015	Mid-development 2030	Full-development 2050
2 reservoirs	5 reservoirs	10 reservoirs
260 MW	850 MW	1250 MW
74 kha	255 kha	402 kha
5.9 million inhabitants	9.7 million	16.8 million

- Management scenarios reflect alternative allocation policies between competing uses
  - **Food security: flood recession agriculture, fisheries and irrigation**
  - **…**
  - **Energy security: hydropower generation**

Hydropower generation

- Annual energy generation



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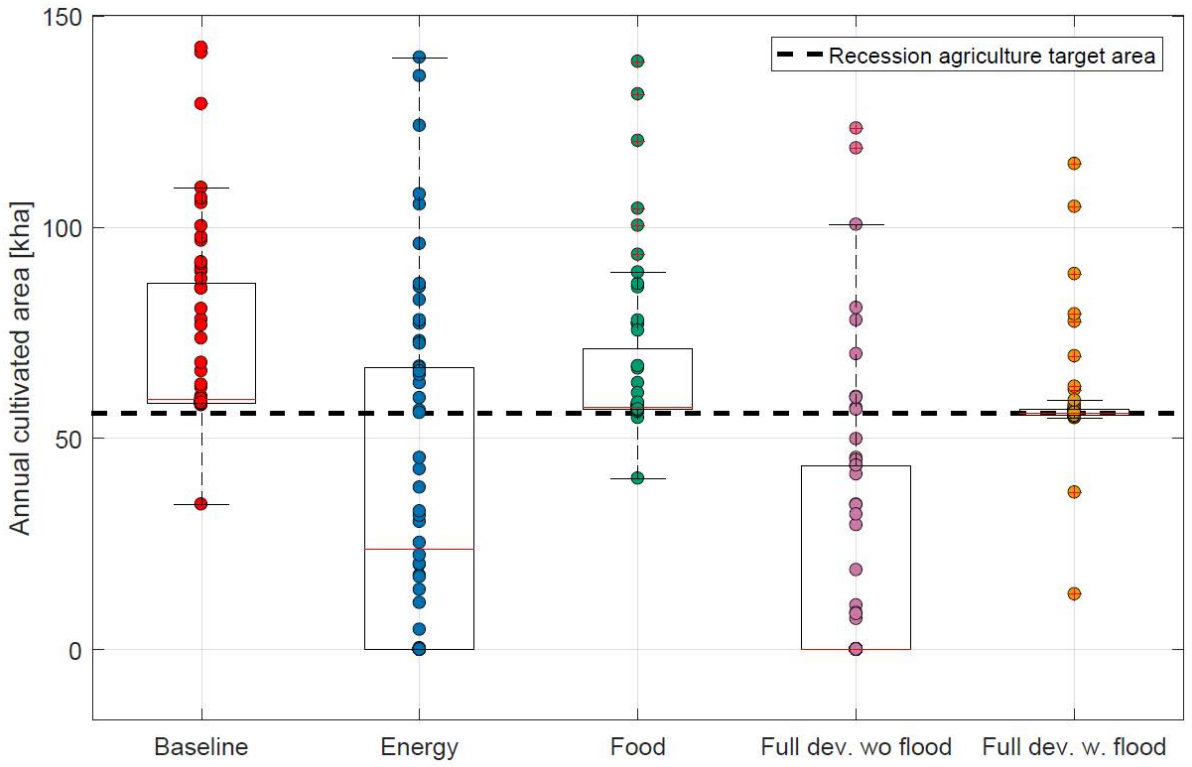
Cultivated area – flood recession agriculture



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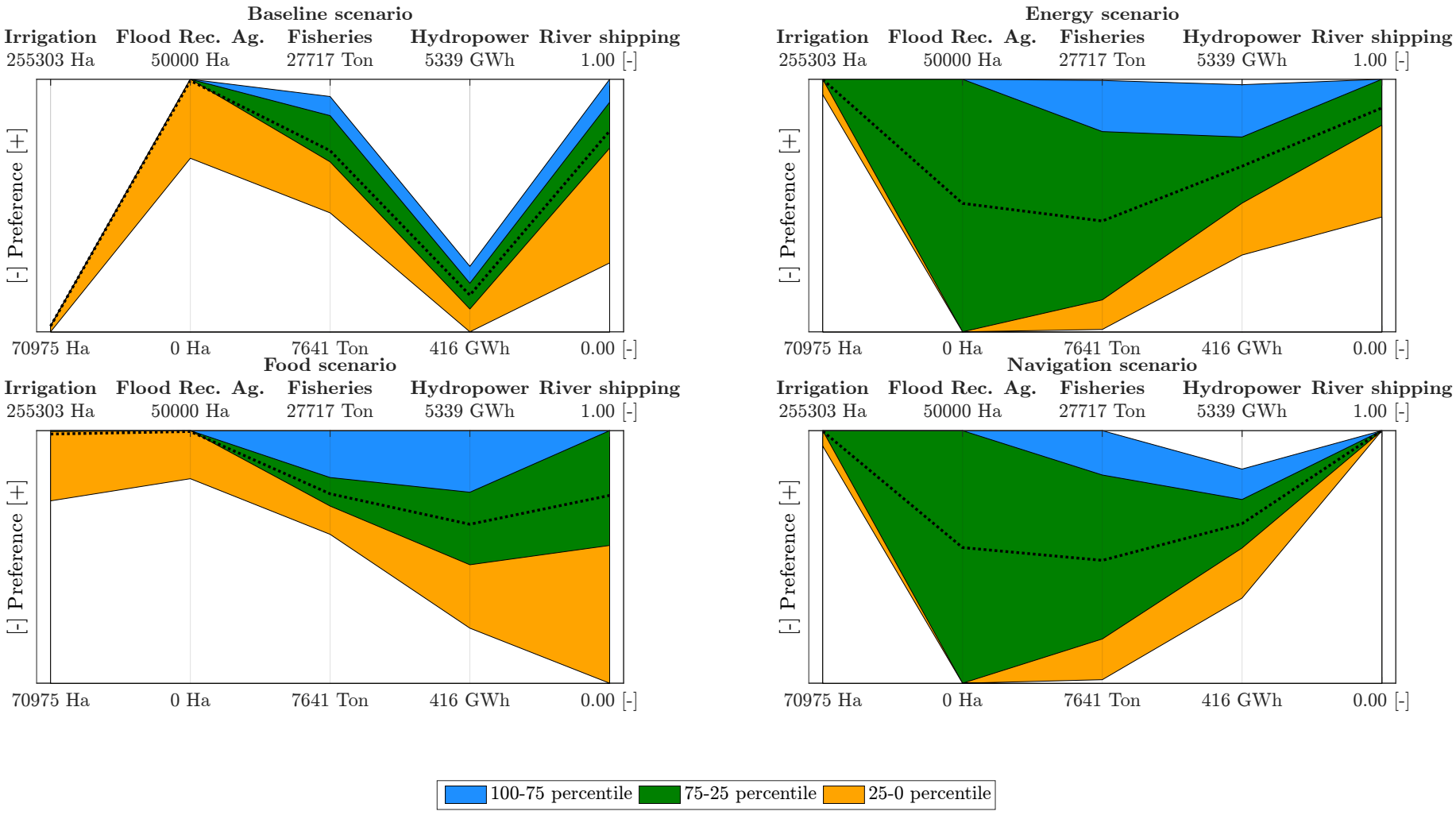
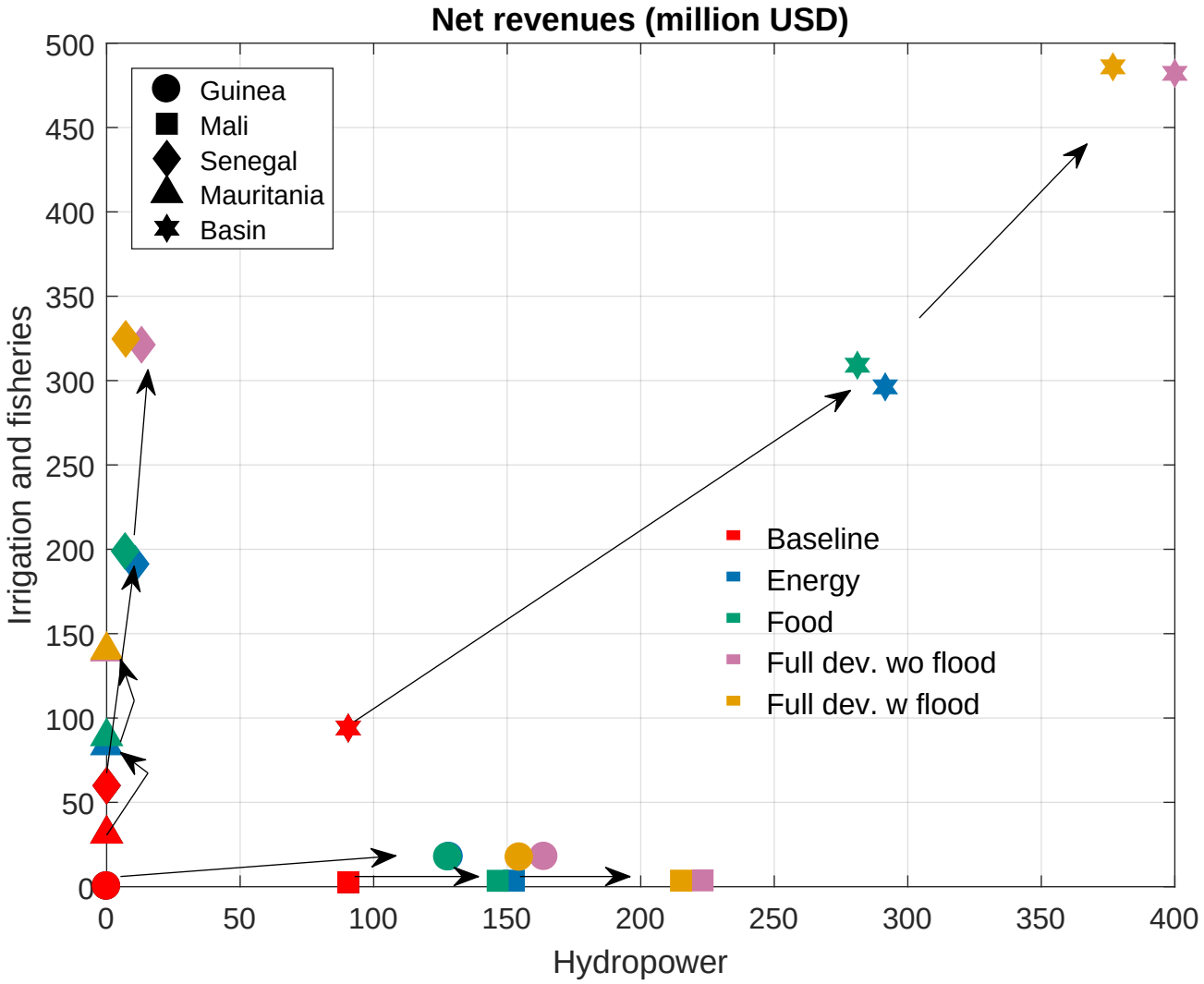
Trade-off (2015 - 2030)



Basin-wide net revenues (2015, 2030, 2050)



Takeaways

- Traditional food production sector more vulnerable to hydro-climatic variability and policy changes
- Benefit sharing. Energy OK. Agriculture?
- The performance of the Senegal river system can be significantly improved through the coordinated operation of the multireservoir system -> institutional challenge
- Impact of climate change on trade-offs and vulnerabilities:
  - **Quebec-funded project managed by FAO**
  - **Partnership between Ouranos (www.Ouranos.ca) – U. Laval and OMVS**
  - **In progress**

- Tilmant A. et al., 2020. Probabilistic trade-off assessment between competing and vulnerable water users -- The case of the Senegal River basin. *Journal of Hydrology* 587 124915