



# Introduction into the Ouémé catchment

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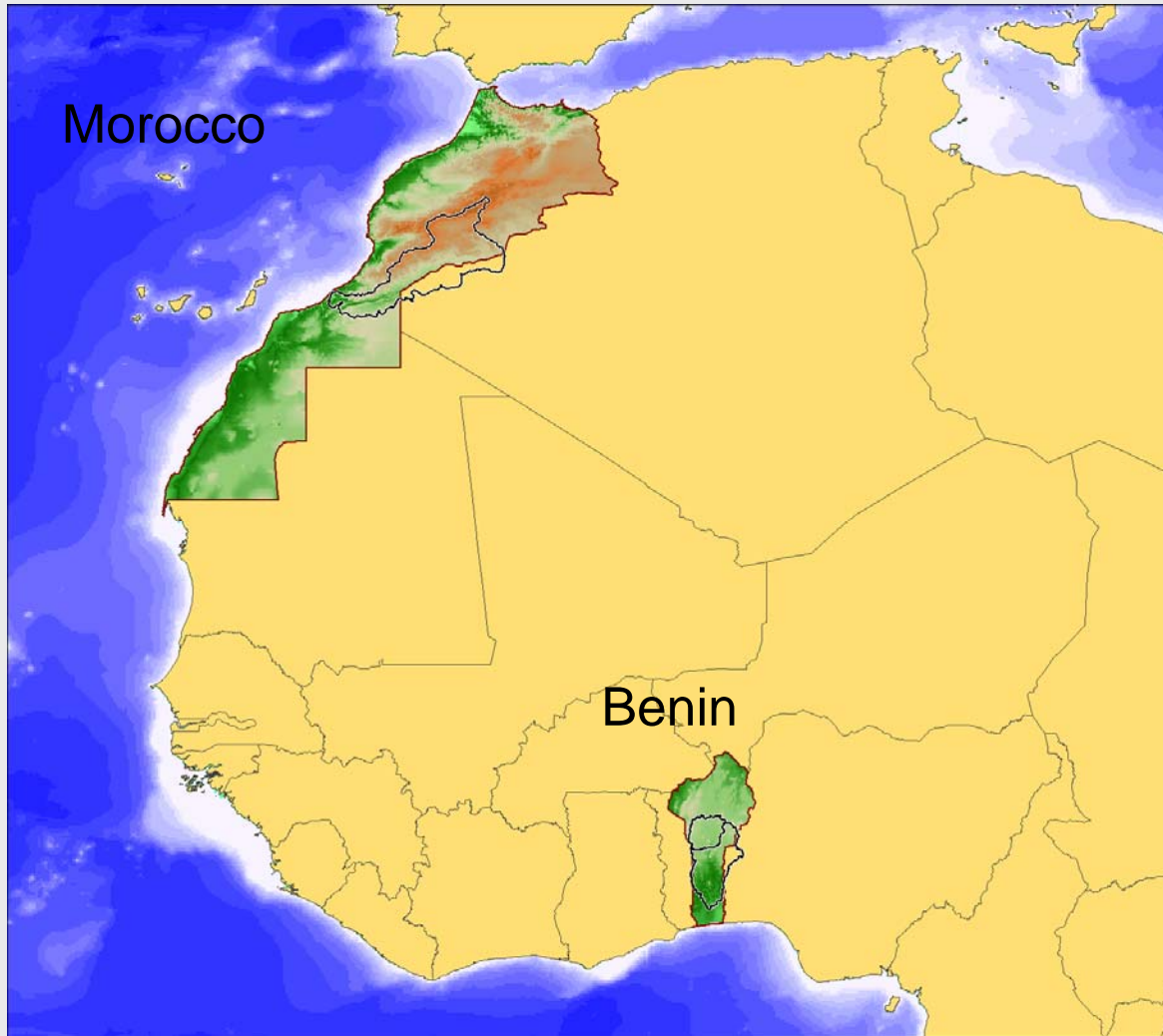
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# Benin: The Ouémé River Catchment

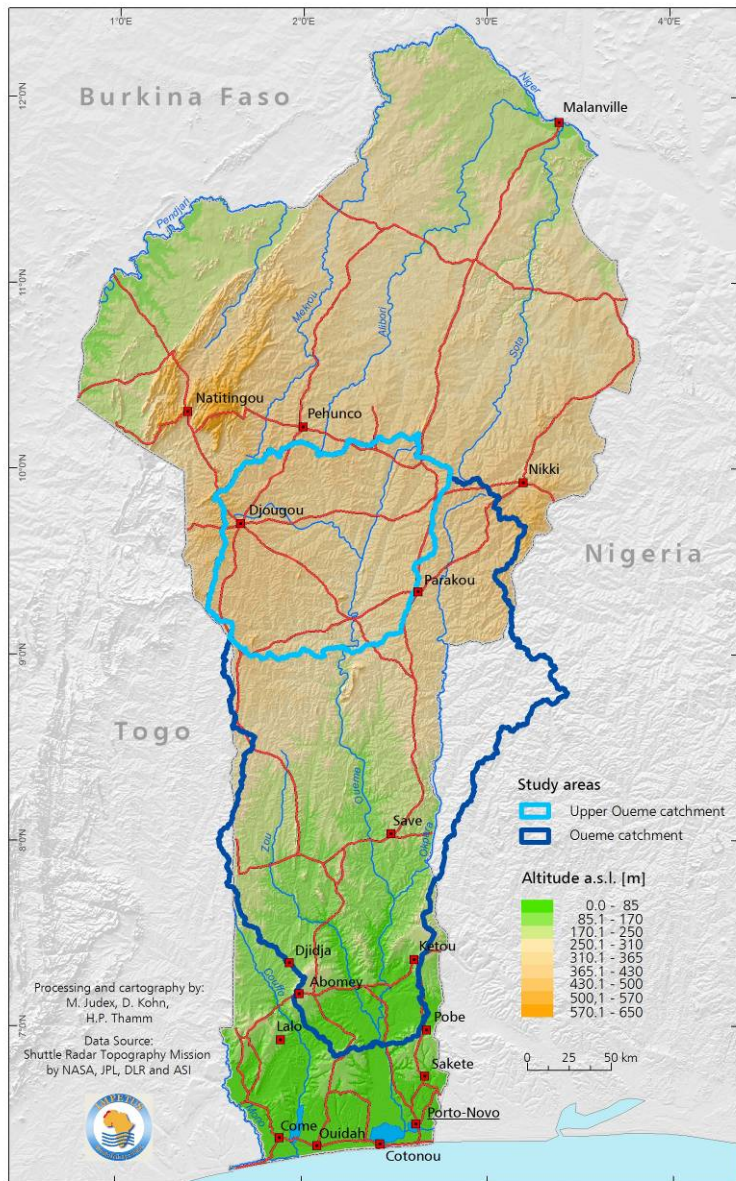




# Major Issues in the Ouémé River Catchment

- Below-normal annual rainfall since about 1970
- The majority of the population has no access to safe drinking water
- High mortality among infants and children, partly due to climate and/or water related diseases
- Difficult drinking water supply due to aquifer characteristics
- Conversion of partly protected forests into arable land
- Annual population growth rate regionally exceeds 4.5% p. a.
- Ethnic diversity

# The Ouémé River Catchment



- Benin's largest river
- Size of about 50,000 km<sup>2</sup>
- Headwaters in the Dahomey pediplain with isolated inselbergs
- Lower Ouémé in the flat coastal sediments
- September / daily peak discharge: 646 m<sup>3</sup> s<sup>-1</sup> / 1400 m<sup>3</sup> s<sup>-1</sup> (1948–2002)
- Total renewable water resources: 221 mm year<sup>-1</sup> (1993–2003)

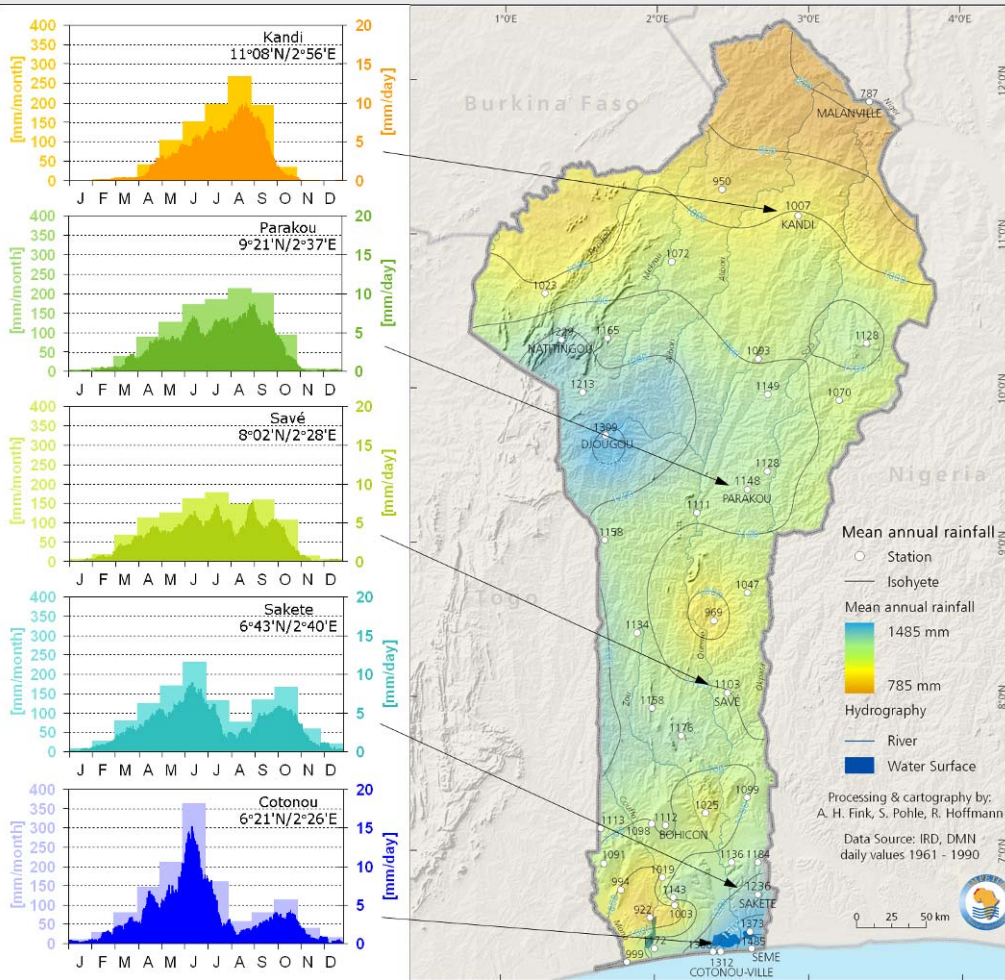


# The Upper Ouémé River Catchment



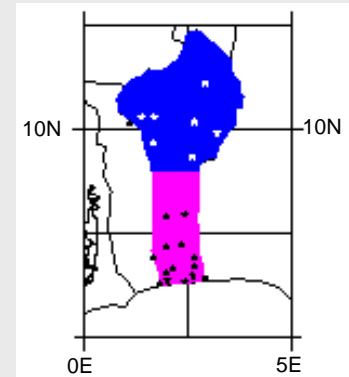
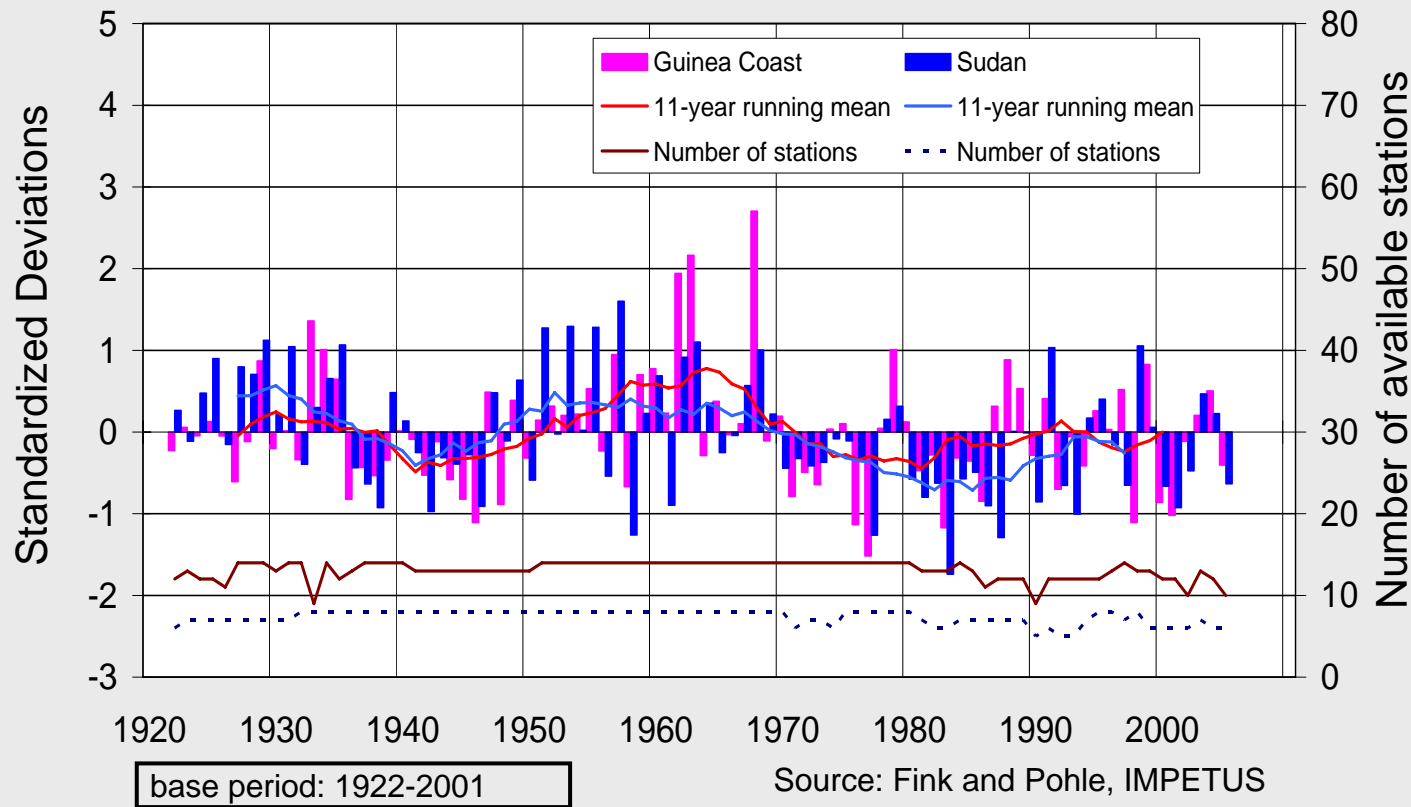
- Size of about 15,000 km<sup>2</sup>
- September / daily peak discharge: 249 m<sup>3</sup> s<sup>-1</sup> / 787 m<sup>3</sup> s<sup>-1</sup> (1952–2002)
- All rivers dry out from December through May
- Total renewable water resources: 292 mm year<sup>-1</sup> (1993–2003)

# Mean Rainfall and Seasonal Cycle, 1961–1990



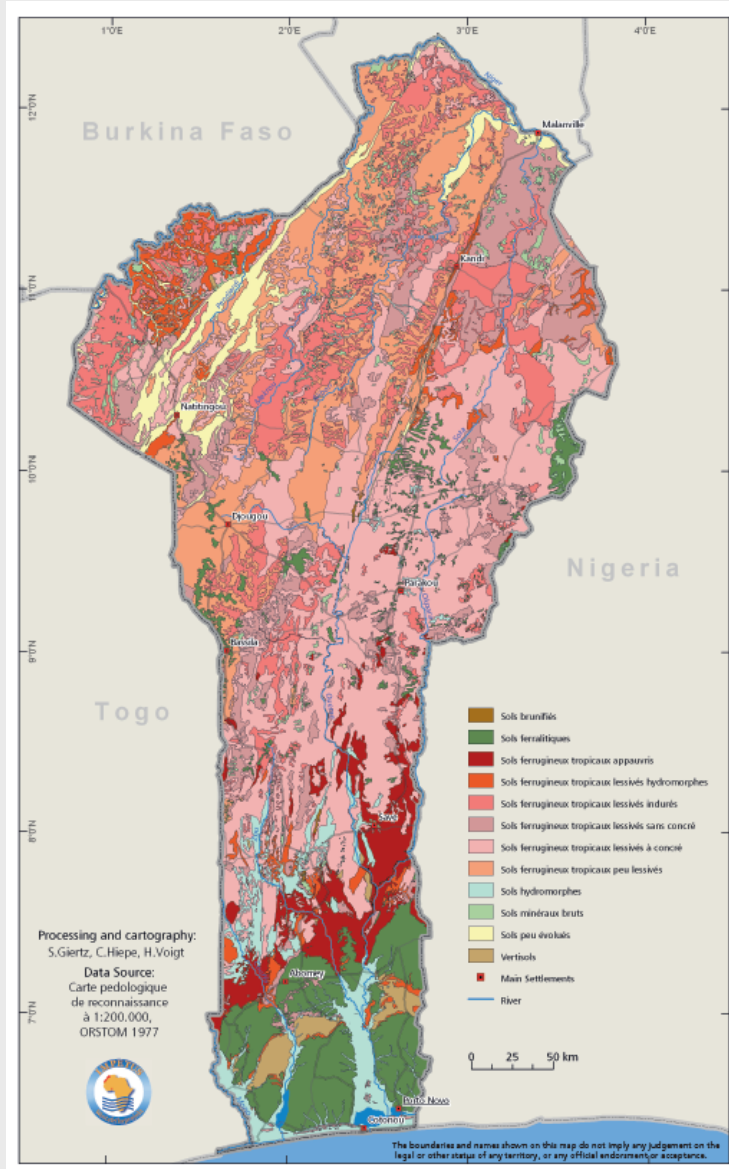
- Mean annual rainfall of 1127 mm
- Wet and dry sub-humid Tropics
- Bimodal rainy season in the South
- Unimodal rainy season in the North

# Rainfall variability 1922–2005



- Mostly below-normal mean annual rainfall since 1970

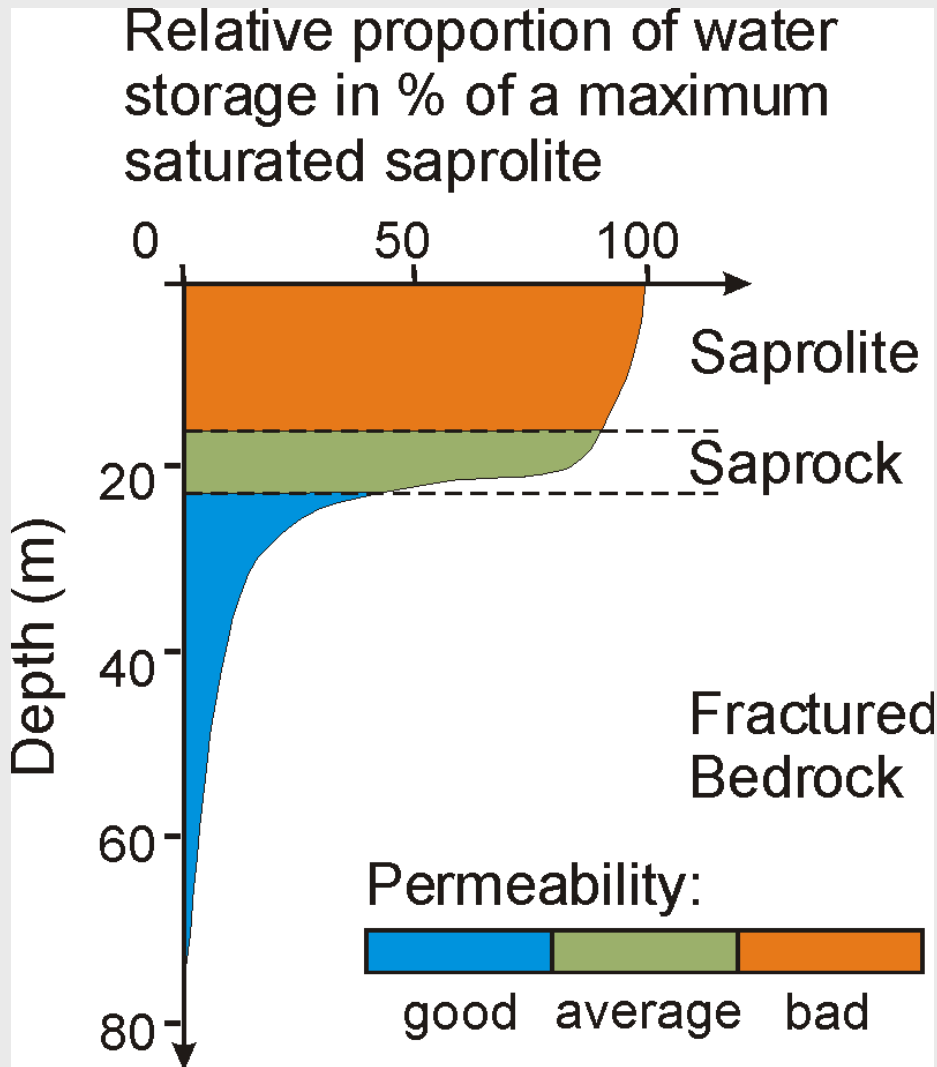
# Soils



- North: Fersialitic soils with high gravel content
- South: Ferallitic and hydromorphic soils

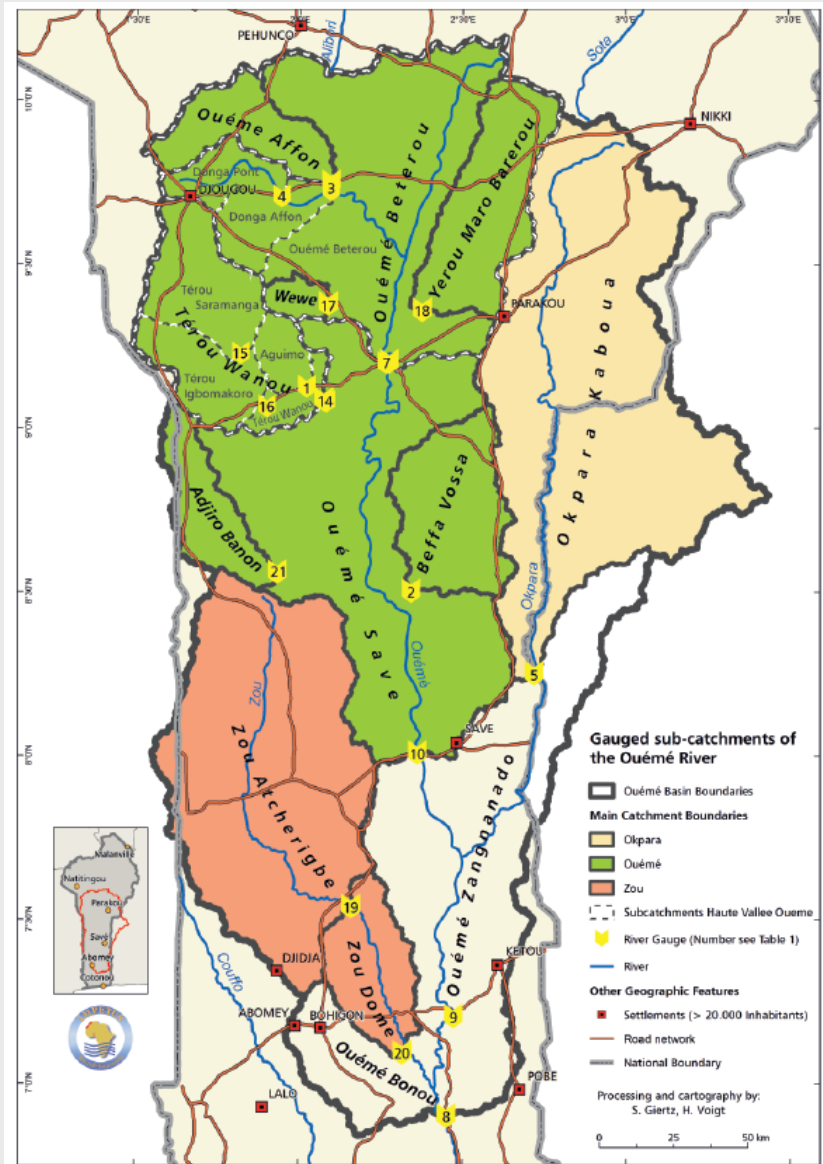


# Geology



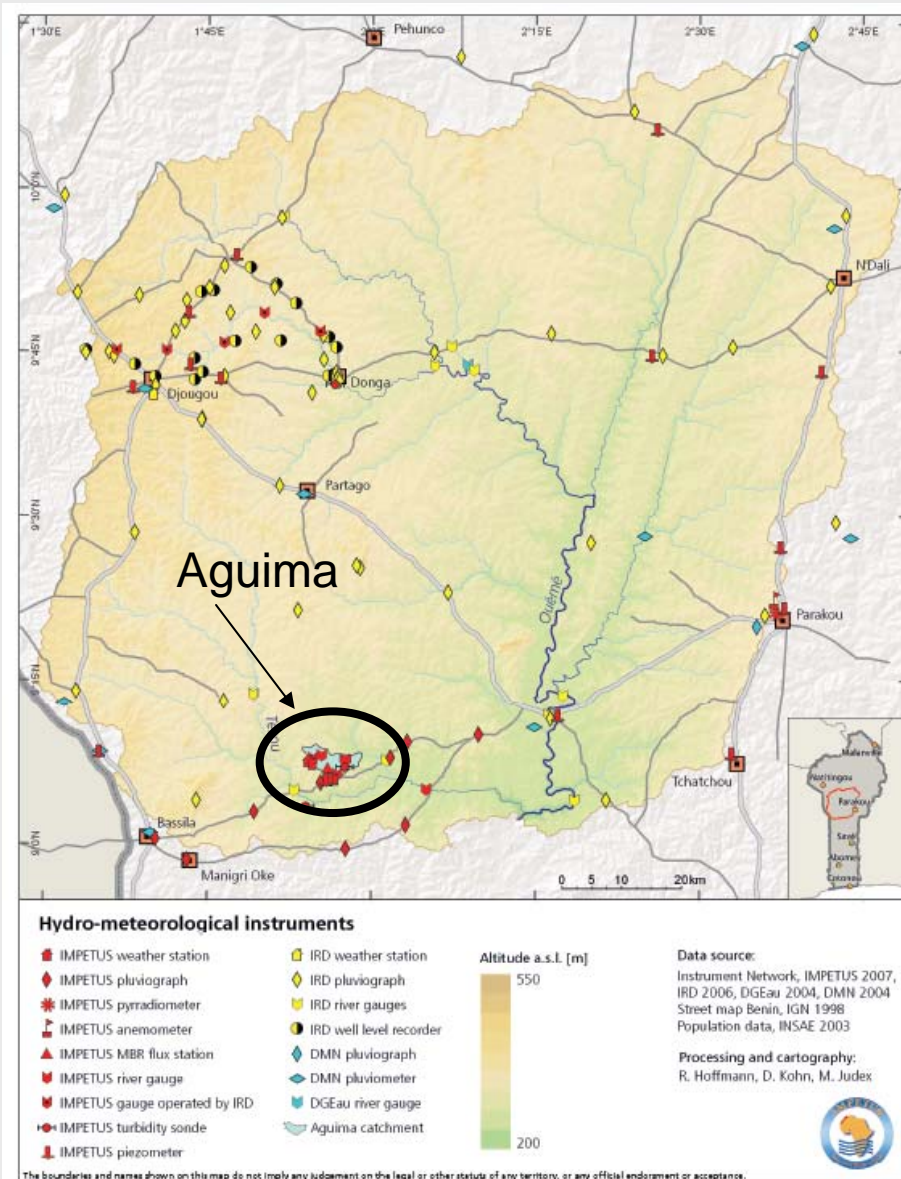
- Fractured bedrock has a high hydraulic conductivity, but low storage capacity, and limited lateral flow
- Difficult drinking water supply due to aquifer characteristics

# Hydrology



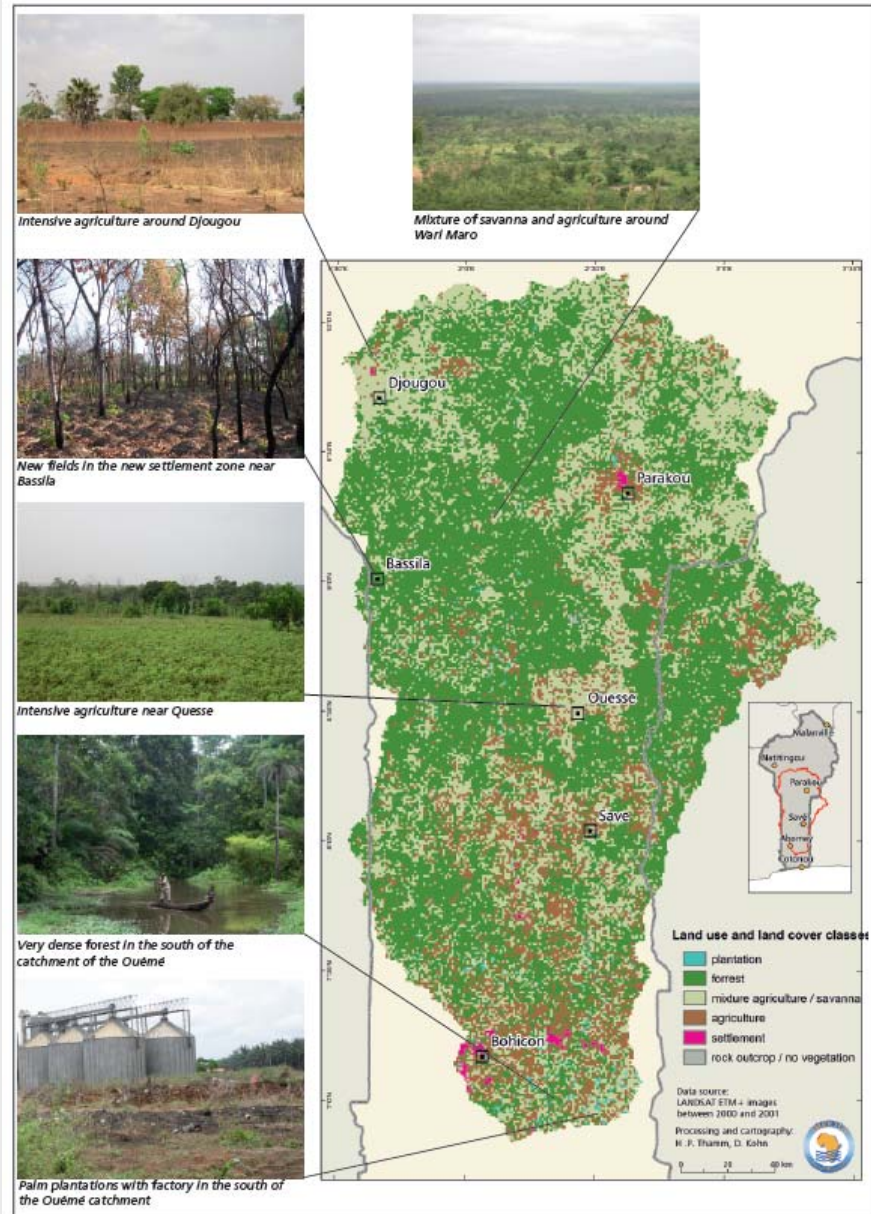
- Major tributaries:  
Okpara, Terrou, and Zou
- About 20 river gauges run  
by the national DGEau and  
the French IRD

# Hydro-Meteorological Network (Upper Ouémé)



- 63 rain gauges and more than 20 water-level recorders run by DGEau, DMN, IRD, and IMPETUS
- 12 IMPETUS divers to monitor groundwater level
- IMPETUS super test site in the Aguima catchment

# Land Cover & Land Use



Natural vegetation:

- North: Woody savannahs
- South: Mixed savannah and dry dense forests (-> Dahomey gap)

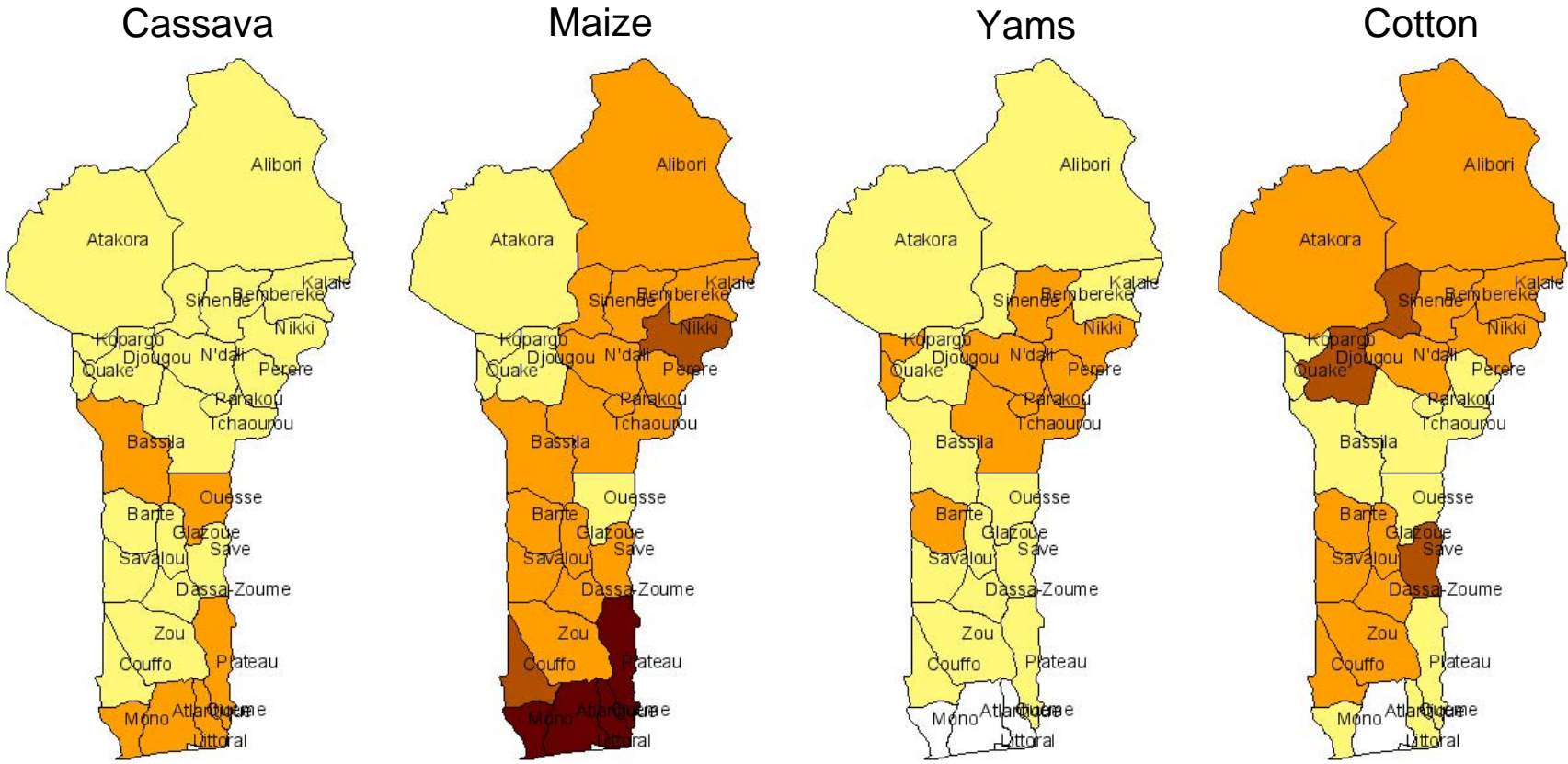
Current vegetation:

- North: Expansion of small-scale farming partly into the vast, state-owned protected forest areas
- South: large oil palm plantations and intensive agricultural land use



# Major Crops in Benin

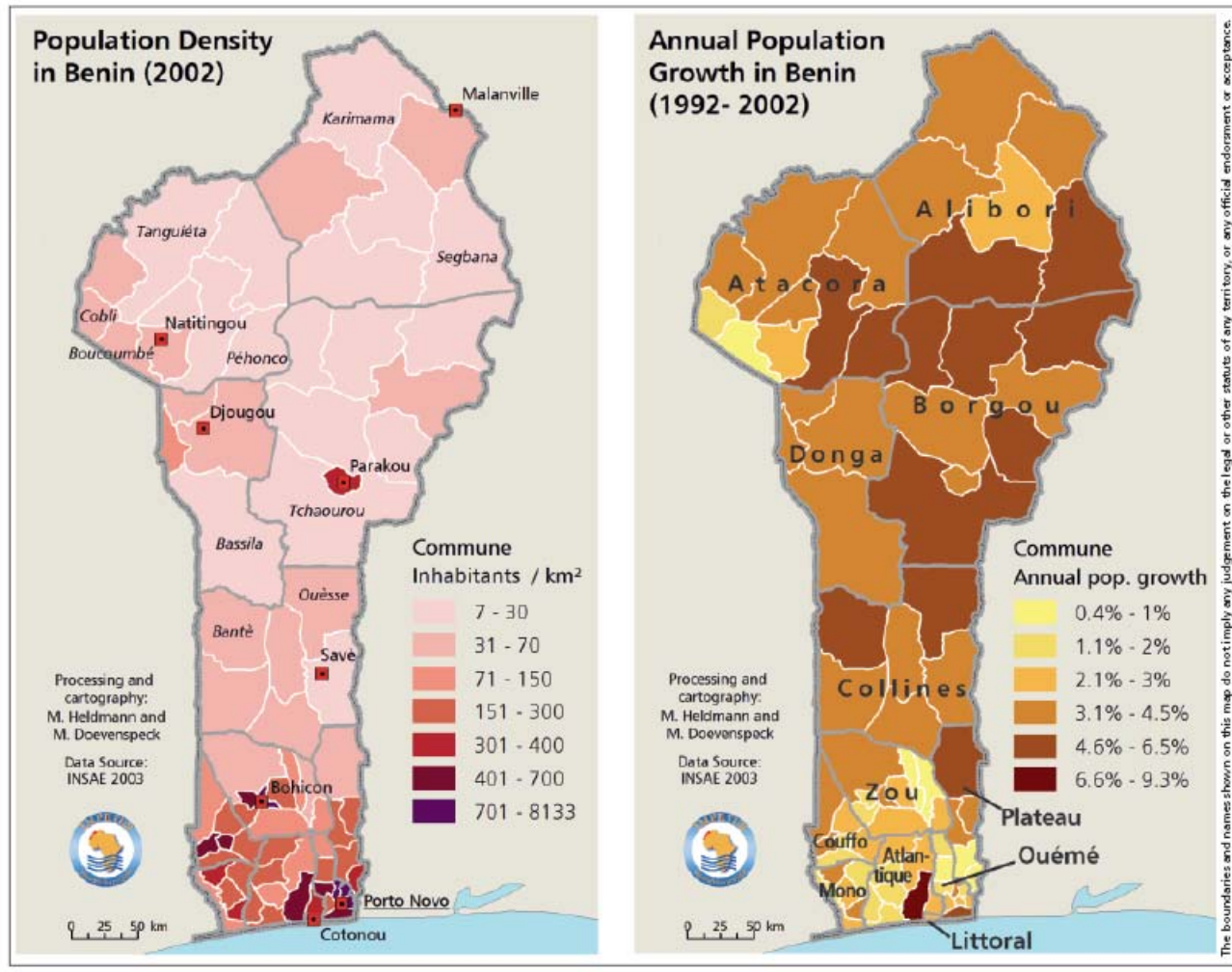
(Reference Year: 2000)



Fractional Crop Area in %



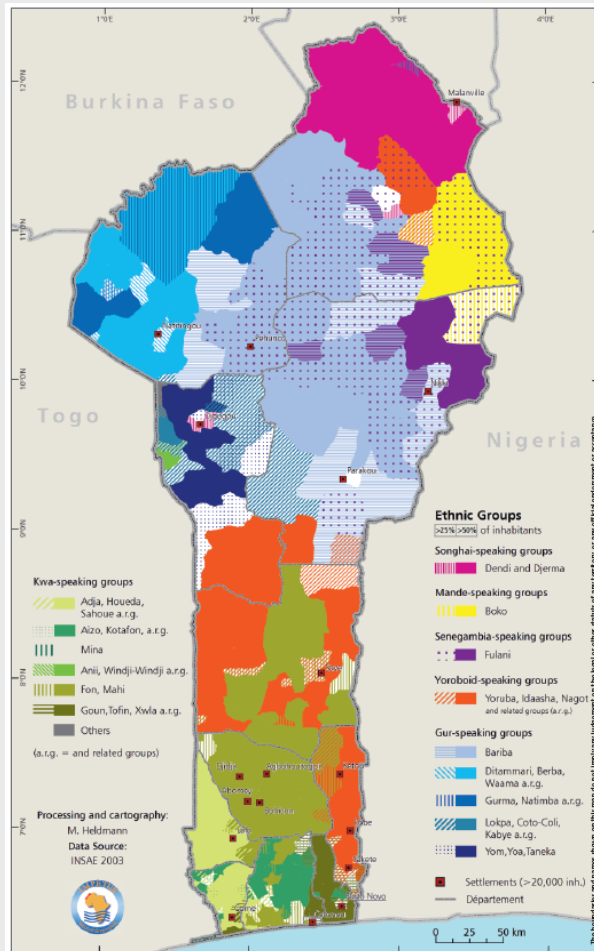
# Population and Society



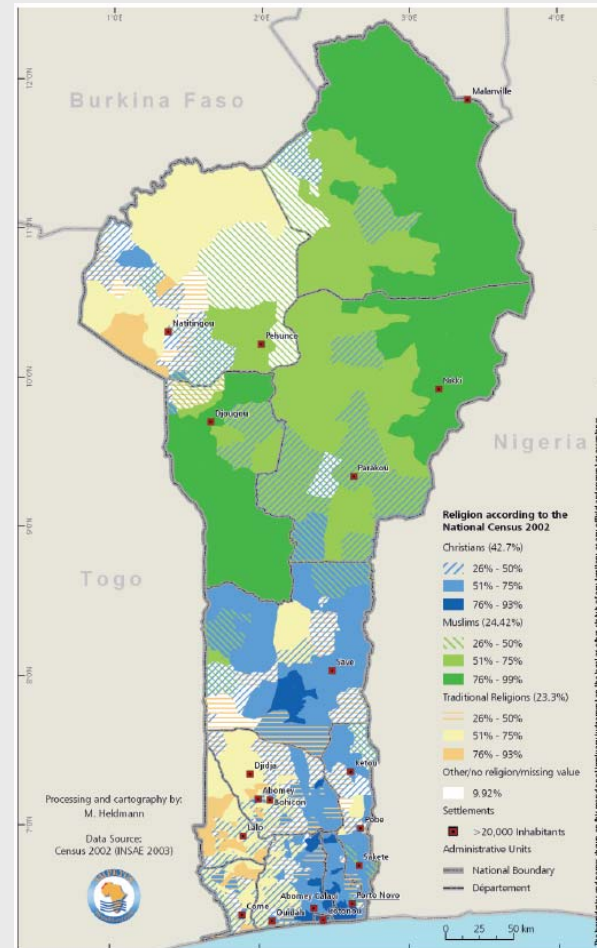
Source: Heldmann and Doevenspeck 2008, IMPETUS Atlas

- About 8 million inhabitants (IMPETUS 2008) and a growth of 3.25% p. a.
- Annual population growth rate regionally exceeds 4.5% p. a.

# Ethnic Groups and Religions



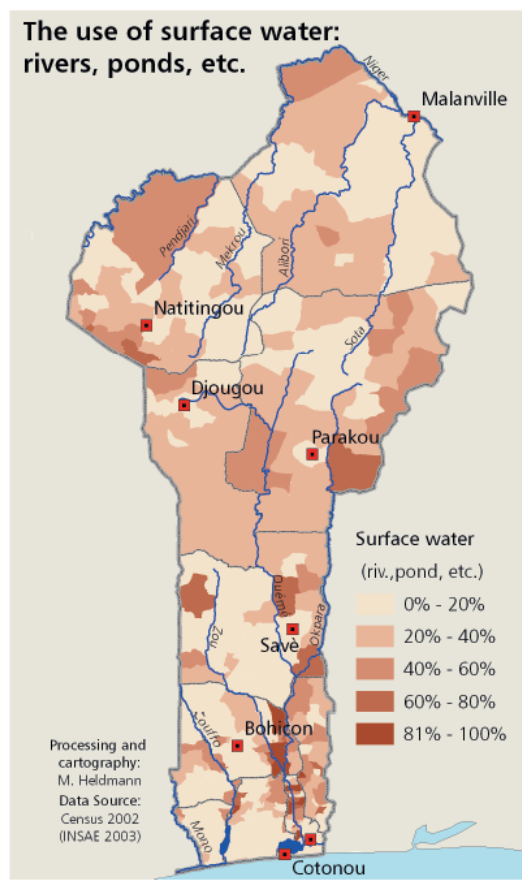
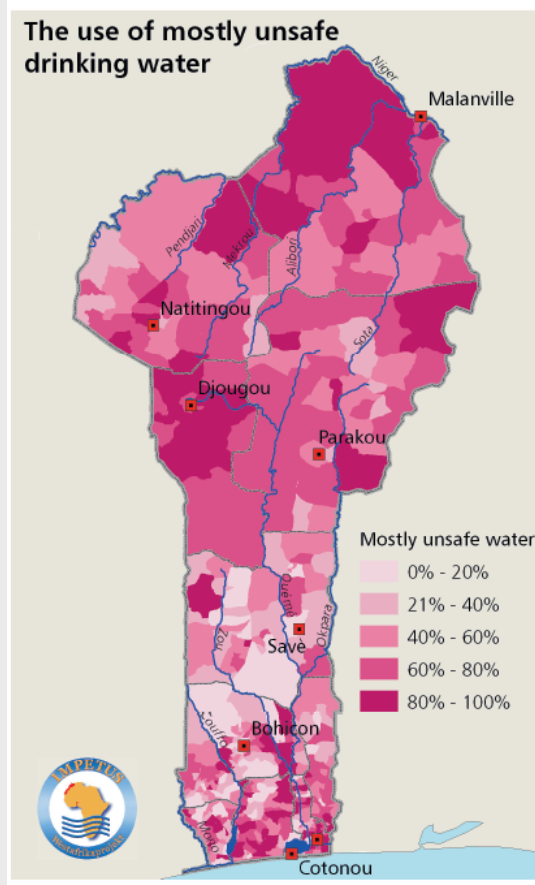
Source: Heldmann 2008, IMPETUS Atlas



Source: Hadjer and Heldmann 2008, IMPETUS Atlas

- About 60 ethnic groups
- About 43% Christians and 25% Muslims, the latter mostly in the North

# Drinking Water Supply



Source: Heldmann and Doevenspeck 2008, IMPETUS Atlas

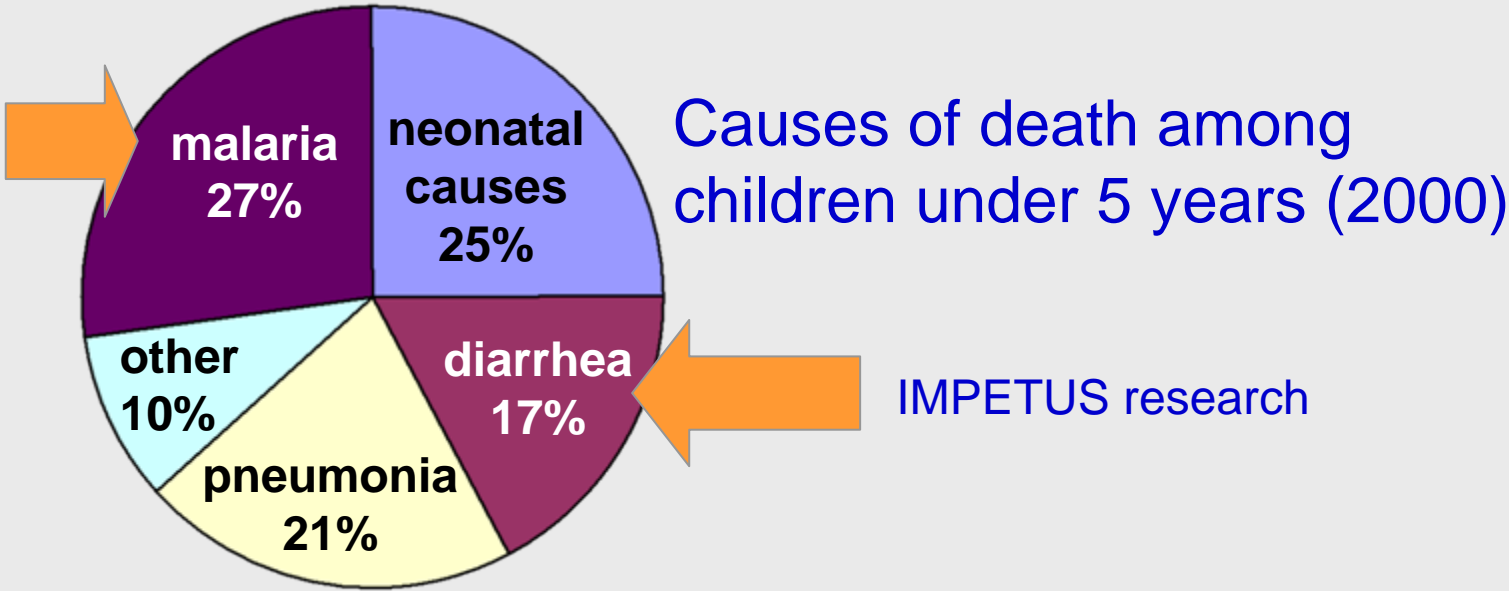
- About 46% of Benin's households use unsafe water sources
- Ten times the average price of drinking water in the United States  
Cause: 10 hours to get drinking water in the dry season





# Health in Benin

IMPETUS research



Source: WHO 2006

- Infant mortality rate (per 1000 live births): 90
- Probability of dying per 1000 live births under 5 years : 152



# IMPETUS Research

The IMPETUS research dealt with the issues raised:

- Projection of future rainfall variability and trends
- Estimation of the future renewable water resources
- Drinking water quality in relation to well type
- Future land use
- Population projections taking into account migration
- Projections of malaria prevalence related to climate change



# Thank you for your attention



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