

How far are mangrove ecosystems in Benin (West Africa) conserved by the Ramsar Convention?

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1. The problem

Mangroves around the world provide humanity with a variety of ecosystem services. However, rising populations coupled with human activities jeopardize the sustainable management of these ecosystems. Climate change is also expected to have a severe impact on mangrove ecosystems, especially in Benin, West Africa. Since 2000, several initiatives for the conservation of mangrove have been established under the Ramsar Convention on Wetlands. However, little is known about the impact of this convention and the associated projects on mangrove conservation.

2. The research question (RQs)

What are the impact of the Ramsar Convention on mangrove ecosystem conservation in Benin?

3. How we addressed the RQs

Study area: 1°20'–1°25'E and 6°14'–6°20'N of Ramsar site 1017. It is characterized by the Guineo–Congolian climate. Coastal forests, thickets and mangroves dominate the vegetation.

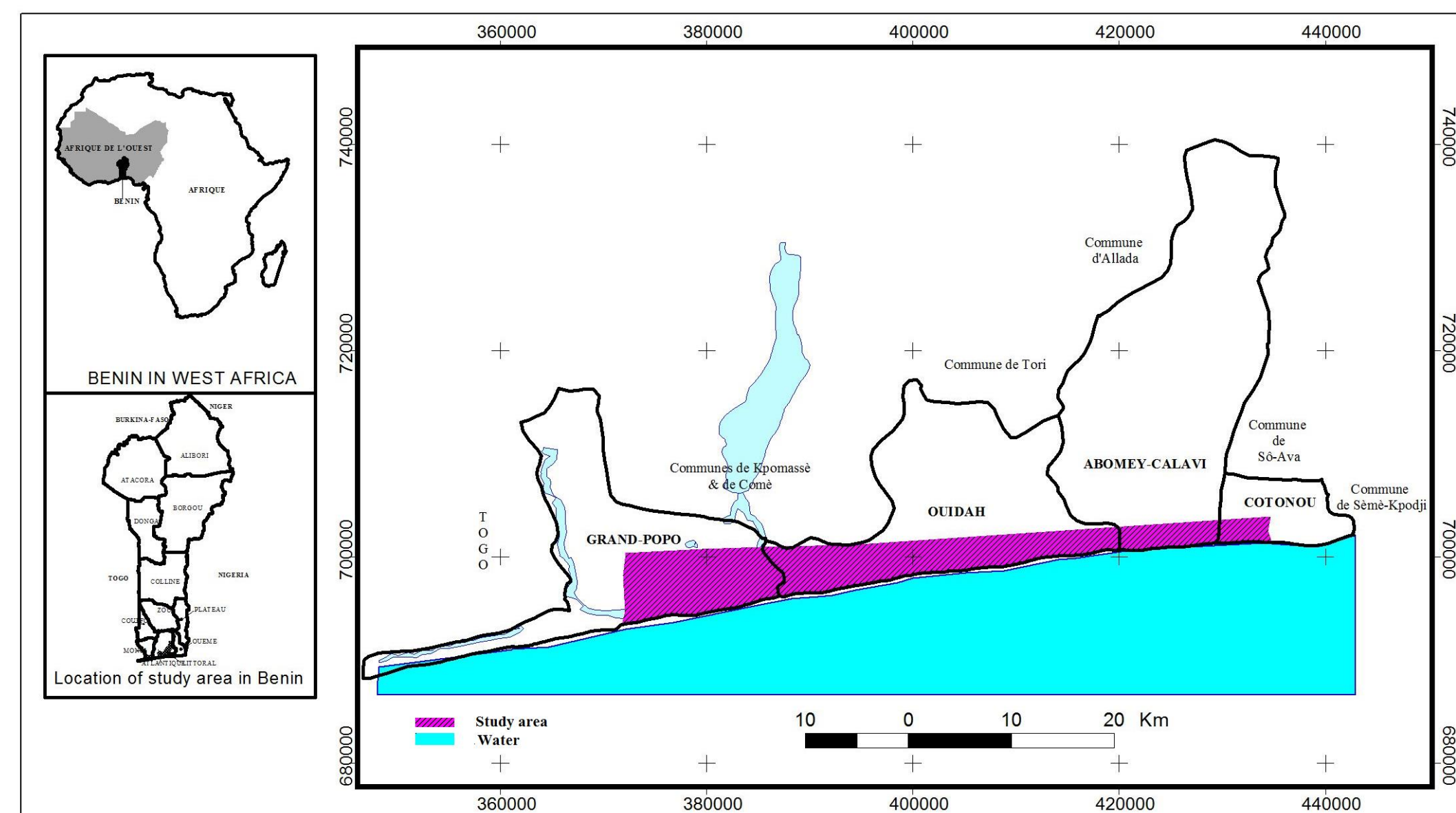


Figure 1. Study area

Changes in Land use/land cover (LULC) were elaborated with three Landsat images taken in the dry season February 1995, December 2005 and December 2015 (Figure 2). **LULC transition matrices** were elaborated for 1995–2005 and 2005–2015 and used to analyze each class of LULC. **Each LULC was predicted** using the annualized probability matrices with the Markov chain model.

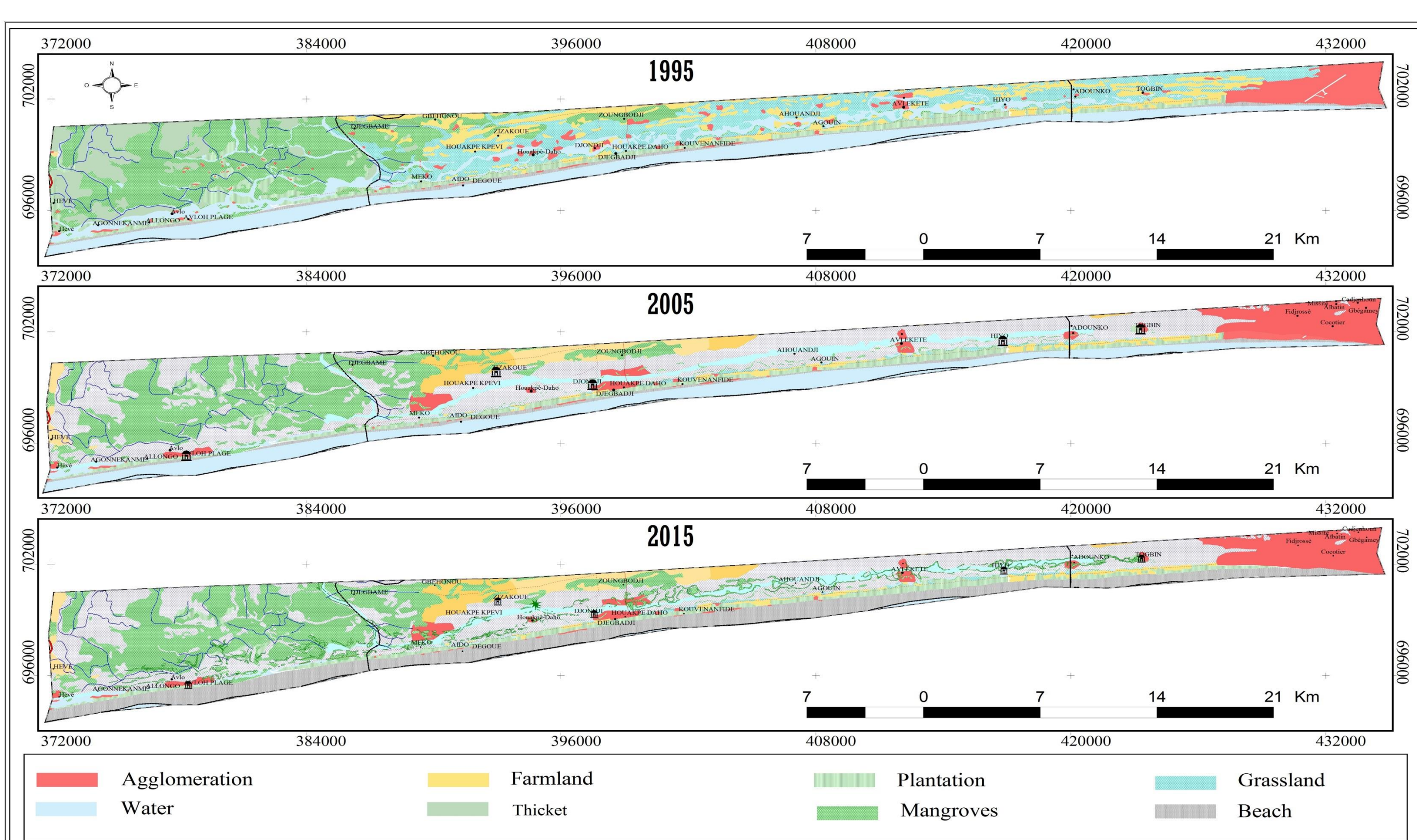


Figure 2. LULC maps

Degradation or conservation rate for each period (1995–2005 and 2005–2015) was calculated using the proposed formula of FAO (1996). The degradation rate, D (% lost area/year), was calculated as follows:

$$D = \left[1 - \left(1 - \frac{(A_1 - A_2)}{A_1} \right)^{1/t} \right] \times 100$$

A1 (initial year) and A2 (final year) represent the cover of each LULC class and t is the number of year within each period.

4. What we found

LULC classes

- ❑ A total of eight LULC classes were obtained (Figure 2).
- ❑ In 1995, 2005 and 2015, farmland and grassland were the predominant LULC.
- ❑ Mangrove was lost during 1995–2005 (0.15% decrease from 1995) and restored during 2005–2015 (12% increase from 2005).

Changes in LULC

- ❑ In the period 1995–2005, mangrove was converted to grassland and farmland.
- ❑ In the period 2005–2015, mangrove was converted to grassland.

Future scenarios

- ❑ Assuming the dynamics observed in 1995–2005, the area of mangrove will decrease by more than half of the 1995 area by 2070.
- ❑ Assuming the dynamics observed in 2005–2015, the area of mangrove will increase by 1% of the 2005 area by 2070.

Degradation or conservation rate

Table 1: Annual rate of degradation (% lost ha/year)

LULC class	1995–2005	2005–2015
Mangrove	2.64	–2.15
Grassland	–0.31	–1.43
Thicket	14.04	–6.18
Plantation	–1.98	–1.71
Farmland	0.06	0.64
Water	0.08	–0.03
Beach	22.88	–18.83
Agglomeration	–2.97	–1.89
Total	34.45	–31.59

(–) restoration or increase (+) degradation or decrease

5. Conclusion and Perspectives

Human pressures are the major cause of the regression of the mangrove ecosystems of Ramsar 1017 during the period 1995–2005. From 2005 to 2015, the mangrove ecosystems were restored due to the implementation of the Ramsar Convention with several projects on the conservation of biodiversity and sustainable use of mangrove ecosystems resources.

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