



# Effects of seasonal hydrology and land use on in-stream *Escherichia coli* concentration in the lower Mekong basin, Lao PDR.

Presented by Paty NAKHLE

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# Context & objectives

## ❖ Fecal contamination in tropical streams of South-east Asia

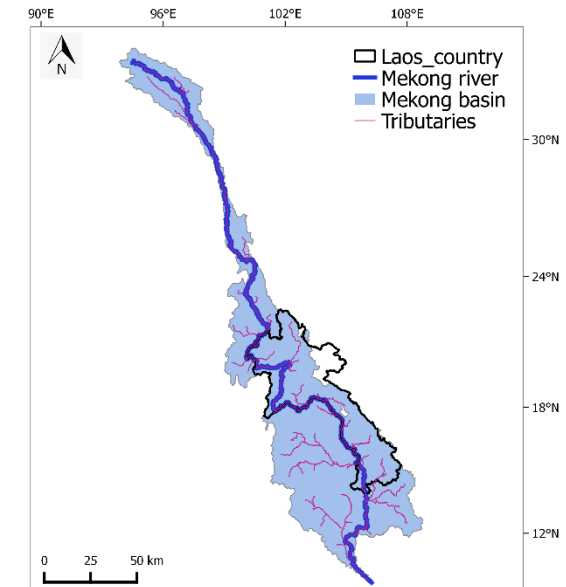
- Limited access to safe drinking water
- Inadequate hygiene practices
- Lack of health infrastructure
- Rapid climate and land use changes

## ❖ Fecal Indicator Bacteria (FIB) like *Escherichia coli*



## Objectives:

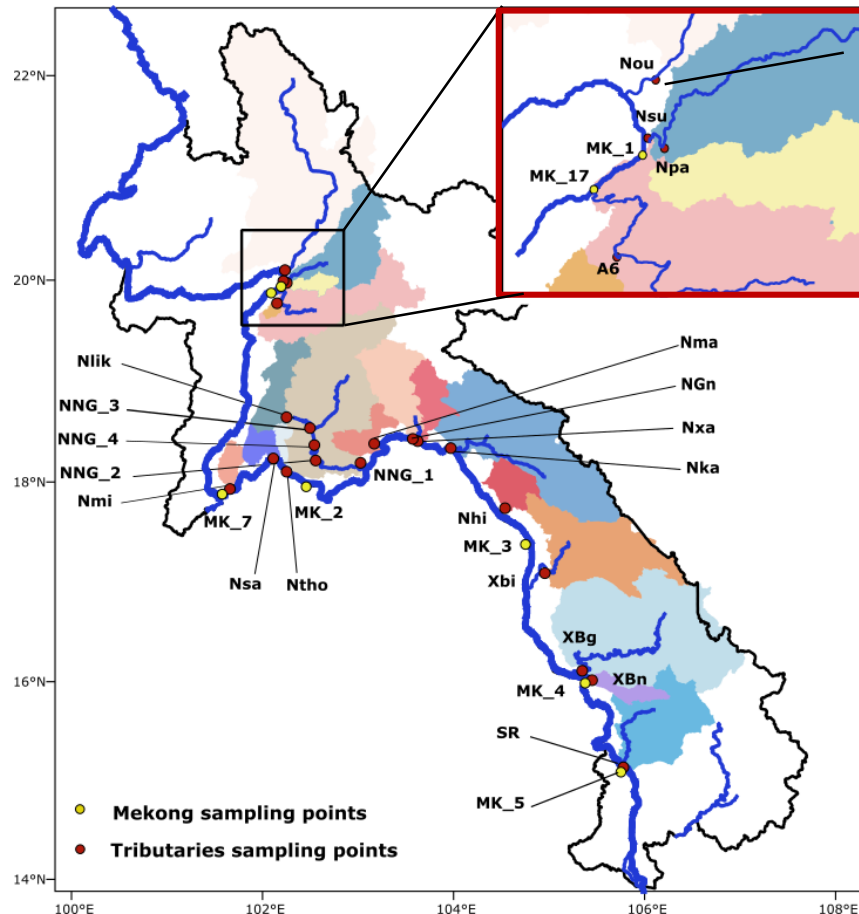
- ❖ Examine seasonality of *E. coli* dynamics at watershed-scale in Mekong river and its tributaries in Lao PDR
- ❖ Identify environmental and anthropogenic key drivers
  - Hydro-meteorological regime
  - Physicochemical conditions
  - Human activities (land use, livestock and human densities)



# Study area

## Lao PDR

- 6.5 million people; mainly rural population (70%)
- Sub-humid climate (rainy/dry seasons)
- Average annual rainfall :1300 - 3500 mm



### ❖ Datasets:

2016 campaign during dry season (March) and rainy season (July):  
Mekong and 19 tributaries

2017/2018 regular sampling at 10 days interval:

**Nam Ou (Nou), Nam Suang (Nsu), Mekong (MK17)**

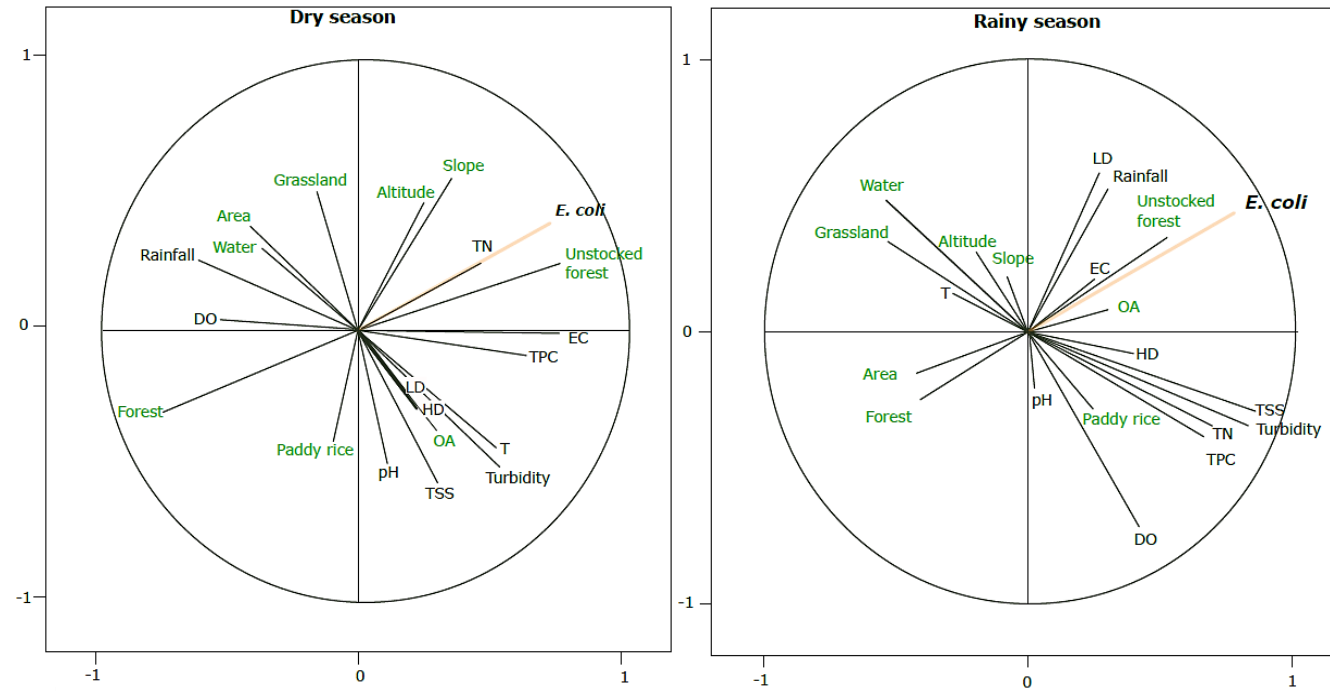
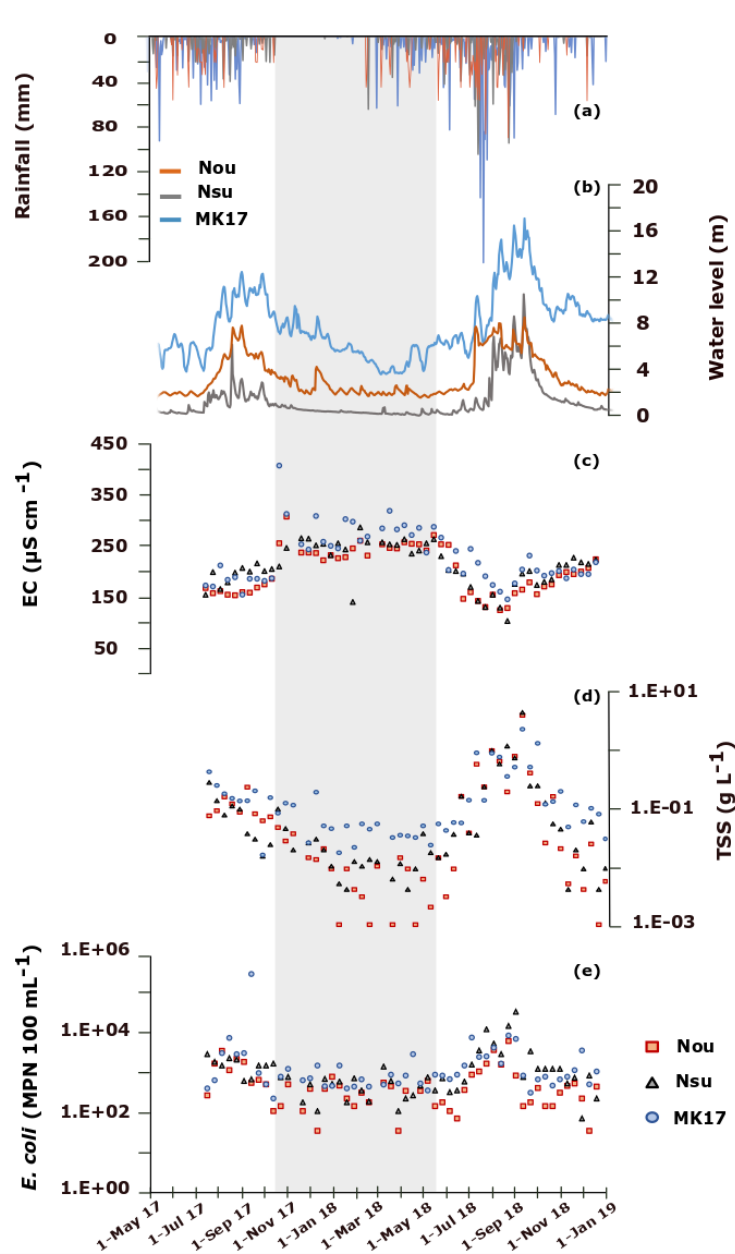
### ❖ Parameters:

*E. coli*, turbidity, total suspended sediments, total nitrogen, total particulate carbon, total nitrogen, pH, electrical conductivity, dissolved oxygen, temperature, slope, area, rainfall, land use, human and livestock density

### ❖ Method: Partial least square regression analysis (PLS)



# Main results




**TSS**: Total Suspended Sediment  
**TPC**: Total Particulate Carbon  
**TN**: Total Nitrogen  
**LD**: Livestock density  
**HD**: Human density  
**OA**: Other agriculture  
**T**: Temperature  
**EC**: Electrical conductivity

- ❖ Seasonal variability of *E. coli* concentration with higher values occurring during wet season in response to rainfall events (overland flow and resuspension)
- ❖ Strong correlation with in stream suspended solids (attached bacteria), and unstocked forest area (vulnerable to erosion processes)
- ❖ Indirect impact of *E. coli* primary sources, human & livestock, on fecal contamination of water (urban-rural disparities in improved sanitation facilities, diffuse sources)

# Conclusion

- ❖ Continuous fecal contamination in surface water on which rural population directly depends
- ❖ Importance of adequate land management in tropical context to reduce soil loss and water quality degradation
- ❖ Need to better assess the environmental fate and transport of fecal contamination through field monitoring at various spatial and temporal scales

A scenic landscape photograph showing a tropical village nestled in a valley. A river flows through the center of the village, surrounded by lush green trees and vegetation. In the background, there are rolling green hills and mountains under a blue sky with scattered white clouds. The village features numerous small houses with red-tiled roofs. A small boat is visible on the river.

Thank you for stopping by  
Questions are welcomed!

# Acknowledgements

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