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Contribution to the identification of responses to the effects of socio-ecological stressors on aquatic ecosystems in Burkina Faso

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Introduction

Burkina Faso has adopted dam construction as a strategic response to water scarcity, making it one of the countries with the highest concentration of dams in sub-Saharan Africa. However, the sustainability of these water reservoirs is a major challenge. This work aims at analysing how the effects of socio-ecological stressors on aquatic ecosystems imply responses towards sustainable fisheries and water resources management.

Methods

Multi-evidence approach was used:

1. Desk research helped to collect secondary data, using scientific and grey literature;
2. Empirical research to gather primary data used:
 - Strategic simulation with decision makers and stakeholders
 - 27 Qualitative interviews with experts and stakeholders
 - Survey with 204 fishermen

Results

Climate change, dam construction, overfishing and agricultural water abstraction are causing series of stressors adversely affecting fish

Table 1: Pressures, stressors, and their direct effects on the water ecosystem and fishes. The table was elaborated based on the results of the literature reviews realized from April 2017 to March 2018

Pressure	Stressors on Freshwater Ecosystem	Direct Effects on Fishes
Climate change	Decrease in floods plains (area and duration)	Decrease in fish average size
	Decrease in water level and availability	Decrease in fish abundance
	Decrease in dissolved oxygen content	Decrease in primary production
	Increase of surface water temperature	Decrease in productivity
Eutrophication	Floods plains (area and duration) decrease	Decrease in reproduction capacity
	Decrease in water level and availability	Block of fish migration
	Decrease in water level and availability	Decrease in fish population
	Increase of salinity	Decrease in fish biodiversity
Dam construction (cf. habitat alteration and/or degradation through pollution and/or physical habitat change)	Decrease in water level and availability	Decrease in fish average size
	Increase of salinity	Decrease in fish population
	Pollution	Decrease in fish population
Overfishing	Physical habitat modification (e.g., loss of connectivity, loss of habitats, habitat fragmentation)	Decrease in fish population
	Lack of management implementation	Decrease in fish biodiversity
	Illegal fishing	Decrease in fish average size
Agriculture water abstraction	Ignorance of regulation	Decrease in fish population
	Eutrophication	Decrease in fish population
	Decrease in water quality	Decrease in fish population
	Decrease in water quantity	Decrease in fish population

Water abstraction (73%), followed by climate change (72.1%), overfishing (71.1%), human settlement (70.1%), deforestation (62.7%), gardening (59.8%), and sand mining (52.9%) are the main factors threatening fisheries

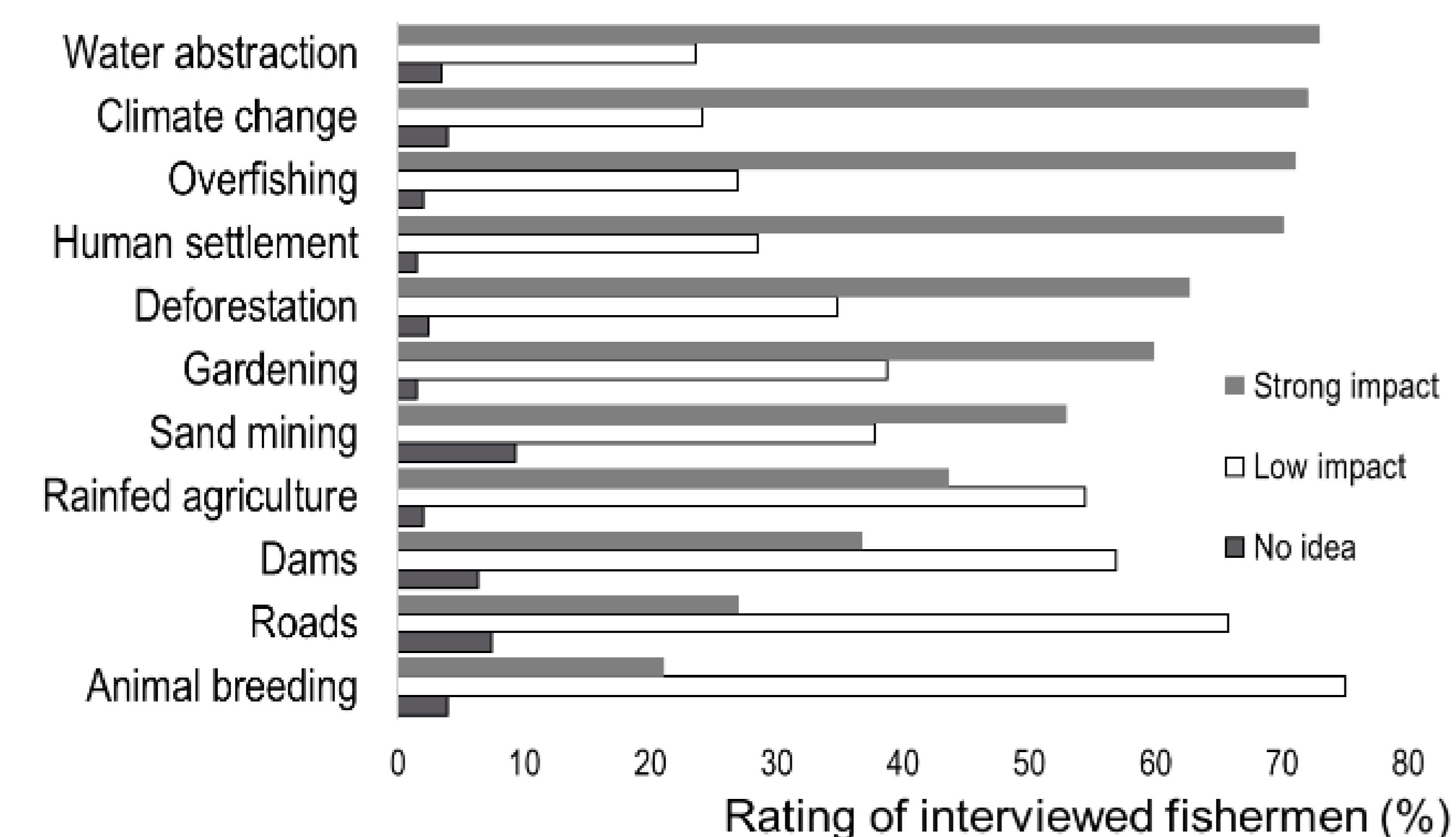


Figure 1. Fishermen perception of the strong, low, and no impact of human activities threatening fish

Conclusion

- Significant similarities between literature and empirical data
- Stakeholders are aware of the negative impact of human activity
- Identified responses aim to adapt and mitigate the difficulties facing fisheries



Figure 2. Representation by the participants to the strategic simulations of the future pathways regarding the vision-priority focus on economy and energy sectors in Nakambe Basin

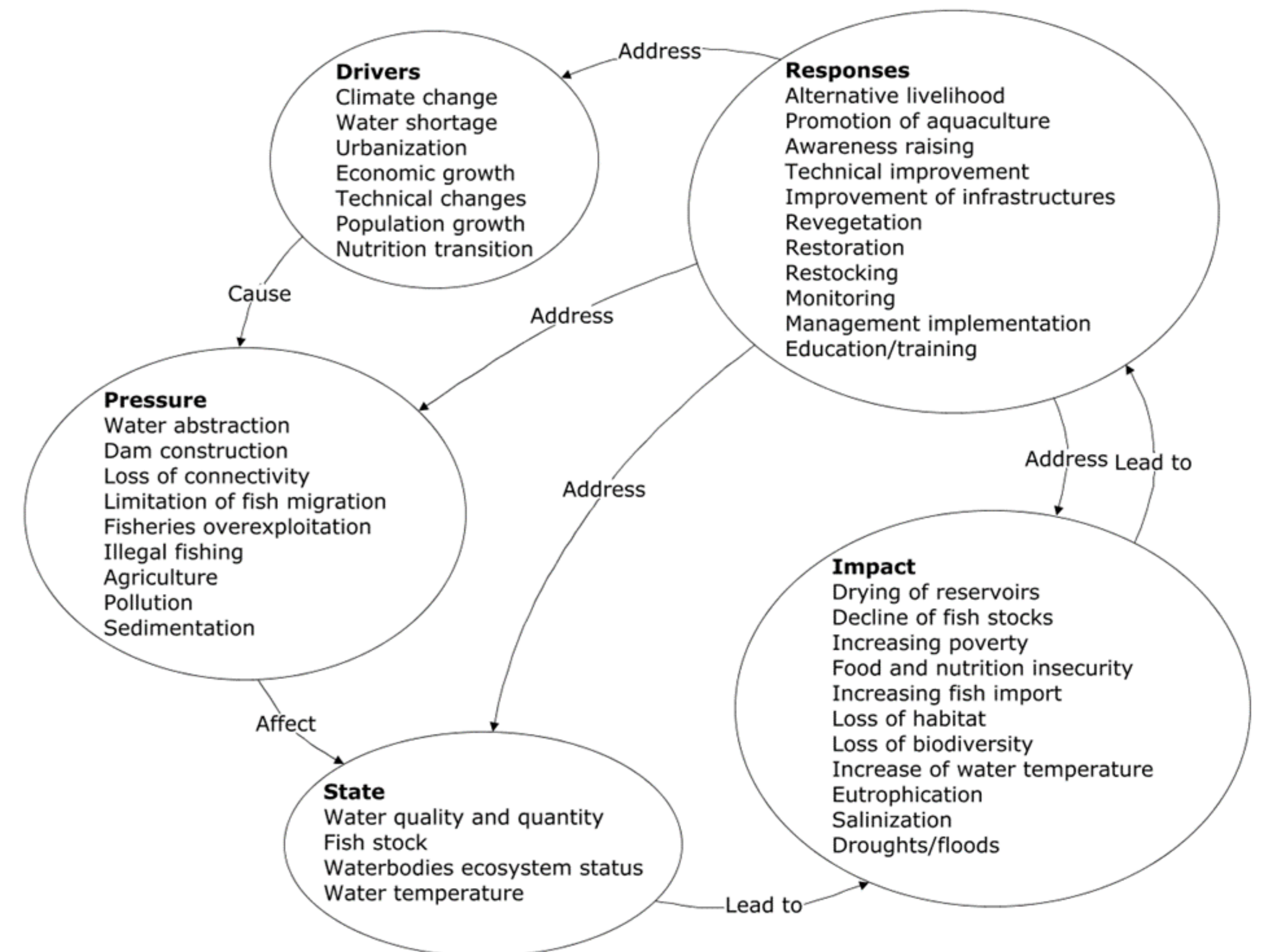


Figure 3. Simplified Driver-Pressure-State-Impact-Response (DPSIR) relating to the Burkina Faso aquatic ecosystem based on literature reviews and interviews

Future pathways and responses for sustainable fisheries and water resources management include

1. Improvement of education
2. Institutional enforcement and multi-level governance
3. Improvement of infrastructure
4. Development of alternative livelihoods
5. Shift to alternative and green energy
6. Support towards sustainable livelihoods

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