Prioritising areas for biodiversity conservation to inform the Mahavavy-Kinkony Wetland Complex management plan, Madagascar

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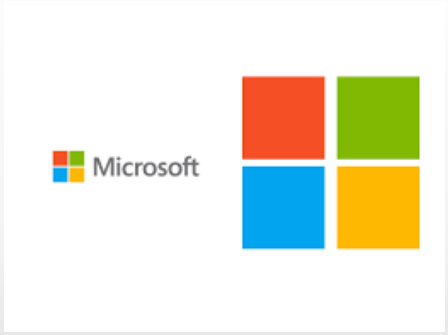
Supporting organizations



Objective

- Prioritizing potential areas for threatened species in order to design the management plan of the protected area, Mahavavy-Kinkony Wetland Complex (MKWC)

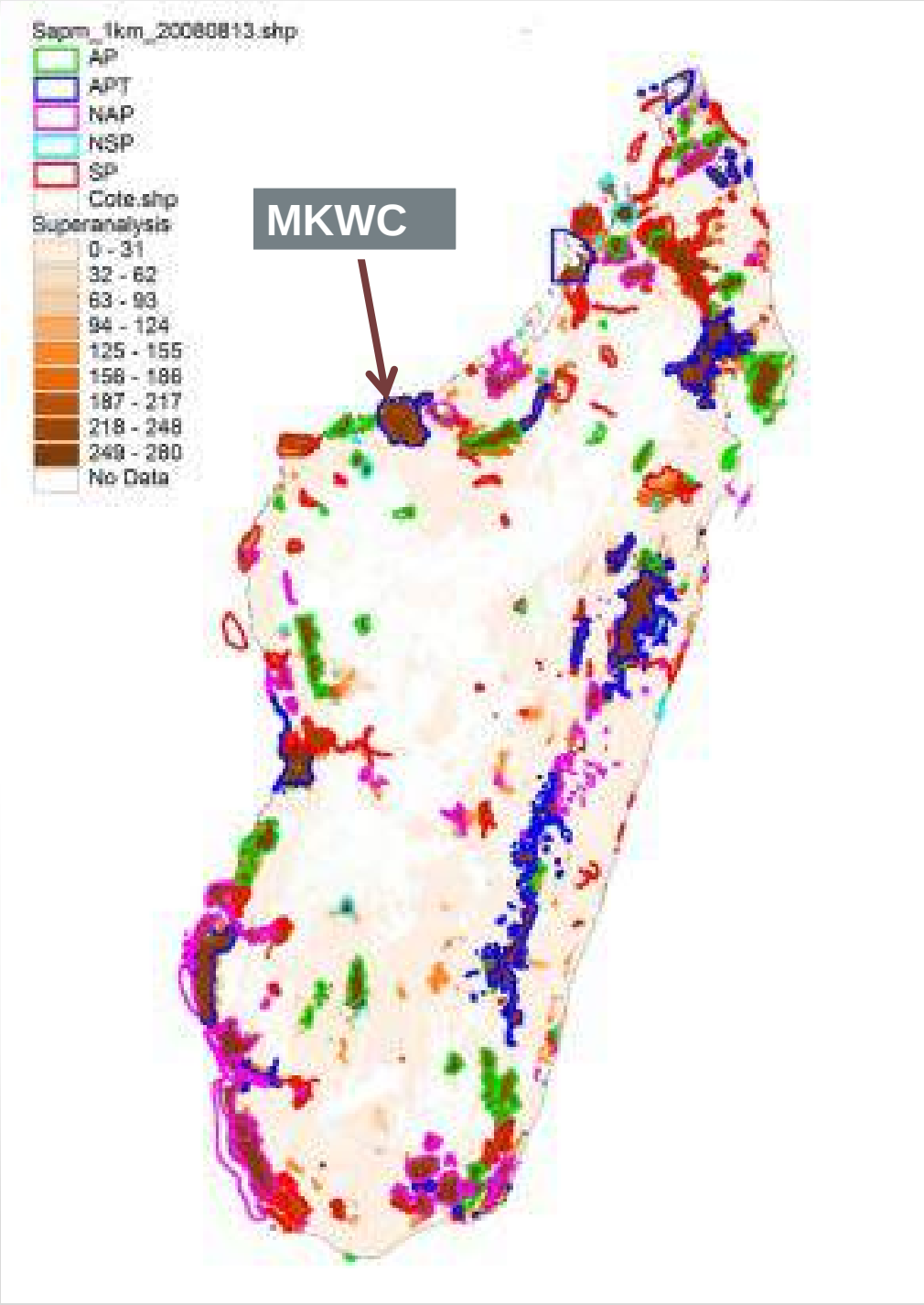
- Why this study is different from the prioritization already done in Madagascar?

Context

- Madagascar is a globally important biodiversity hotspot
- In 2003, during the World Parks Congress in Durban: Malagasy Government committed to triple the protected area coverage (from 2 million hectares to 6 million hectares)
- Existing prioritizations at the national scale in Madagascar (Kremen et al. 2008 and Razafimpahanana, 2010) for identifying potential sites for protected area

Context

- Result: this map was edited in 2008 and serves as tools for national planification
- MKWC is one of these priority sites for protected area establishment



Context

- The prioritization of this study is at site level
  - **Why?**
- MKWC is classified as Category V (UICN), people can use sustainably some parts of the natural resources
- The aim is to inform decision makers where are the importantes places for threatened species, and merit to be protected and where are places that pepople can use sustainably

Methodology: area

- Study area:
  - Located in north-west of Madagascar
  - Total area of about 300,000ha
  - Mixture of habitats : fresh water lakes, rivers, marshes, mangrove forest, and deciduous forest

Methodology: Data

- Sources of Data:
  - Identification project of Important Bird Areas (ZICOMA, 1997-1999)
  - Inventory and Monitoring done by Conservation program of Birdlife in Madagascar (2002-2006)

Methodology: Data

- Data used:
  - 19 threatened species : 9 birds, 3 primates, 3 fishes, 3 bats and 1 aquatic reptile
  - Species distributions of these19 species needed for the analysis
  - For modeling distributions, we used as sources :
    - 1) land cover types from Remote sensing using Landsat 2005
    - 2) expert knowledge: species records inside the site were used to guide experts at Asity Madagascar

Methodology: Tool

- Software-based Analysis using as tool: conservation planning software Marxan
- Following files were created to run Marxan :
  - Planning Unit File (pu.dat)
  - Conservation Feature File (spec.dat)
  - Planning Unit versus Conservation Feature File (puvspr2.dat)
  - Input Parameter File (input.dat)

Methodology

- Approach for having management plan used two steps:
- software-based analysis

- community consultation process

- Finality : to delineate three zones those for conservation, those sustainable uses and those for human occupancy.

- This reseach contibuted mainly to the first
- step

Methodology: process

- *Conservation goal : keep at least 25% of the species habitat*
- *Planning unit:*
  - Using GIS, study area was devided into planning units of 625m² (corresponding to planning unit of mining permits)
  - Conservation cost:
    - Planning Unit belonged to the natural habitat such as forest, lakes, rivers and mangroves had lower cost.
    - Planning Unit located in a degraded habitat like degraded forest and wooded savannah land had higher cost
- *All planning units available for prioritization*

Methodology: analysis

- Conservation Feature File created using WWF Gap 1.5 tool
  - Maximum value of the area of occupation set at 250,000,000m², minimum value at 100,000,000 m² with asymptote at 25
    - for species with occupation area more or equal to maximum value, 25% of its occupation area only will be kept
    - for species with less or equal to the minimum value, 100% per cent of its occupation area will be prioritized.
    - Between these two extremes, the priority will vary progressively from 25 to 100%

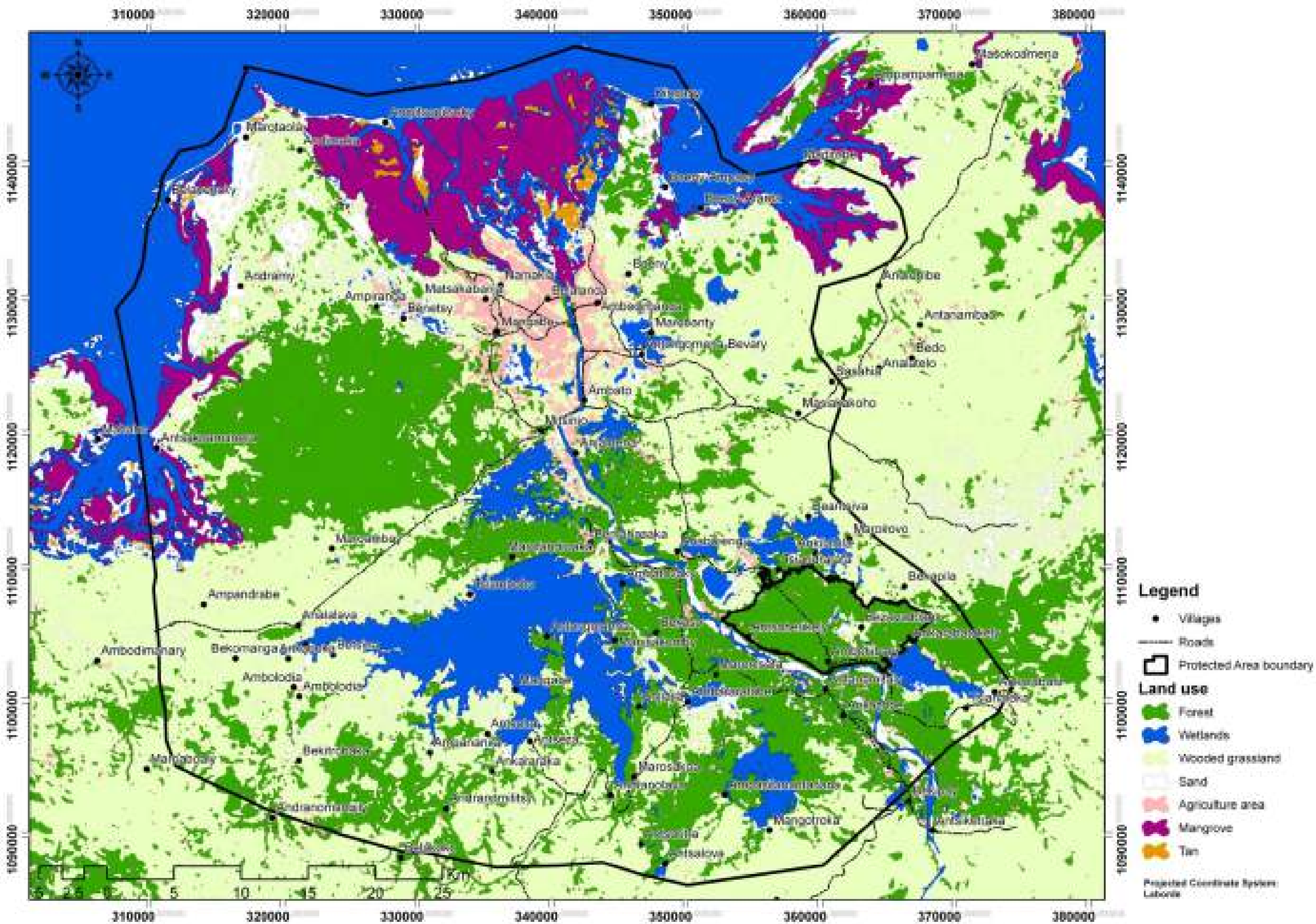
Methodology: analysis

- *Boundary length file* value set at 1
- *Default setting of Simulated annealing algorithm* with 1000000 iterations for each run
- Ran Marxan 100 times

- For detail of Marxan parameters please refer to: http://www.uq.edu.au/marxan/tutorial/module4.html or
- http://www.uq.edu.au/marxan/docs/Marxan_User_Manual_2008.pdf

Results

- 7 classes were extracted from Landsat 2005:



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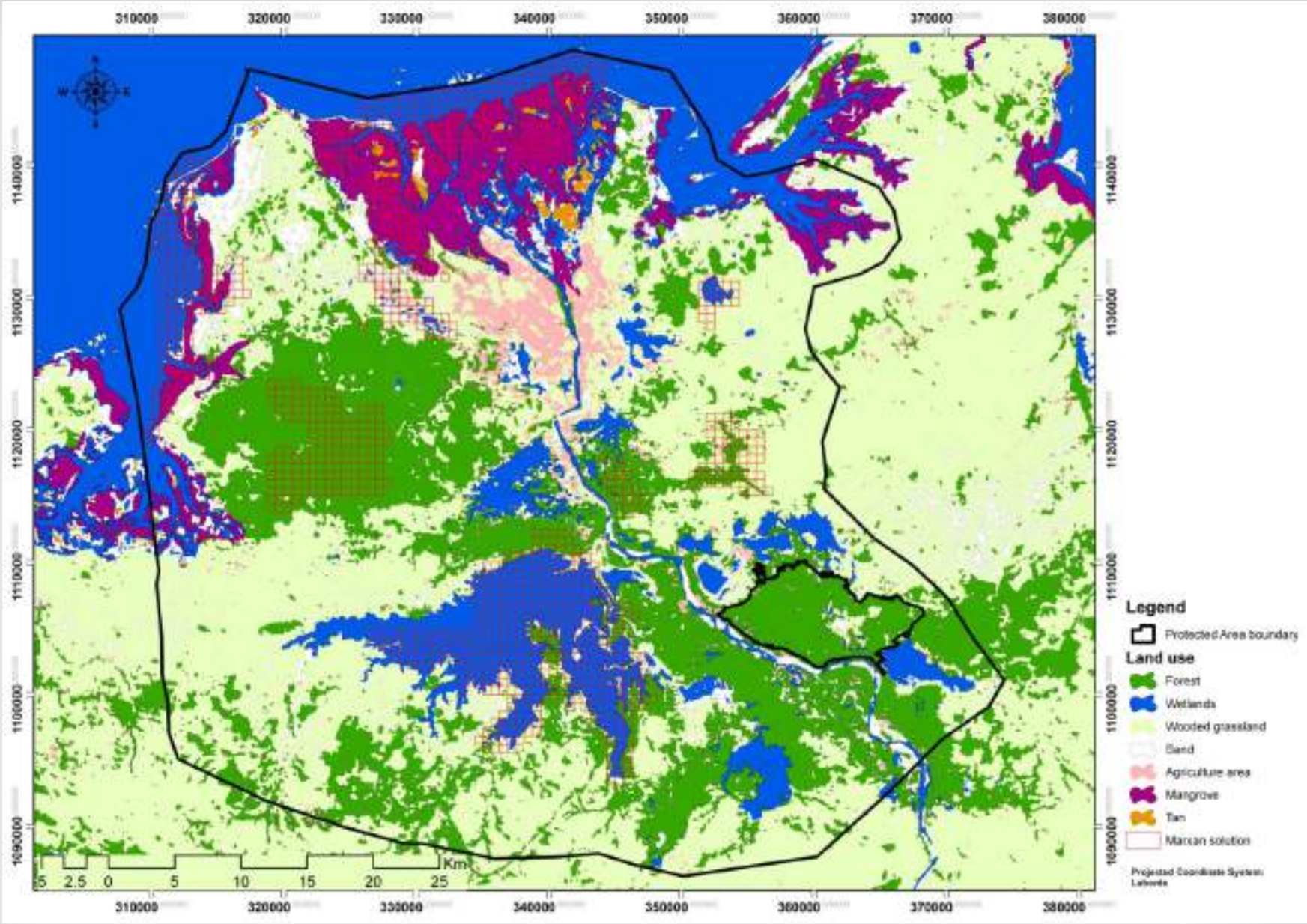
Legend
Villages
Roads
Protected Area boundary
Land use
Forest
Wetlands
Wooded grassland
Sand
Agriculture area
Mangrove
Tan
Km

Results

- Forest, mangrove and terrestrial wetland are important for the biodiversity
  - Forests are important for lemurs
  - Mangrove for water birds
  - Terrestrial wetlant for fishes, waterbirds and aquatic reptil

Results

- Site divided into 7354 planning units, costs rank from 10 to 3979
- Summed solution of Marxan with the irreplaceability more than 25 % was kept as solution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Protected Area boundary
Land use
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Wooded grassland
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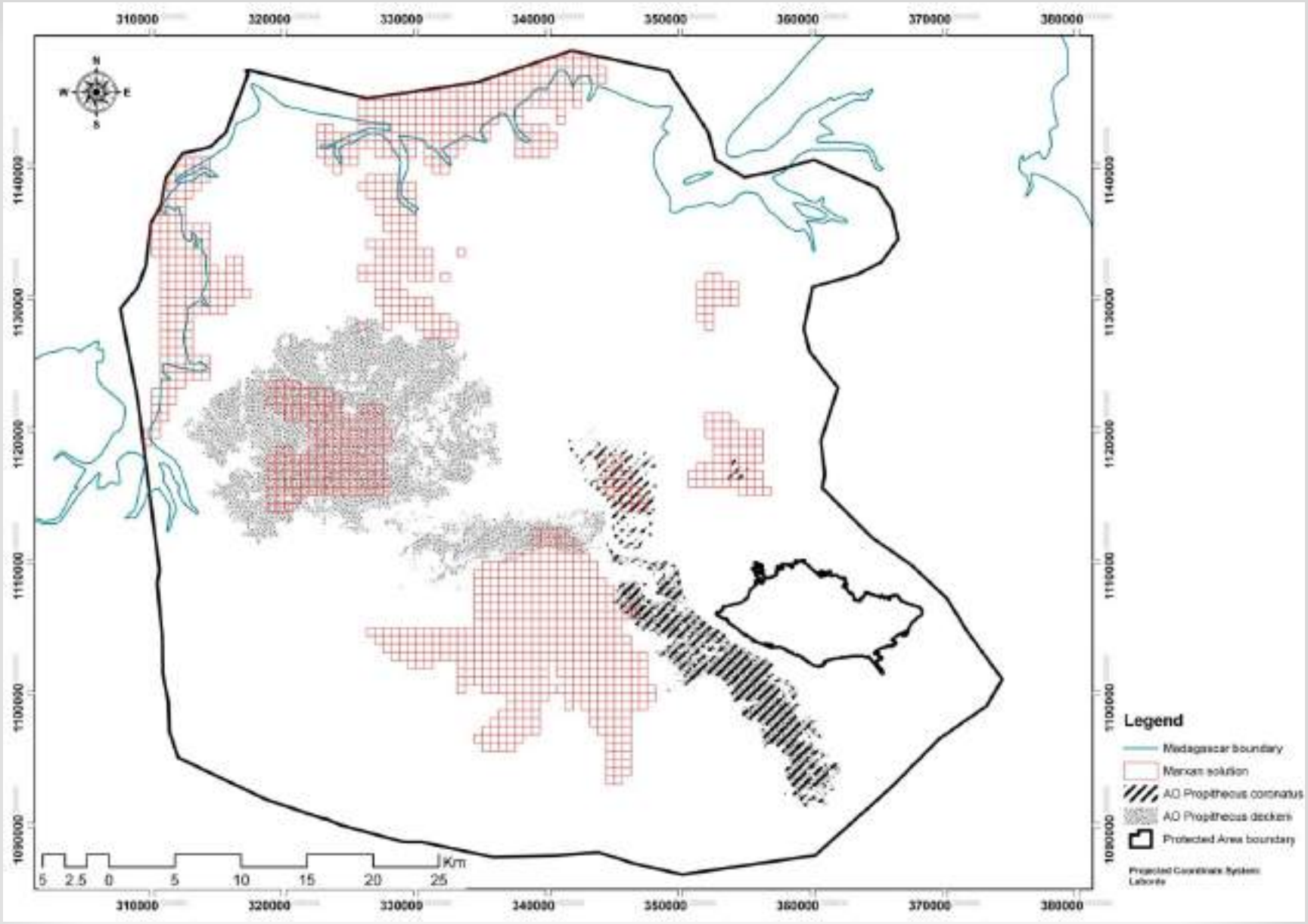
Agriculture area
Mangrove
Tan
Maxan solution
Projected Coordinate System:
Lat/lon/m

Results: Gap analysis

- Majority of the species had more than 25% of their distribution protected, except crowned sifaka (*Propithecus coronatus) and* Decken's sifaka (*P. deckenii*) with respectively 9.19% and 22%
- They didn’t meet the 25% target of conservation
- Manual adjustment

Results: Manual adjustment

- Why manual adjustment instead of systematic adjustment?
- Systematic adjustment will increase considerably the amount of habitat kept for other taxa and may offend local community
  - Some resources have to be retained for sunstainable uses by local community
- The goal of manual adjustment was to detect the area where these two species of lemurs occur but had not been captured in the solution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Madagascar boundary
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AO Propitheous coronatus
AO Propitheous deckeri
Protected Area boundary
Projected Coordinate System:
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Results: Manual adjustment

- Part of forest where these two species occur was not captured in the solution
- Manual incorporation of this part of forest increased the conservation of these species to 91.66% for Crowned Sifaka and 96.56% for Decken's Sifaka

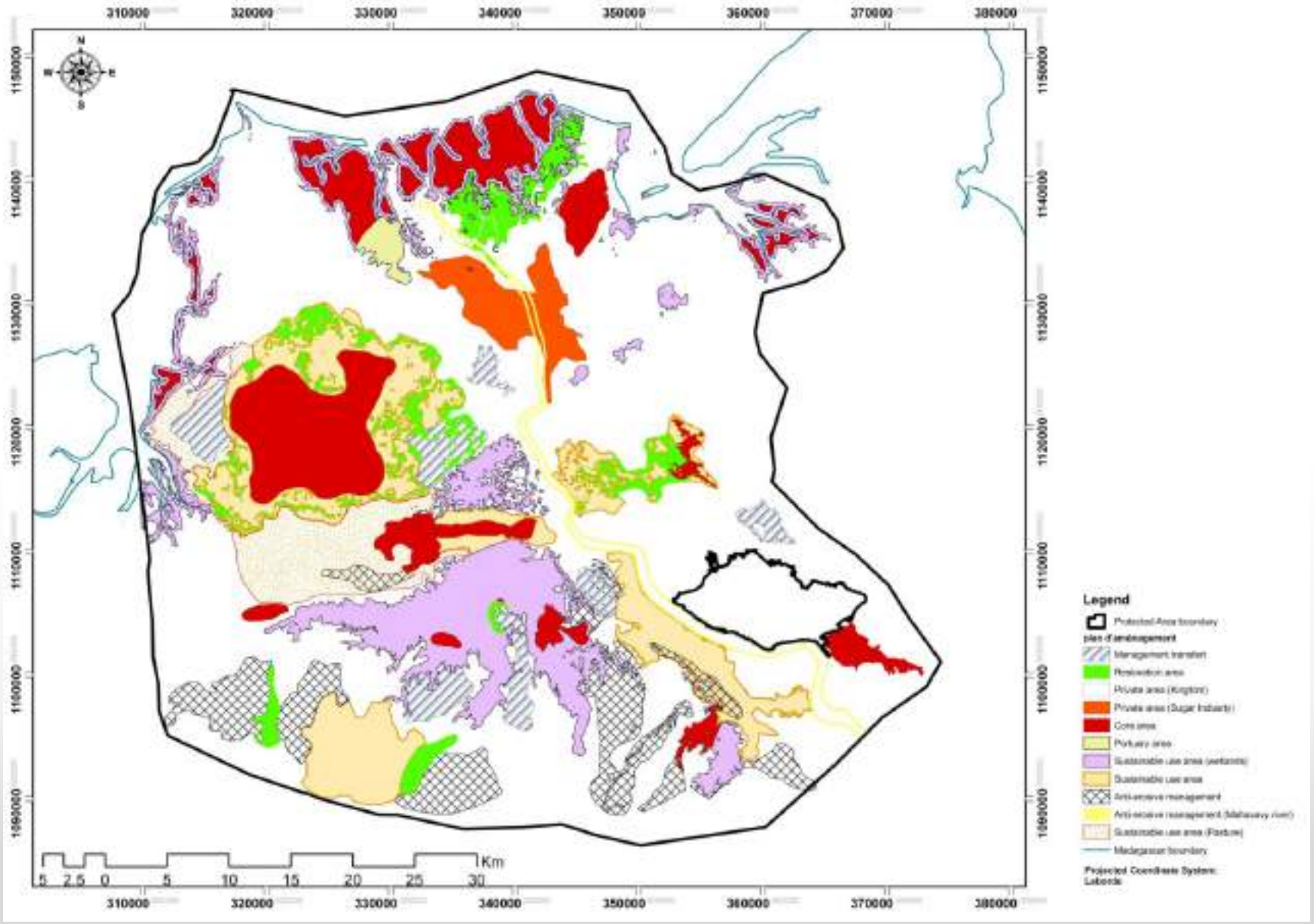
Taxa	Species	Distribution (in %) inside theirreplaceablility more than 25%
BAT	*Myzopoda schliemanni*	28.57
BAT	*Pteropus rufus*	38.26
BAT	*Roussetus madagascariensis*	100
BIRD	*Amaurornis olivieri*	100
BIRD	*Anas bernieri*	66
BIRD	*Ardea humbloti*	54.58
BIRD	*Charadrius thoracicus*	41.07
BIRD	*Haliaeetus vociferoides*	59.72
BIRD	*Pheonicopterus minor*	84.09
BIRD	*Sterna bengalensis*	92.18
BIRD	*Tachybaptus pelzelnii*	96.57
BIRD	*Threskiornis bernieri*	51.82
FISH	*Paretroplus dambabe*	99.99
FISH	*Paratilapia polleni*	100
FISH	*Paretroplus kieneri*	77.43
LEMUR	*Eulemur mongoz*	28.91
LEMUR	*Propithecus deckeni**	22
LEMUR	*Propithecus coronatus**	9.19
REPTILE	*Erymnochelys madagascariensis*	67.02
	Overall	**63.06%**

91.66

96.56

69.89

Results : After public consultations



Discussion/lesson learnt

- Gap analysis is a compulsory to ensure that all target species are enough protected even if the overall percentage of the species habitat kept in the solution was arleady high (63.06%)

- Difference was very enormous at species level (Crowned Sifaka : 9.19% # 91.66%) even if the difference between global percentages of the natural habitat of all species included in the solution without manual adjustment and with manual adjustment were very little (63.06% # 69.89%)

Discussion/lesson learnt

- Program was very good for restricted distribution species :
  - Madagascar grebe (*Tachybaptus pelzelnii)*
  - a fish *Paratilapia polleni* only at Tsiambarabe Lake
  - Sakalava rail (*Amaurornis olivieri*) and Paretroplus dambabe occurred Lac Kinkony
  - Madagascan rousette *(Roussetus madagascariensis*) at Anjohibe forest.

Discussion/lesson learnt

- Very high percentage of the conservation values were kept as goal during the systematic planning process for two reasons:
  - Threatened species only are considered so the solution should ensure others species
  - After public consultations some areas have to be released for sustainable uses of the local people.

Discussion/lesson learnt

- Extent of the prioritized natural habitat should always be considered for the prioritization because it will be divided into different zones (core area, the sustainable utilization area and the controlled human-occupied area)

Thank you for your attention