LOCAL ECOSYSTEM ACCOUNTING, A TOOL FOR ENVIRONMENTAL MANAGEMENT

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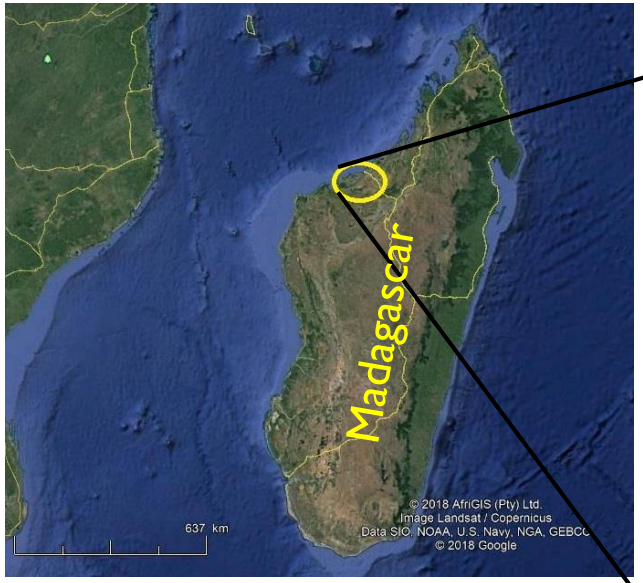
Ecosystem Natural Capital Accounts (ENCA)

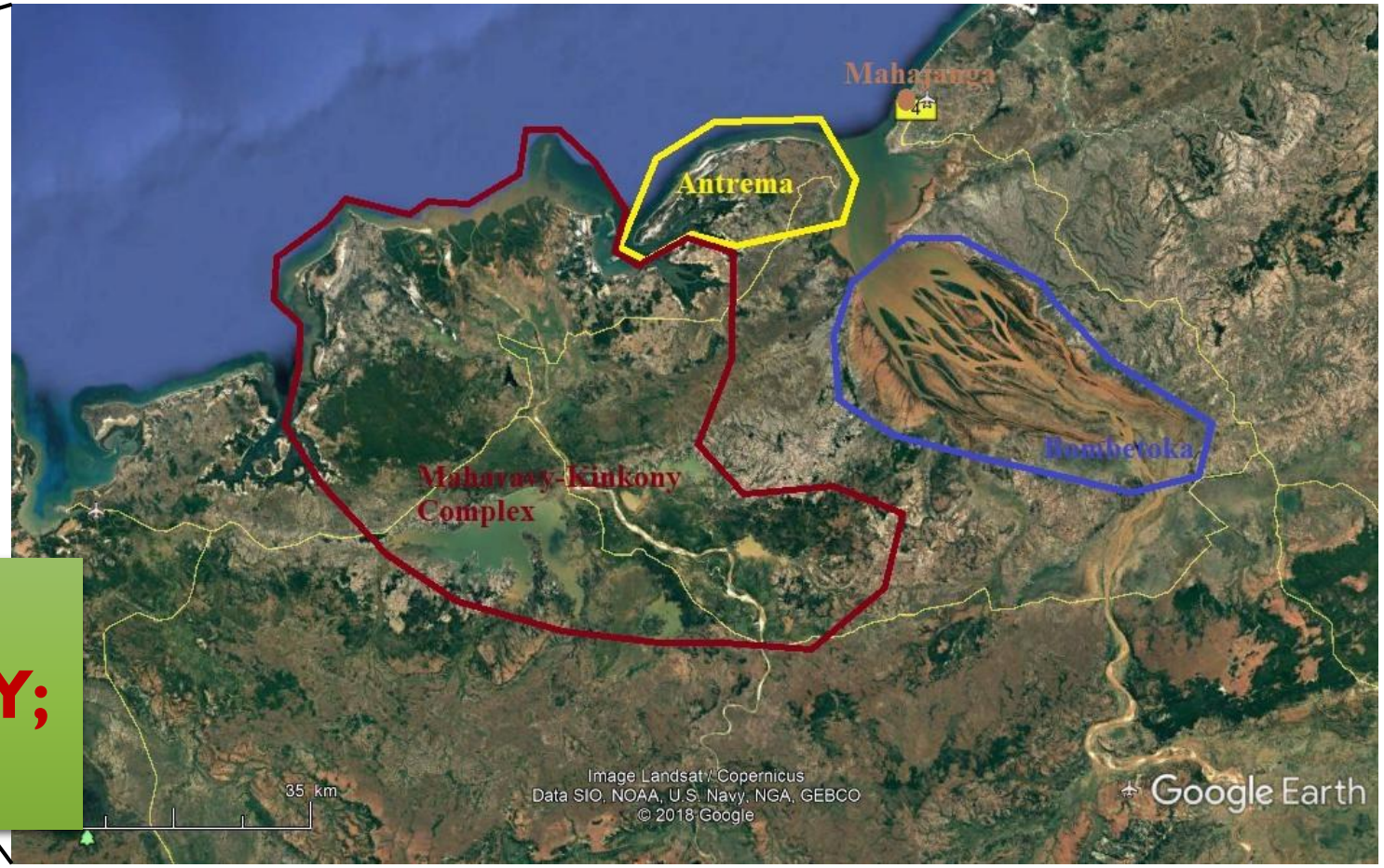
Biophysical Accounts

- Landcover Account
- Ecosystem Carbon Account
- Ecosystem Water Acccount
- Ecosystem Infrastructure Functional Services Account
- Ecosystem Capital Capability Account

Monetary Account

THE PROTECTED AREAS OF NORTHWESTERN REGION





* **ANTREMA;**
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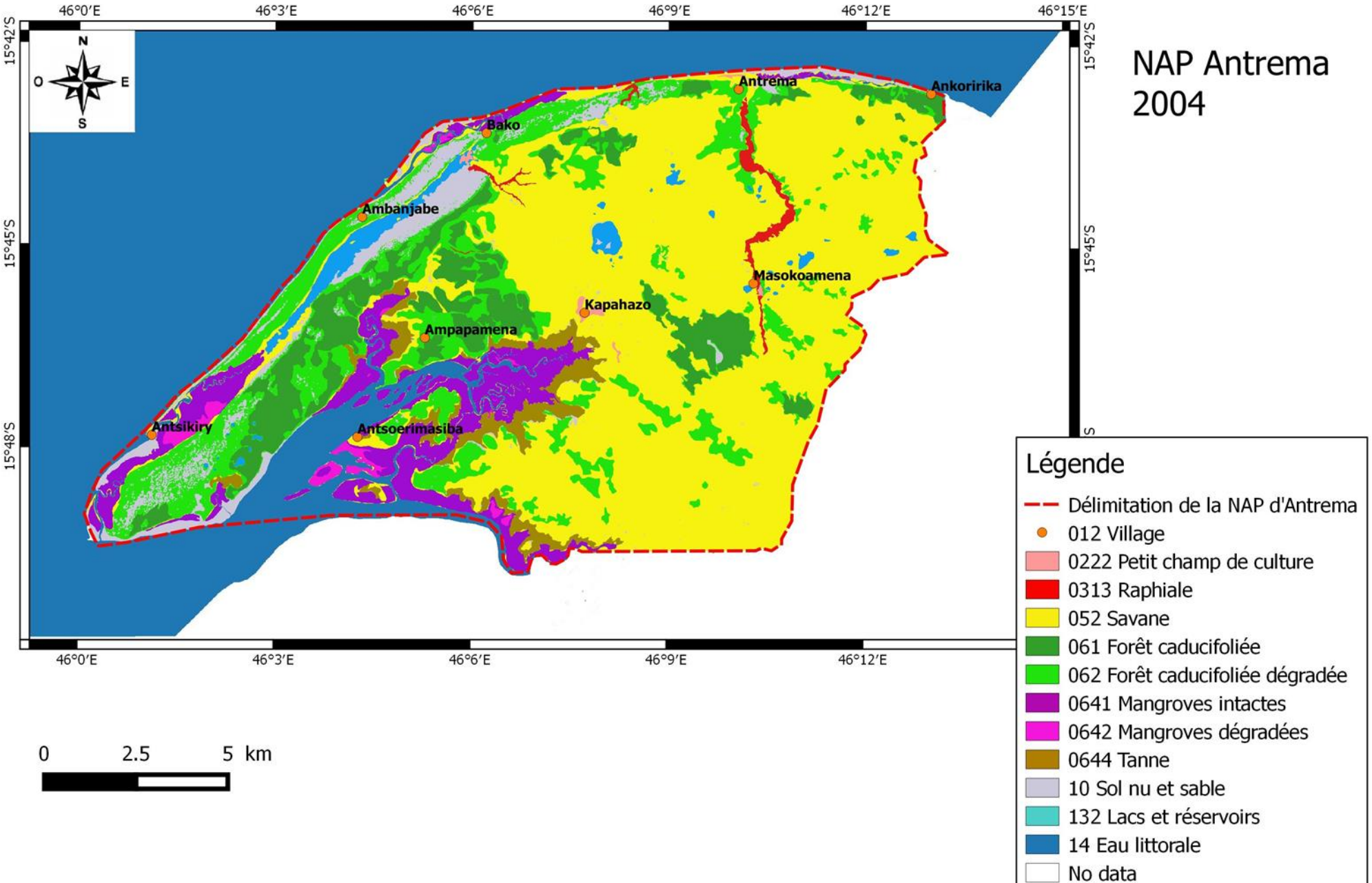
* **BOMBETOKA.**

TYPICAL LANDCOVER CLASSES (ANTREMA)

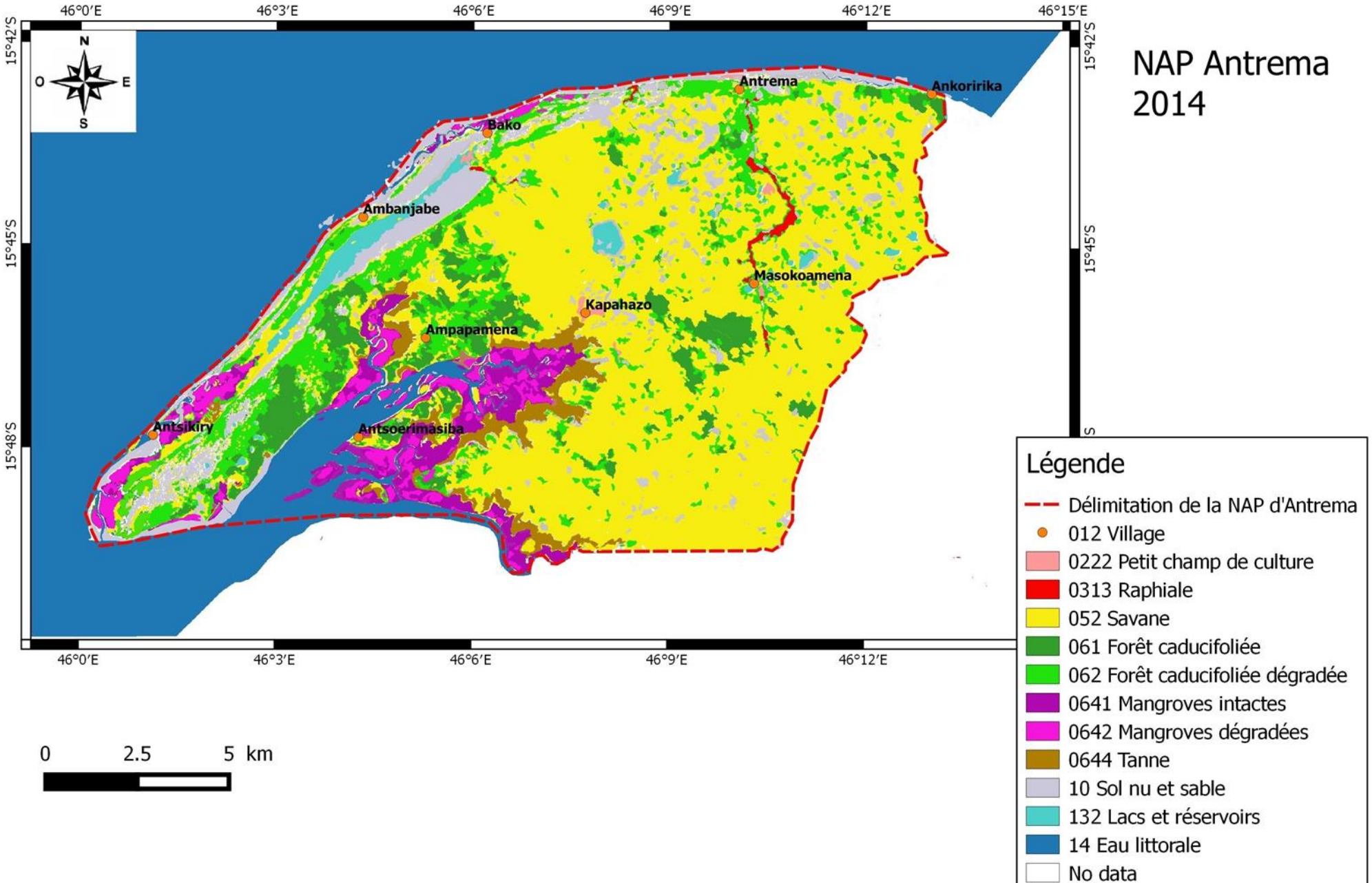
01	Urban and Associated Developped Areas (villages)
020202	Small Herbaceous or aquatic cropland (rice)
030103	Raphia
0502	Natural Grassland (savannah and savannah with trees)
0601	Dry Forest
0602	Degraded Dry Forest
060401	Mangrove
060402	Degraded Mangrove
060404	Tanned
10	Barren Land
1302	Lakes and Reservoirs
14	Coastal waters bodies and inter-tidal areas

ANTREMA LANDCOVER MAPS (2004, 2014)

NAP Antrema 2004



NAP Antrema 2014



LANDCOVER ACCOUNT

	Classification des unités de couverture des terres écosystémiques (UCTE)	012	0222	0313	052	061	062	0641	0642	0644	10	132	TOTAL (ha)
	Stocks et flux d'occupation des terres	Peuplements humains dispersés (village)	Petits champs de cultures herbacées ou aquatiques	Raphière	Prairies naturelles (savane et savane arborée)	Forêt caducifoliée (dense sèche)	Forêt caducifoliée dégradée (dense sèche dégradée)	Mangroves intactes	Mangroves dégradées	Tanne	Sols nus	Lacs et réservoirs	
I. Stocks d'ouverture													
Stocks d'ouverture		10	40	164	11 182	1 982	2 431	1 631	175	672	1 762	378	20 427
II. Formation de couverture des terres													
F_If1	Développement artificiel	24											24
F_If2	Développement de l'agriculture		7										7
F_If3	Conversions et rotations internes												
F_If4	Gestion et altération des espaces forestiers				991								991
F_If41	Gestion, coupe et replantation						338						338
F_If5	Restauration et création d'habitats												
F_If6	Changements dus à des causes naturelles et multiples				47		911		485	14	95		1552
F_If7	Autres changements des terres et réévaluation				370								370
	Total, formation de couverture des terres	24	7		1 408		1 249		485	14	95		3 282
III. Consommation de couverture des terres													
C_If1	Développement artificiel						10				14		24
C_If2	Développement de l'agriculture				7								7
C_If3	Conversions et rotations internes												
C_If4	Gestion et altération des espaces forestiers						935	56					991
C_If41	Gestion, coupe et replantation					338							338
C_If5	Restauration et création d'habitats												
C_If6	Changements dus à des causes naturelles et multiples			47	851			499			155		1552
C_If7	Autres changements des terres et réévaluation									42	328		370
	Total, consommation de couverture des terres			47	858	338	945	555		42	497		3 282
	Changement net de couverture des terres	**24**	**7**	**-47**	**550**	**-338**	**304**	**-555**	**485**	**-28**	**-402**		
	Aucun changement	10	40	117	10 324	1 644	1 486	1 076	175	630	1265	378	17 145
IV. Stocks de clôture													
Stocks de fermeture		34	47	117	11 732	1 644	2 735	1 076	660	644	1 360	378	20 427

2014 ↓

2004 →

		052	061	062	0641	0642	0644	10	132	Unité ha
		Natural Grassland	Dry Forest	Degraded Dry Forest	Mangrove	Degraded Mangrove	Tanned	Bareland	Lakes and reservoirs	TOTAL (2004)
										10
										40
		47								164
052	Natural Grassland	10 324		756				95		11 182
061	Dry Forest		1 644	338						1 982
062	Degraded Dry Forest	935		1 486						2 431
0641	Mangrove	56			1 076	485	14			1 631
0642	Degraded Mangrove					175				175
0644	Tanned	42					630			672
10	Bareland	328		155				1265		1762
132	Lakes and reservoirs								378	378
	TOTAL (2014)	11 732	1 644	2 735	1 076	660	644	1 360	378	20 427

ECOSYSTEM WATER ACCOUNT (ANTREMA)

Ecosystem Water Basic Balance

Unit: m3

I. Ecosystem Water Basic Balance	Lakes & reservoirs	Rivers	Undergroud water	Soil et vegetation	Total inner water
Opening Stocks (2004)	9.473.946	669.801.894	4.688.772.480		5.368.048.320
Closing Stocks (2014)	8.802.321	608.910.813	4.688.772.480		5.306.485.614
Increase/Decrease	-671.625	-60.891.081			-61.562.706
%	-7,09	-9,09			-1,15
Preecipitation 2004	3.894.491	2.414.772		450.418.030	456.727.293
Précipitation 2014	2.434.727	1.141.764		272.433.133	276.009.624
%	-37,5	-52,7		-39,5	-39,6

Accessible Basic Ressource Surplus

Unit: m3

II. Accessible Basic Water Surplus	2004	2014	Difference	%
Total natural renewable water resources	1.227.548.151	894.820.607	-332.727.544	-27,1
Total secondary water resources	68.793.691	76.132.088	7.338.397	10,67
Net primary & secondary water resource	773.656.117	569.200.309	-204.455.808	-26,43
Ressources en eau naturelle exploitables	1.074.517.783	752.229.949	-322.287.834	-30
Exploitable natural water resources	68.790.895	76.128.007	7.337.112	10,67
Net Ecosystem Accessible Water Surplus]	1.143.308.678	828.357.956	-314.950.722	-27,55

Total Water Use

Unit : m3

III. Total Water Use	2004	2014	Différence	%
Abstraction from water assets	63.888.974	70.989.606	7.100.632	11,11
Agriculture and forestry 'green water' use	76.190.538	44.971.703	-31.218.835	-40,97
Collecte des eaux de pluie	41,3	60,24	18,94	45,86
Total Use of Ecosystem Water	140.079.553	115.961.369	-24.118.184	-17,22
Artificial inflows of water from other territories	2,23	2,8	0,57	25,56
Withdrawal of water from the sea	190,5	278,1	87,6	45,98
Imports of Water/ commodities & residuals content	20	24	4	20
Exports of Water/ commodities & residuals content	20,3	21,2	0,9	4,43
Direct Use of Water	140.079.786	115.961.674	-24.118.112	-17,22
Domestic Consumption of Water	140.079.765	115.961.653	-24.118.113	-17,22
Virtual water embedded into imported commodities	307.150	341.278	34.128	11,11
Total Water Requirement	140.386.936	116.302.952	-24.083.984	-17,15

Table of indexes of intensity of use and ecosystem health

Unité m3

	Lakes et reservoirs	Rivers	Underground water	Soil & vegetation	Total inner water
Net Ecosystem Accessible Water Surplus	14412330	387604992	153907225	272433409	828357956
Total Use of Ecosystem Water	996274	69987677	5655	44971703	115961369
Sustainable intensity of water use	14,47	5,54	27218,06	6,06	7,14
Composite index of change in ecosystem health	1	1			1
Water ecological internal unit value	7,73	3,27	27.218	6,06	4,07

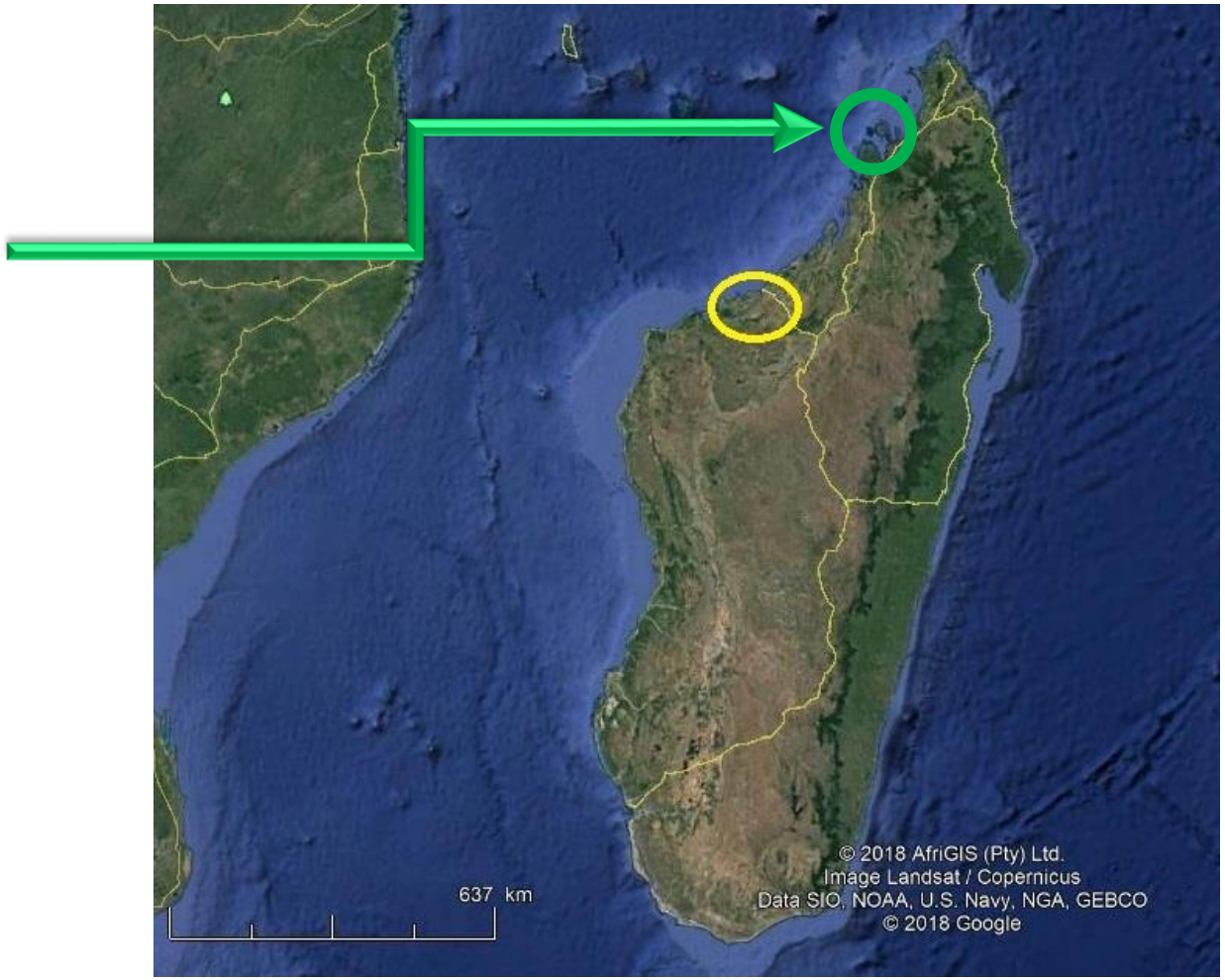
INTERPRETATION OF WATER ACCOUNT

- **ALMOST THE SAME STRUCTURE OF ECOSYSTEM WATER ACCOUNT OBSERVED FOR THE 3 PROTECTED AREAS.**

INTERPRETATION OF WATER ACCOUNT (2)

- **DECREASE OF PRECIPITATION (dry areas);**

- **BUT INCREASE OF PRECIPITATION OBSERVED IN NOSY BE ISLAND (Northern Madagascar);**



INTERPRETATION OF WATER ACCOUNT

- SUSTAINABLE INTENSITY OF WATER USE > 1, WATER IS STILL SUFFICIENT FOR PRESENT USE,
  EXCEPT FOR BOMBETOKA PROTECTED AREA ;
- COMPOSITE INDEX OF CHANGE IN ECOSYSTEM HEALTH<1 = DECREASE OF WATER QUALITY.
  SOURCES = CLIMATE CHANGE + EROSION ;

THANK YOU