

# Water, Sanitation and Hygiene: Integrated analysis of risk factors for malaria and schistosomiasis in Korhogo (Côte d'Ivoire) and Kaedi (Mauritania)

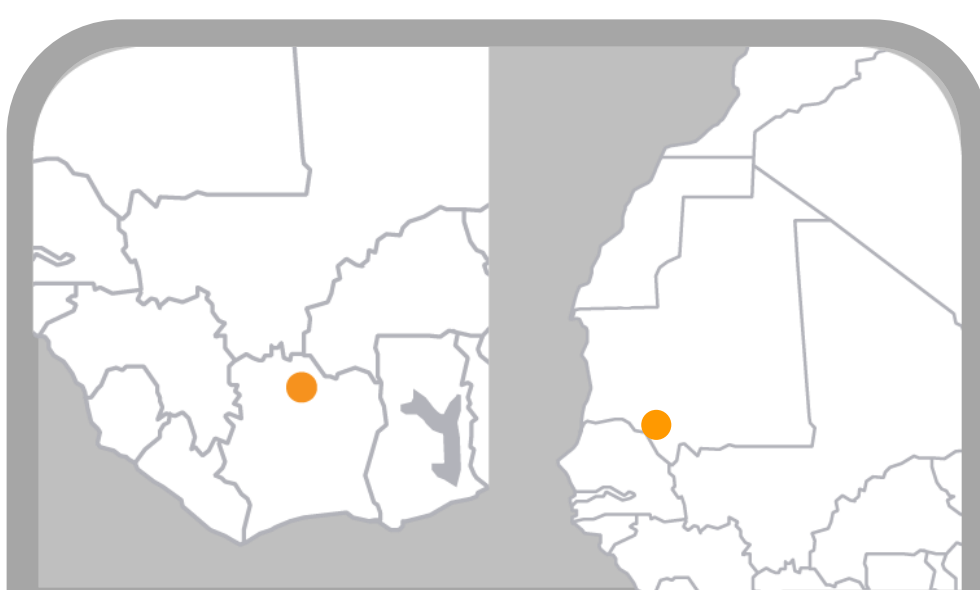
# research

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In 2015, many developing countries, mainly in sub-saharan Africa, did not meet the MDGs in Water, Sanitation and Hygiene (WASH). Côte d'Ivoire and Mauritania in West Africa are among them. Moreover, climate change has some impact on water and sanitation sectors as well as on population health (Figure 1). The present study intends to describe weaknesses in WASH in two secondary cities of the two countries and understand their main consequences for malaria and schistosomiasis in the context of climate change.



**Study Site:**  
 Korhogo (North Côte d'Ivoire):  
 Population: 210 000 Inhabitants;  
 Precipitation(mm/y): 1200-1500, Average :1350 mm/y; Annual Mean T°[min-max]: 30 °C [24-36°C]; Presence of a dam (Vol=10<sup>7</sup> m<sup>3</sup>) and other small water bodies  
 Kaedi (South Mauritania):  
 Population: 118 195 Inhabitants;  
 Precipitation (mm/y) 300-500 , Average : 400mm/y; Annual Mean T°[min-max]: 29,5°C [12-47°C]; Located along the Senegal river

## Key message / lessons

- There is an insufficiency in hygiene and sanitation systems in Korhogo and Kaedi ;
- Breeding sites that have a higher value of dissolved oxygen are more conducive to the development of Anopheles larvae ;
- The spatial and temporal distribution of water and garbage points is overlapped with the distribution of malaria cases in Korhogo ;
- The prevalence of malaria is higher in rainy season than in the dry season, but the prevalence of schistosomiasis is higher in dry season ;
- Ongoing analysis of data will give more information on the relation between climate, environment and the transmission of malaria and schistosomiasis in Kaedi and Korhogo.

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## Collaborating Institutions



## 3 main references related to the study theme:

- Sherpa M. A., Koottatep T., Zurbrugg C. and Cissé G., 2014. Vulnerability and adaptability of sanitation systems to climate change. *Journal of water and climate change*, 05(4): 487-495.
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## Materials & Methods

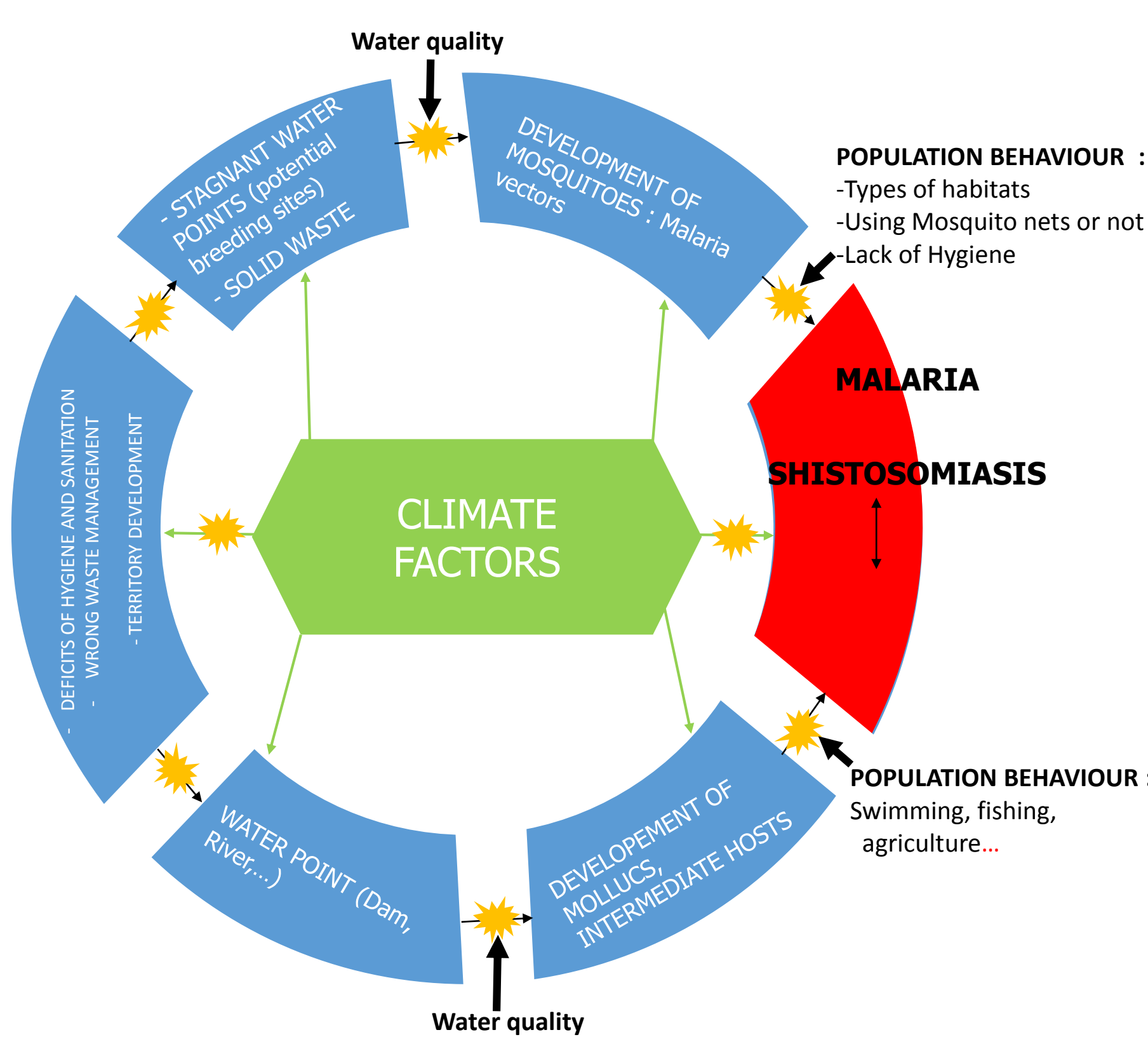


Figure 1 : Analytical conceptual framework of the study

A cross sectional study was conducted in Korhogo and Kaedi respectively in rainy and dry seasons of 2014-2015 through:

- household survey by questionnaire on access to WASH and associated health problems,
- geographical survey with Global Positioning System (GPS) on some environmental health risk factors,
- physical analysis of breeding sites of anopheles larvae and molluscs
- meteorological and clinical data collection over the period 2000-2014,
- The data was analysis by XLStat 2014, SPSS 20 and Arcgis 9.2.

## Preliminary results

➔ In Kaedi (a), there is no rainwater drainage system. In Korhogo (b), the system is dysfunctional by location; so there is stagnant water points in the two cities during the rainy season. These points are potential breeding sites of anopheles larvae.



Photo 1 : Inadequate sanitation in Kaedi (a) and Korhogo (b)

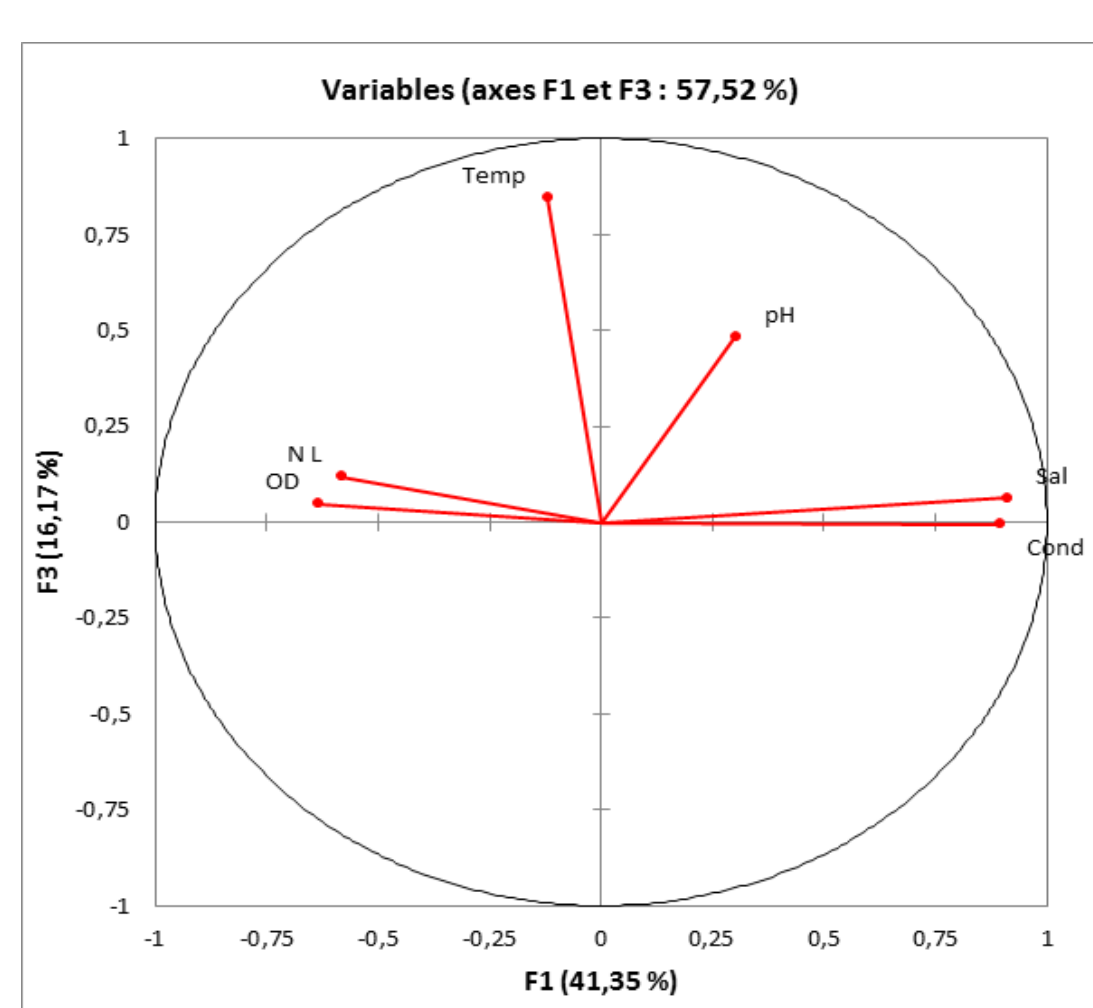


Figure 2 : Principal components Analysis of breeding site in Korhogo in F1-F3 plan

➔ The presence of Anopheles larvae (NL) in a breeding site is positively correlated with dissolved oxygen (OD) and negatively with conductivity (Cond) and salinity (Sal) (Figure 2).

➔ There is a good overlap between the spatial and temporal distribution of risk factors (surface water, garbage deposits, stagnant wastewater points) and households with malaria cases in Korhogo.

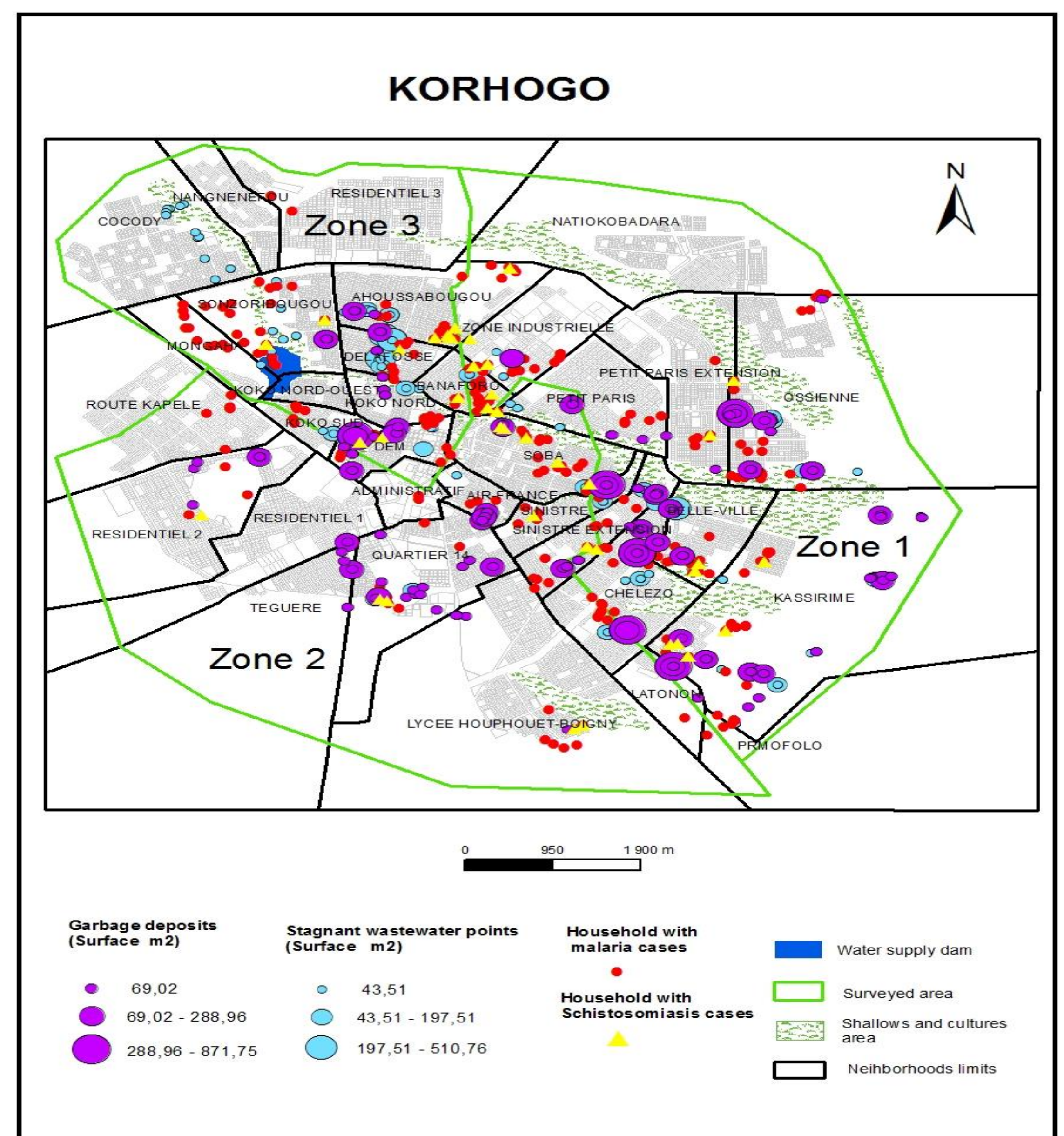


Figure 3 : Superposition of environmental factors and malaria in Korhogo in rainy season

➔ We note a significant correlation between intra-annual malaria incidence with rainfall ( $r=0,64$ ;  $p=0,03$ ) and relative humidity ( $r=0,83$ ;  $p=0,001$ ) in Korhogo. However schistosomiasis is correlated with temperature ( $r=0,57$ ;  $p=0,053$ )

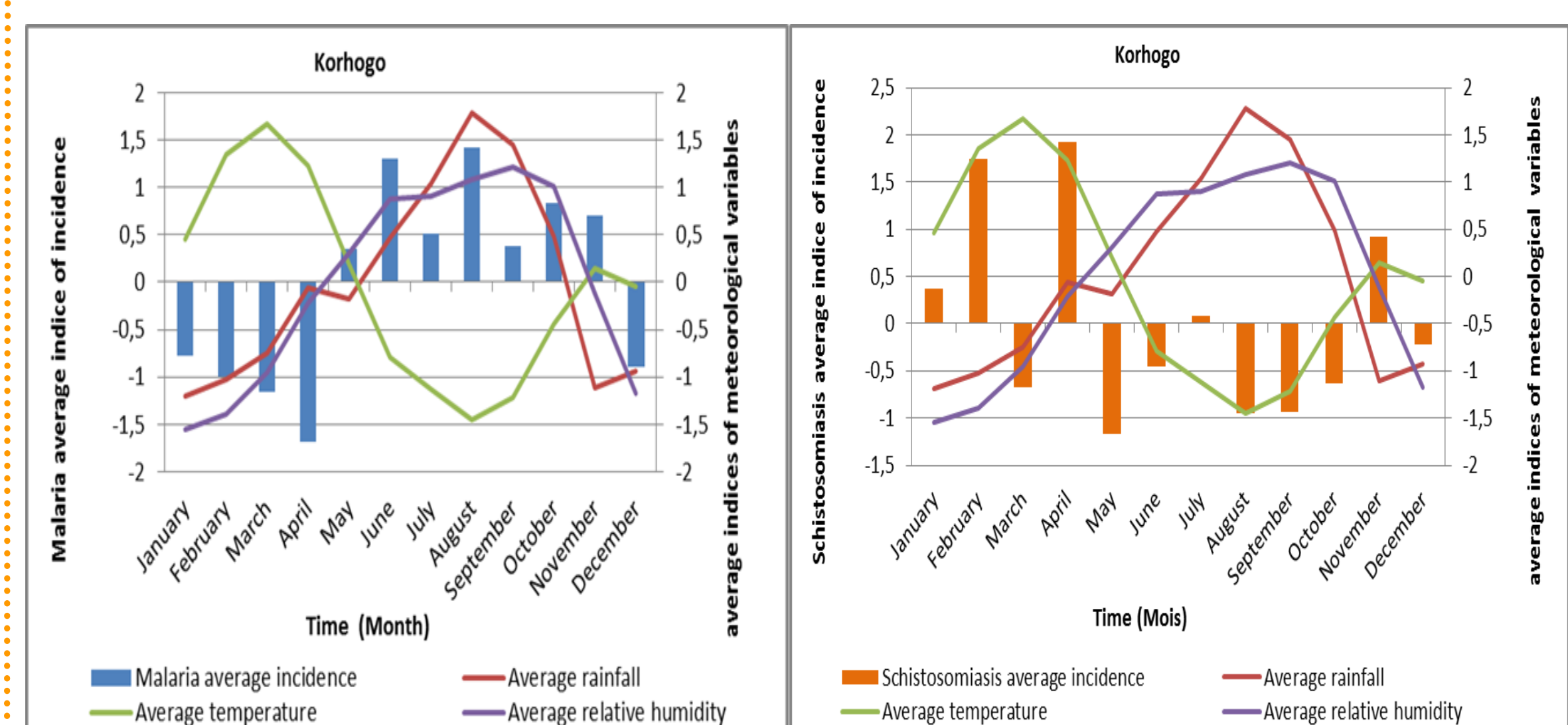


Figure 4 : Relation between meteorological variables and incidence of malaria and Schistosomiasis in Korhogo

## Next Steps

- ➔ Continue analyzing data for both study sites mainly for Kaedi ;
- ➔ Participation to conferences ;
- ➔ Publication of study results ;
- ➔ PhD writing.