



# Evaluation of the functional infrastructure services and biodiversity of Bombetoka, NW Madagascar



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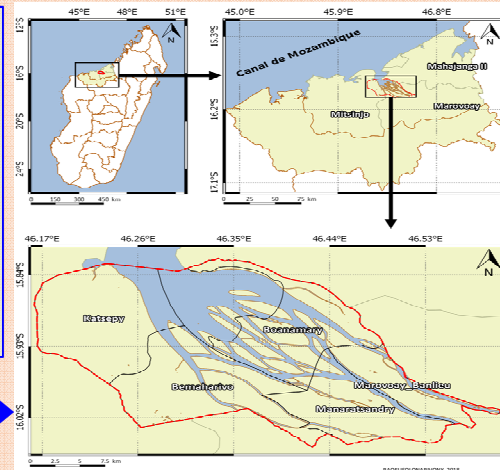
## Context

Currently, global biodiversity is declining. Human activities are the main causes of this degradation. Facing to this problem, the Convention on Biological Diversity (CBD) has recommended to countries member to integrate the monetary values of biodiversity into the national accounts. The present study aims to evaluate the state and all changes in the natural capital of the Protected Area (PA) of Bombetoka, Boeny Region, in the northwestern part of Madagascar (2007-2017).

## Methodology

The research was based on an ecological study for all existing plant formations (dry forest, mangrove, savanna) and a cartographic study. After conducting bibliographic consultations, a field trip for ecological and ethnobotanical surveys, as well as cartographic treatments were established.

## Geographical situation of Bombetoka



## Results

Amboaniokely		
Families	Genus	Species
45	95	125

Endemic families : SPHAEROSEPALACEAE, PHYSENACEAE

=> 78% of plants endemic of Madagascar

- 29% of soil occupation of Bombetoka are mangroves
- The loss in land cover is higher than the gain in 10 years

The final value (-254,212), which indicates a regression of the accessible potential of Bombetoka

The nature conservation (local or global) is still high because of the PA status. Similarly, regional access is high because of the large number of tourists.

Ecosystem index health < 1  
=> Bombetoka ecosystem between 2007 and 2017 is already in a degraded state.

Ecosystem accounting units types	Socio-Ecological Landscape Units (SELU)/Dominant Land Cover Type (DLCT)						s/total landscape ecosystems	RSU/HSRU	Main drains s/total river systems
	Forest	Mangrove	Grassland	Humids areas	Other natural land cover				
<b>I. Basic balances</b>									
<b>I.1 Basic land cover accounts [ha]</b>									
LC1	Opening stock of land cover (2007)	2504	21709	14527	19878	13353	71972		
F_if	Formation of land cover	2338	8462	1676	283	1537	14013		
C_if	Consumption of land cover	3218	9100	5761	1506	10647	30233		
LC2	Closing stock of land cover (2017)	3967	21072	10890	18666	17377	71972		
<b>I.2 Basic river systems account [SRMU]</b>									
RS1	Opening basic stock of rivers (2007)							1084	1084
RSF3	Net change in river basic stocks							389	389
RS2	Closing basic stock of rivers (2017)							694	694
<b>II. Accessible ecosystem infrastructure potential</b>									
CH_TEIP	Change in Total ecosystem infrastructure potential	94197	-76188	-276643	-67554	71975	-254212		
<b>III. Overall access to ecosystem infrastructure functional services</b>									
AIP1	Population's local access to TEIP	7869	26653	19727	22391	18491	95133		
AIP2	Population's local access to agro-ecosystems services					214013	214013		
AIP3	Local access to TEIP for Nature conservation	20281	202258	122457	162592	110049	617639		
AIP4	Basin access to water regulating services	11	11	10	11	9	53		
AIP5	Regional access to TEIP [tourism]	26191	88708	65656	74523	61541	316621		
AIP6	Global access of nature conservation services	20281	202258	122457	162592		507590		
<b>IV. Table of indexes of intensity of use and ecosystem health</b>									
IUIE	Ecosystem infrastructure use intensity	1,6	0,96	0,7	0,95	1,08	0,95		
EIH06	Change in rivers health	0,9	0,66	0,8	0,67	0,8	0,75		
EIH01	Change in threatened species diversity	0,9	0,63	1,2	0,56	0,88	0,83		
ICES	Composite ecosystem health index	1	0,85	0,9	0,88	0,96	0,92		
VUEI	Annual change in ecological internal unit value	1,3	0,9	0,8	0,92	1,02	0,99		

## Dicussion and conclusion

The study allows to know the situation on the degree of disturbance of the ecosystems. The current state of mangroves is degraded compared to the Rajerisoa study in 2006. Razafindramasy also showed a decrease in its occupied area from 1989-2003. And this decrease persists from 2007 to 2017. A reduction in species richness, the loss in land cover high to gain, a regression of the total potential of the ecosystem infrastructure and a degraded ecosystem indicates that the Biodiversity of Bombetoka PA is at the threatened state.

**Key references**  
 - Rajerisoa, T. 2006. Etude écologique des mangroves de Mariarano et de Boanary: typologie, zonation floristique, régénération naturelle et dynamique. Mémoire de DEA. Mention Biologie et Ecologie Végétales. Université d'Antananarivo: 92 p.  
 - Razafindramasy, F. V. 2006. Suivi de l'évolution des mangroves de Boanary à l'aide de la télédétection, Mémoire de DEA. Mention Physique et Applications. Université d'Antananarivo. 63p + Annexes.

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