

2nd Mediterranean Plant Conservation Week

“Conservation of Mediterranean Plant Diversity: Complementary Approaches and New Perspectives”

Diachronic cartography within an Important Plant Area : case study of Mount Chenoua (Tipasa, Algeria)

Methodological approach and preliminary results.

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This work aims to present the GIS set up on Mount Chenoua, one of the 39 plant Key Biodiversity Areas in Algeria.

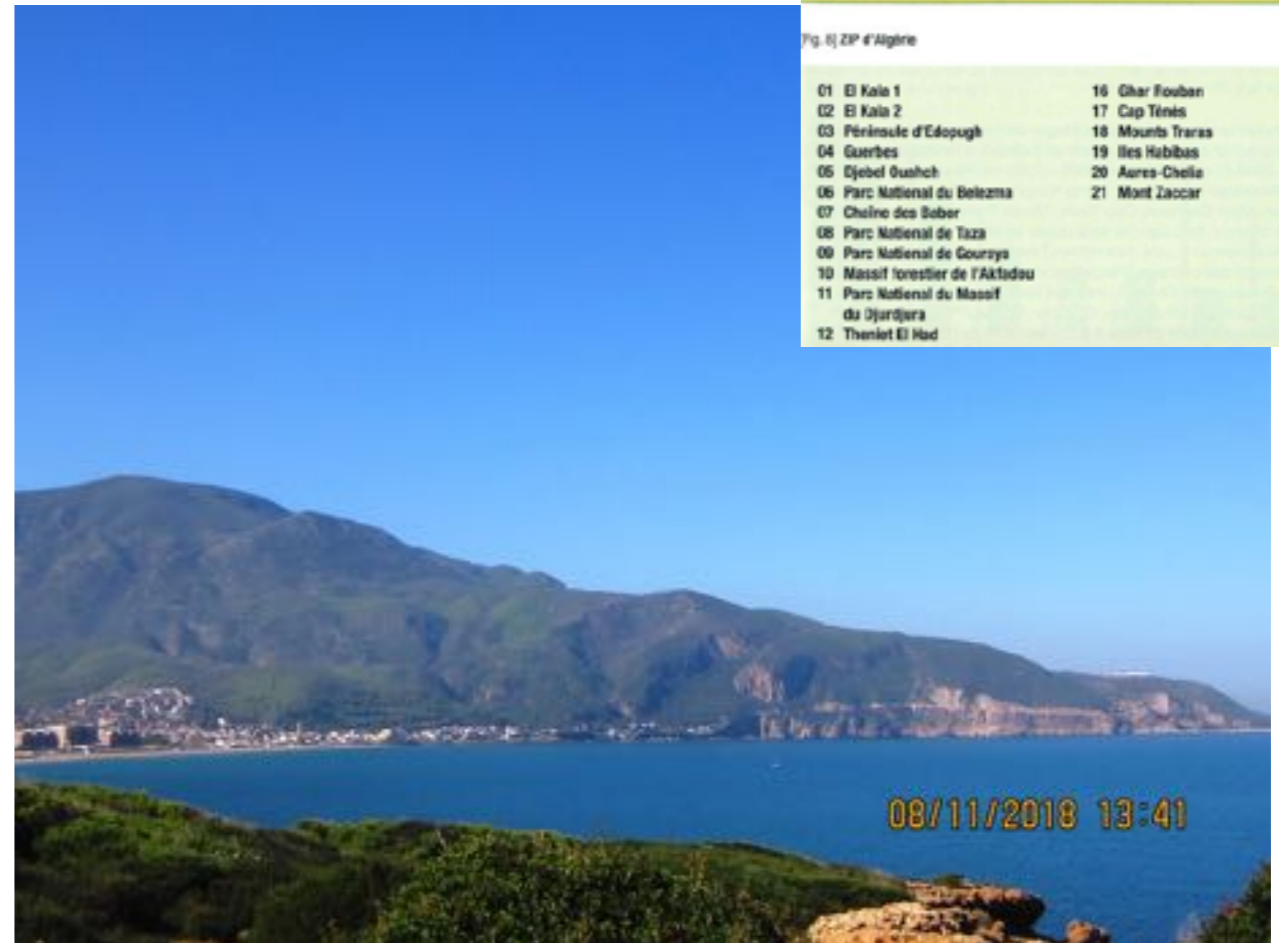
It should also be an opportunity to initiate a debate around:

- ✓ **methodological precautions** to be considered in habitat mapping;
- ✓ **regional typologies** of habitats.



Fig. 63 ZP d'Algérie

01 El Kala 1	16 Ghar Fouban
02 El Kala 2	17 Cap Ténés
03 Péninsule d'Edough	18 Mounts Traras
04 Guelbes	19 Iles Habibus
05 Djebel Guelich	20 Aures-Chells
06 Parc National du Belezma	21 Mont Zaouar
07 Chaîne des Sabers	
08 Parc National de Taza	
09 Parc National de Gourrys	
10 Massif forestier de l'Akhdou	
11 Parc National du Massif du Djurdjara	
12 Theniet El Had	

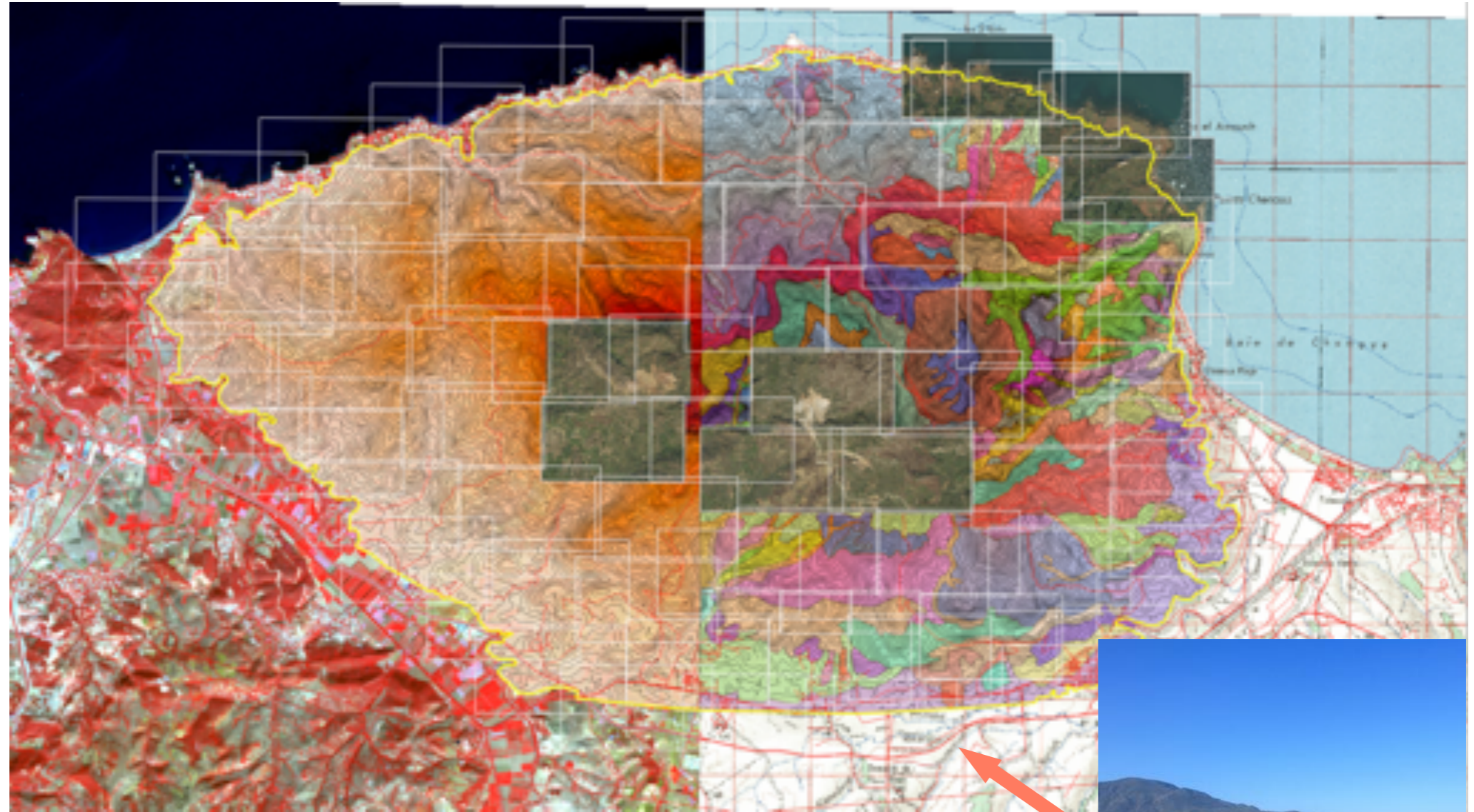


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Chenoua GIS :



Main data taken into account for Chenoua's GIS development

- Field inventories
- Thematic map data
- Topographic map data
- Multi-date satellite data (LANSAT TM5 and TM8, SENTINEL 2)
- Radar Data (SRTM)
- Current aerial photographs (BingMap)
- OSM data (linear road)



Mont Chenoua



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General characterization of the IPA/KBA for plants

Mount Chenoua

- ✓ a rugged coastal area that rises to 905 m.
- ✓ a protected terrestrial area with a total of 9,100 ha.
- ✓ Exceptional landscape, with preserved natural and cultural heritage
- ✓ Patrimonial value at the local and regional level, due to the presence of well-preserved ecosystems



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General characterization of the IPA/KBA for plants

Mount Chenoua's types of vegetation

- ✓ Pure Tetraclinis or mixed forest with Aleppo pine and, more rarely, holm oak.
- ✓ Matorral of Aleppo pine and *Olea europea* with *Pistacia lentiscus* and *Phillyrea angustifolia* subsp. *angustifolia*
- ✓ Maquis of Kermes Oak, *Erica arborea*, *Olea europea*, *Arbustus unedo* and *Ampelodesmos mauritanicus*.
- ✓ Garrigue of *Linum narbonense*, *Micromeria fontanesii* et *Galium brunnaeum*.
- ✓ Formation on rocks and limestone scree represented by *Crucianella latifolia* and *Lathyrus saxatilis*.
- ✓ Riparian forests of *Populus alba*, *Fraxinus angustifolia* subsp. *oxycarpa*, *Ulmus campestris*, *Salix pedicellata* and *Salix alba*.



Fumaria bicolor Sommier



1. General problematic

The cartographic approach carried out aims for :

- ✓ The **identification of all the species concerned by conservation issues**, their precise location in the field and their ecological characterization;
- ✓ The **establishment of a typology to describe the habitats** where these species are likely to develop;
- ✓ The **choice of perception levels and data adapted** to the problem pursued in all its dimensions.



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1. General problematic

A double objective :

- identify and map natural and semi-natural habitats using **QuantumGis** software ;
- Vegetation diachronic mapping based on the confrontation of multi-temporal remote sensing data and documents.

This requires a multi-scalar approach from regional to local and focal.

To do this, 3 scales can be selected :

1/50 000 to 1/200 000

Regional scale

1 / 10,000 to 1 / 25,000

Local scale

1 / 5,000 to 1/2500

Focal scale



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Habitats mapping
sensu UICN-MED

2. IPA's : choice of resolution degree of GIS constituted

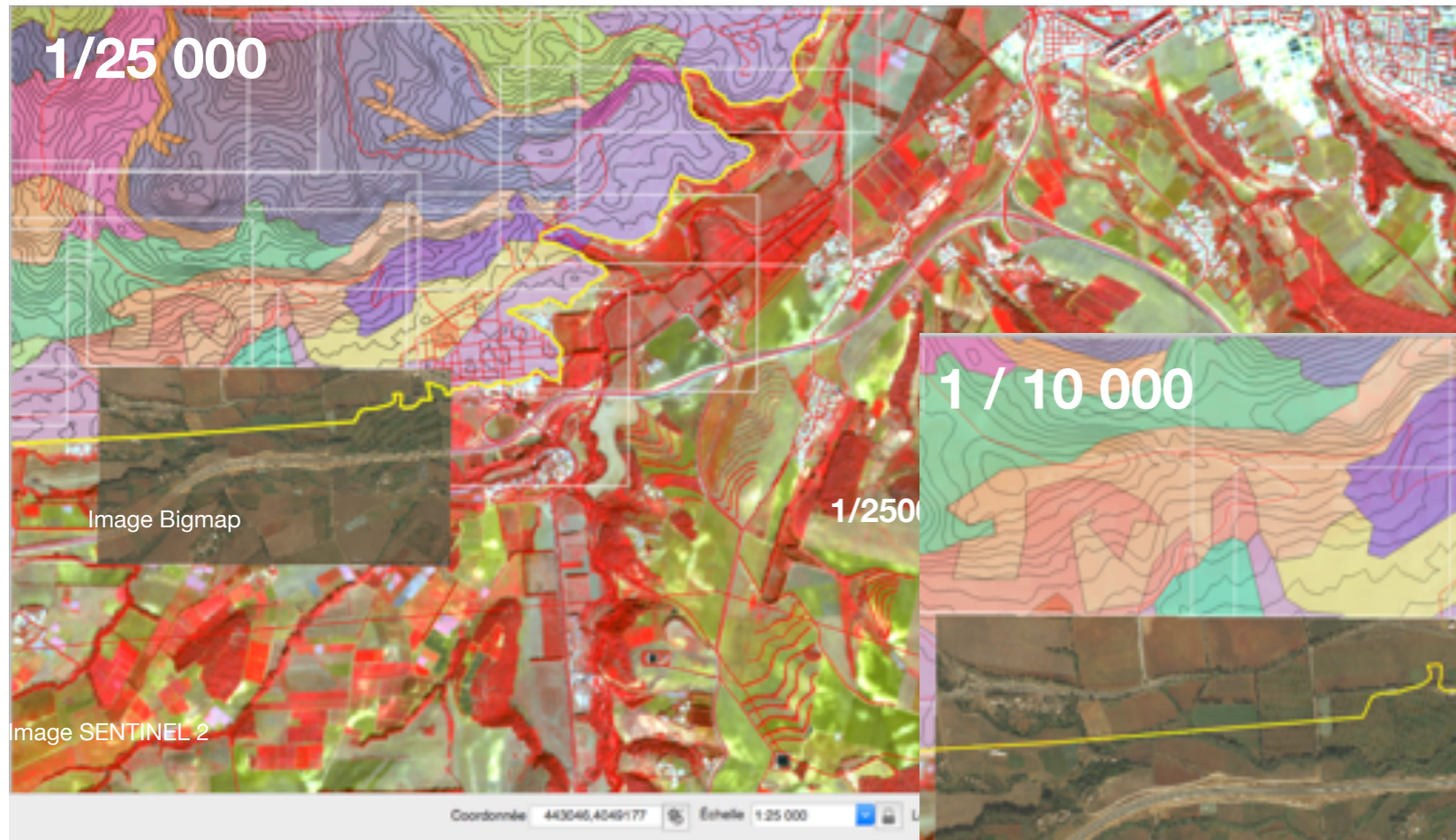
Inventory, management and conservation require a multi-scalar approach from regional to local to focal.

D'après (Allen & Starr 1982, O'Neill et alii 1986, O'Neill 1989, Wiens 1995) modifié

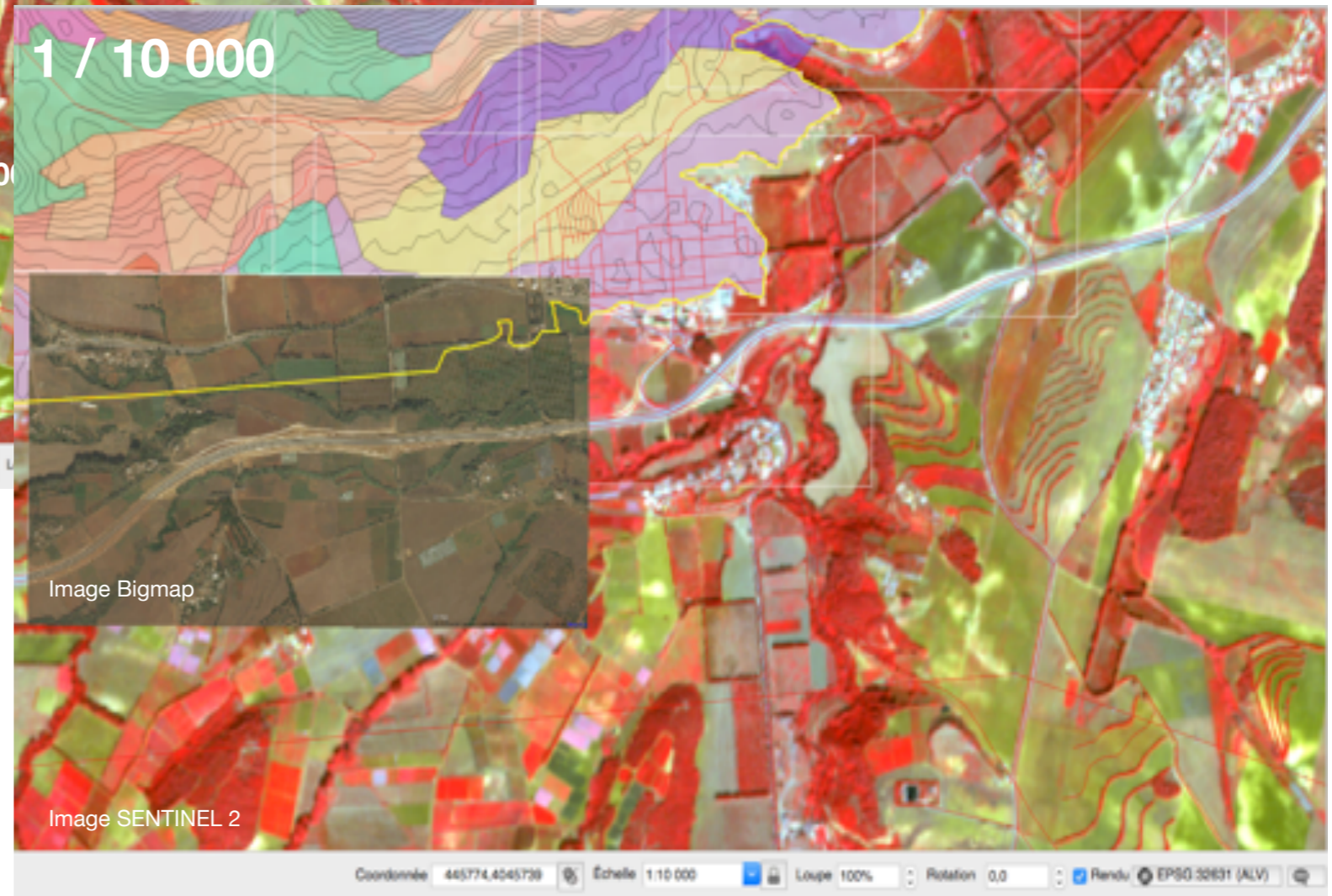
Administrative scale	Communes, ZIPs	Communes, National parks	Wilaya
Cartographic scale	1/5 000 1/10 000	1/50 000	1/200 000
Type of map	Habitats mapping	Habitats mapping	Plant formations maps
spatial data used	Ortho-photo SENTINEL 2	LANDSAT 8 OLI SRTM 30	LANDSAT ETM + LANDSAT MSS
Unit Properties	Phytocoenoses + Physiographic Elements + Local Ecological Factors + Soil Uses	Phytocoenoses + Physiographic Elements + Local Ecological Factors + Soil Uses	Physiographic elements + Vegetation structures + Geomorphological elements
Use	Local Ecological Planning + Landscape Units + Communication-Education	Regional ecological planning	Regional ecological planning



1. General problematic



Focal level



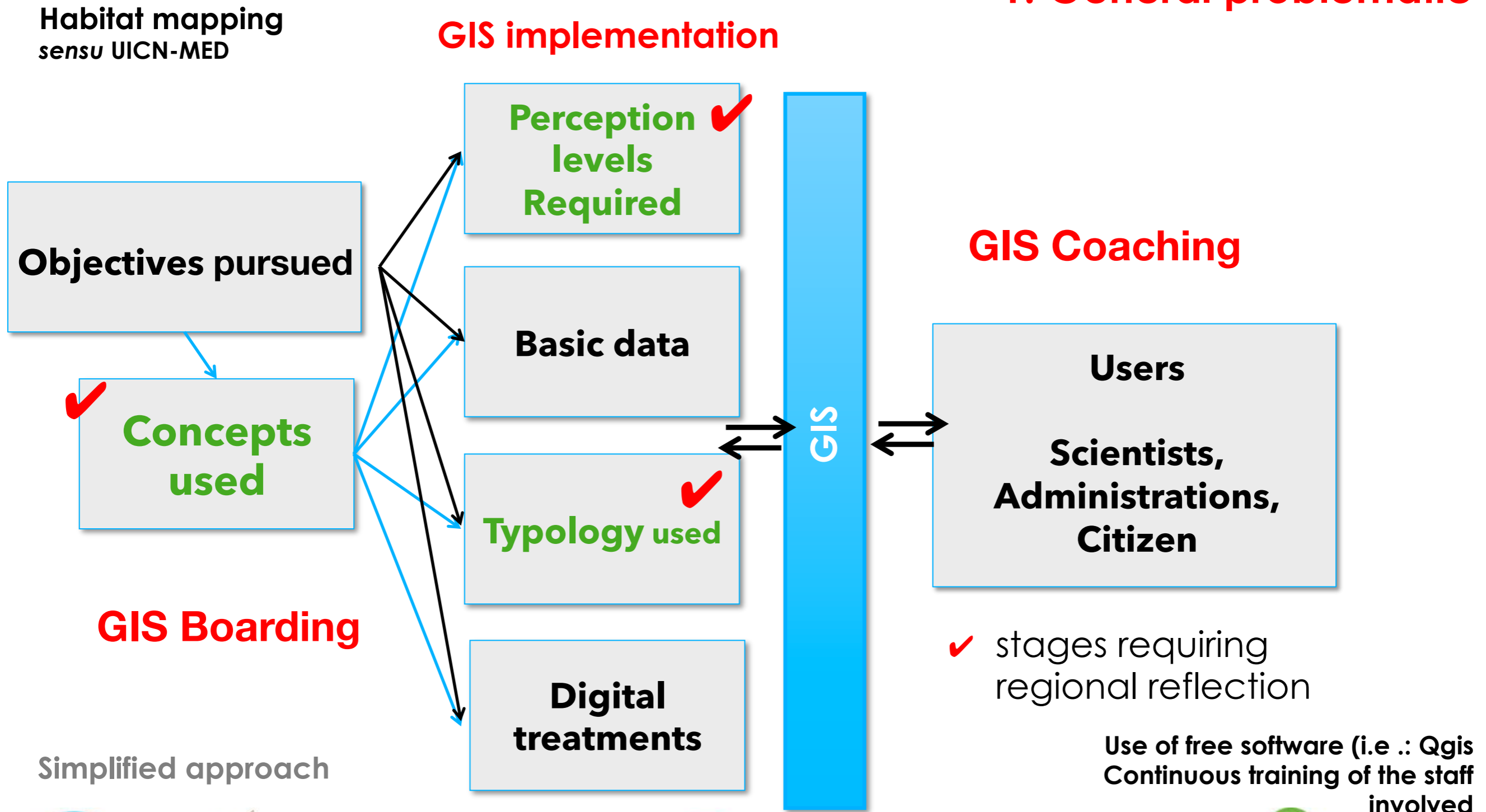
Local level

Sentinel 2 : pixel = 10m
LANDSAT, SRTM : pixel = 30 m
Photo aériennes Bing Map : pixel = 1m50



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1. General problematic



Use of free software (i.e. : Qgis)
Continuous training of the staff involved



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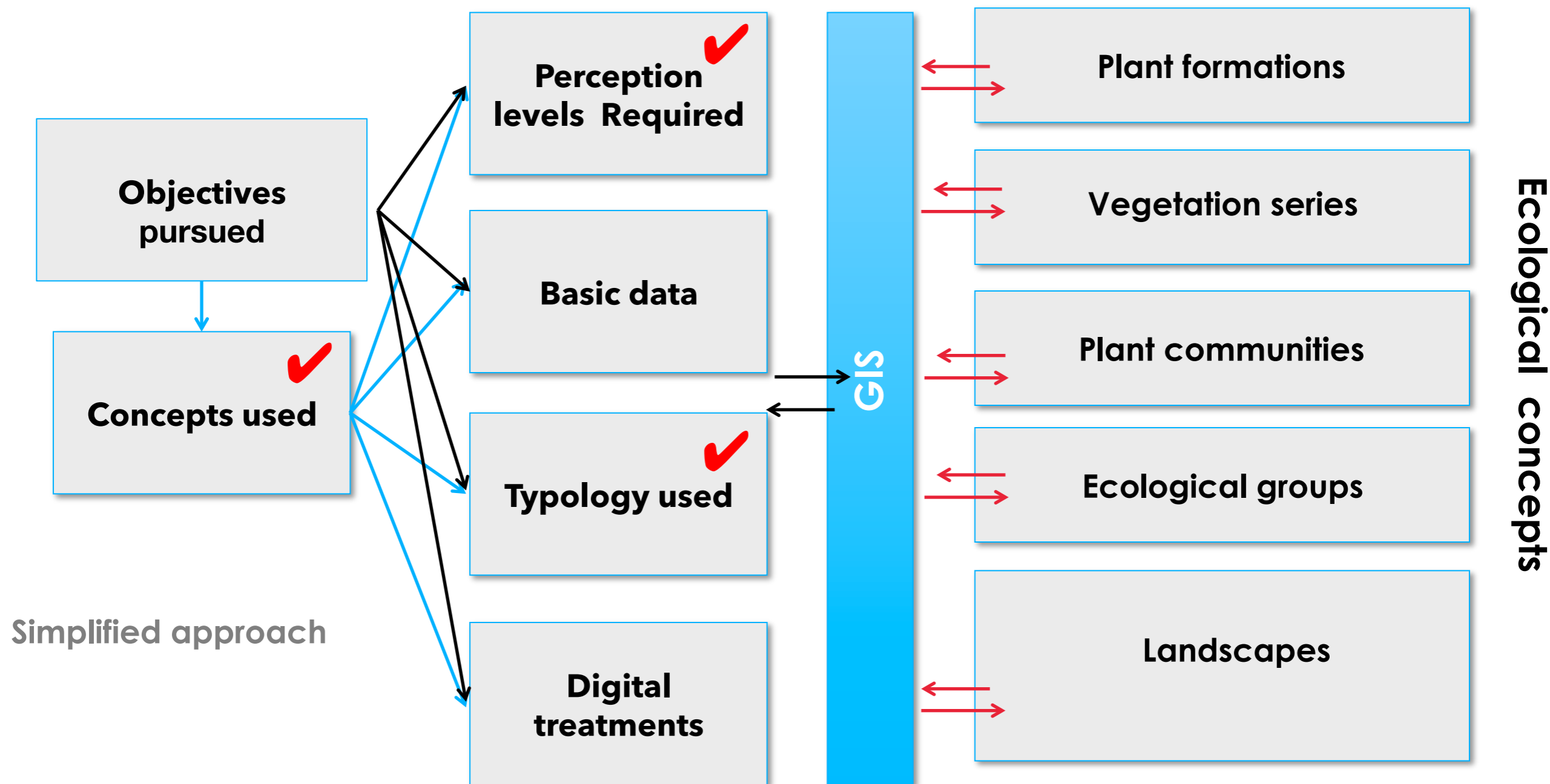
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Habitats mapping
sensu UICN-MED

GIS implementation

1. concepts that might be used



Simplified approach



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3. IPA's : choice of a suitable typology

Habitat remains an unclear and variable concept, characterized by two centuries of evolution and semantic shifts since its appearance in the early nineteenth century ».

Concerning vegetation and according to IUCN, habitats typology should be adapted to the local context. The different habitats (ecosystems s.l.) could easily be described, as proposed by the IUCN, in **terms of vegetation's type** (plant formations) (ie: dense forest, woodland, high matorrals, dense maquis, clear maquis, garrigue, etc.) referring to **horizontal and vertical vegetation structures**.

In addition, it seems essential to associate the names of the **first and second physiognomically dominant species** (ie: High matorral with *Juniperus oxycedrus* and *Stipa tenacissima*, dense forest with *Quercus suber* and *Cytisus triflorus*, etc.), vegetation structure and physiognomically dominant species integrating more than 90% of the information on habitat ecology. To these items, it is **necessary to add unvegetated habitats** (cliffs, bare soils, rocky slopes, urban, etc.).

This **typology** is **more easily understandable and more practical** by scientists, managers, planners and decision-makers.



3. IPA's : choice of a suitable typology



Composite Colour
Phytosociological map

IP/MED / IUCN FICHE DE TERRAIN / FIELD SHEET CODES HABITATS

Classification des habitats d'espèces selon IUCN Habitats (Classification Scheme Version 3.0)

French	English	Code	French
Forêt			
Temperate forest			
Broadleaf deciduous woodland		1.1	Forêt tempérée
Broadleaf evergreen woodland		1.2	Forêt de feuilles caducifolies
Coniferous woodland		1.3	Forêt de feuilles semperviventes
Mixed deciduous and coniferous woodland		1.4	Forêt de conifères
Lines of trees, small anthropogenic woodlands, rewoods (old woodland, early stage woodland and coppice)		1.5	Formations mixtes d'espèces caducifolies et de conifères
Subtropical/Tropical Dry Forest		1.6	Alignements d'arbres, petits bois anthropiques, boisements récemment abanonnés, coudraies denses de boisements et taillis
Savanna			
Savanna			
Dry Savanna		2.1	Savanna sèche
L / Moist Savanna		2.2	Savanna humide
Shrubland			
Temperate Shrubland			
Temperate and Mediterranean montane scrub		3.1	Vegetation arbustive tempérée
Temperate shrub heathland		3.2	Forêts tempérées et méditerranéennes montagnardes
Neotoma-Atlantic sclerophyllous scrub		3.3	Landes arbustives tempérées
Macchia and low scrub		3.4	Forêt de la Méditerranée atlantique (Neotoma-Atlantique sclerophyllous scrub)
Madagascar		3.5	Forêts épineuses et des bas-monts
Shrub plantations		3.6	Mars
Subtropical/Tropical Dry Shrubland		3.7	Plantations d'arbustes
Subtropical/Tropical Moist Shrubland		3.8	Vegetation arbustive sèche tropicale ou subtropicale
Subtropical/Tropical high altitude Shrubland		3.9	Vegetation arbustive humide tropicale ou subtropicale
Mediterranean type Shrubby vegetation		3.10	Vegetation arbustive de haute altitude tropicale ou subtropicale
Steppe, antonometric natural and Neotoma Mediterranean		4.1	Vegetation arbustive de type méditerranéen
Steppe		4.2	Steppes, steppes antonometric et Neotoma-Méditerranéennes
Steppe		4.3	Méditerranéennes
Savanna		4.4	Steppes
Savanna		4.5	Landes épineuses méditerranéennes (épineuses, landes atlantiques et végétation oppositifolia des steppes ibériques)
Grassland			
Temperate Grassland			
Dry grassland		4.6	Forêts tempérées
Wet grassland		4.7	Forêts sèches
Seasonally wet and wet grasslands		4.8	Forêts humides et grasslands humides antonometric
Alpine and subalpine grasslands		4.9	Forêts alpines et subalpines
Woodland fringes and clearings and tall herb meads		4.10	Forêts, steppes ibériques et groupements de grandes herbues non-gambouzes
Wet tall herb meads		4.11	Steppes sèches continentales
Seasonally wet tall herb meads		4.12	Forêts peu herbives
Subtropical/Tropical Dry Lowland Grassland		4.13	Forêts sèches tropicales ou subtropicales de basse altitude
Subtropical/Tropical Seasonally Wet/Proximal Lowland Grassland		4.14	Forêts tropicales ou subtropicales de basse altitude saisonnièrement humides ou humides
Subtropical/Tropical high altitude Grassland		4.15	Forêts tropicales ou subtropicales de haute altitude
Wetlands (Inland)			
Permanent River, Streams, Creeks (includes waterfalls)			
		5.1	Rivières, cours d'eau, rivières permanentes (y compris cascades)
Seasonal/Intermittent/Irrigated River, Streams, Creeks		5.2	Rivières, cours d'eau et rivières saisonnières, intermittentes ou irriguées
Shrub Dominated Wetlands		5.3	Forêts humides arbustives
Bogs, Marshes, Swamps, Fens, Peatlands (generally over 1 ha)		5.4	Tourbières, marais, marais (généralement plus de 1 ha)
Permanent freshwater lakes (over 1 ha)		5.5	Lacs d'eau douce permanents (plus de 1 ha)
Seasonal/Intermittent freshwater lakes (over 1 ha)		5.6	Lacs d'eau douce saisonniers/intermittents (plus de 1 ha)
Permanent freshwater marshes/Peaks (under 1 ha)		5.7	Marais/étangs permanents d'eau douce (moins de 1 ha)
Seasonal/Intermittent freshwater Marshes/Peaks (under 1 ha)		5.8	Marais/étangs saisonniers/intermittents d'eau douce (moins de 1 ha)



IUCN habitats codes

Sentinel2 Copernicus Data
S2B_MSIL1C_20181007T103019_N0206_R108_T31SDA_20181007T160704.SAFE-



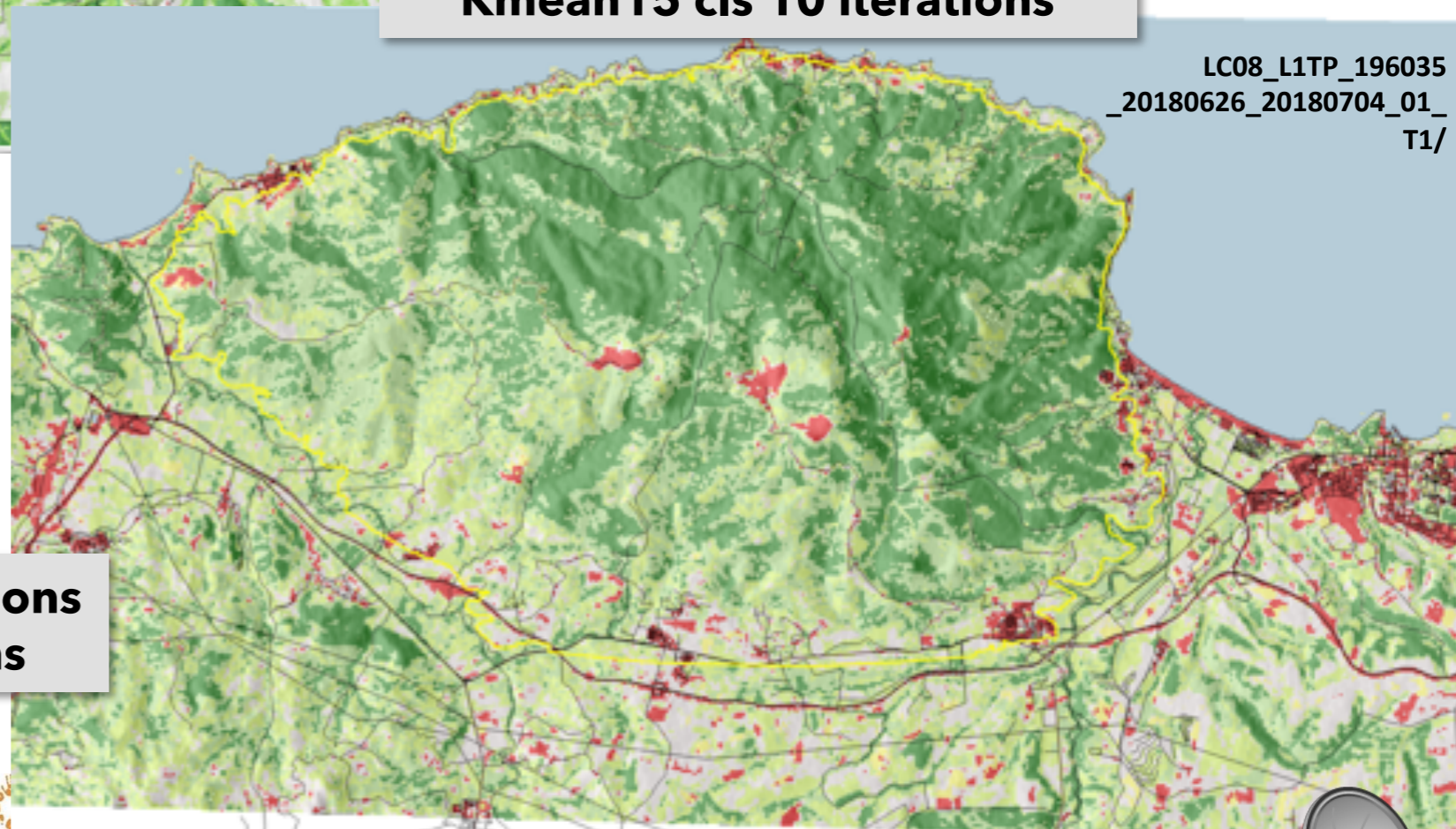
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4. IPAs diachronic study



1987

5 items of land cover



2018

Non Supervised Classifications
Kmean15 cls 10 iterations

Non Supervised Classifications
Kmean15 cls 10 iterations



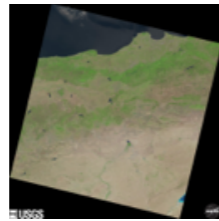
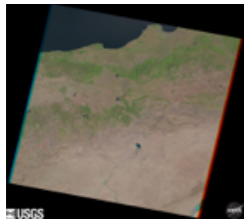
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Multitemporal Satellite Data

LT05_L1TP_196035_
19870621_20170212
_01_T1

LC08_L1TP_196035
_20180626_20180704_01_
T1/



Extracted Data

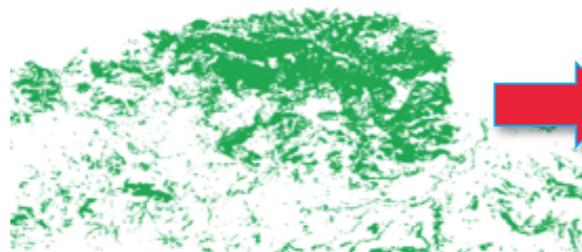
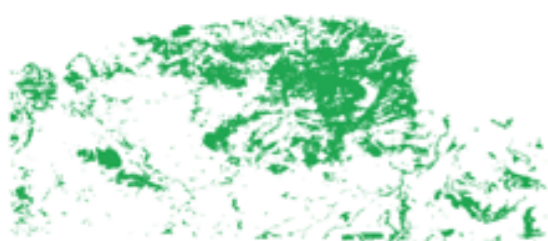
**Non Supervised Classifications
Kmean15 cls 10 iterations**



1987

5 classes of land cover 2018

Extraction of the classe « dense forests »

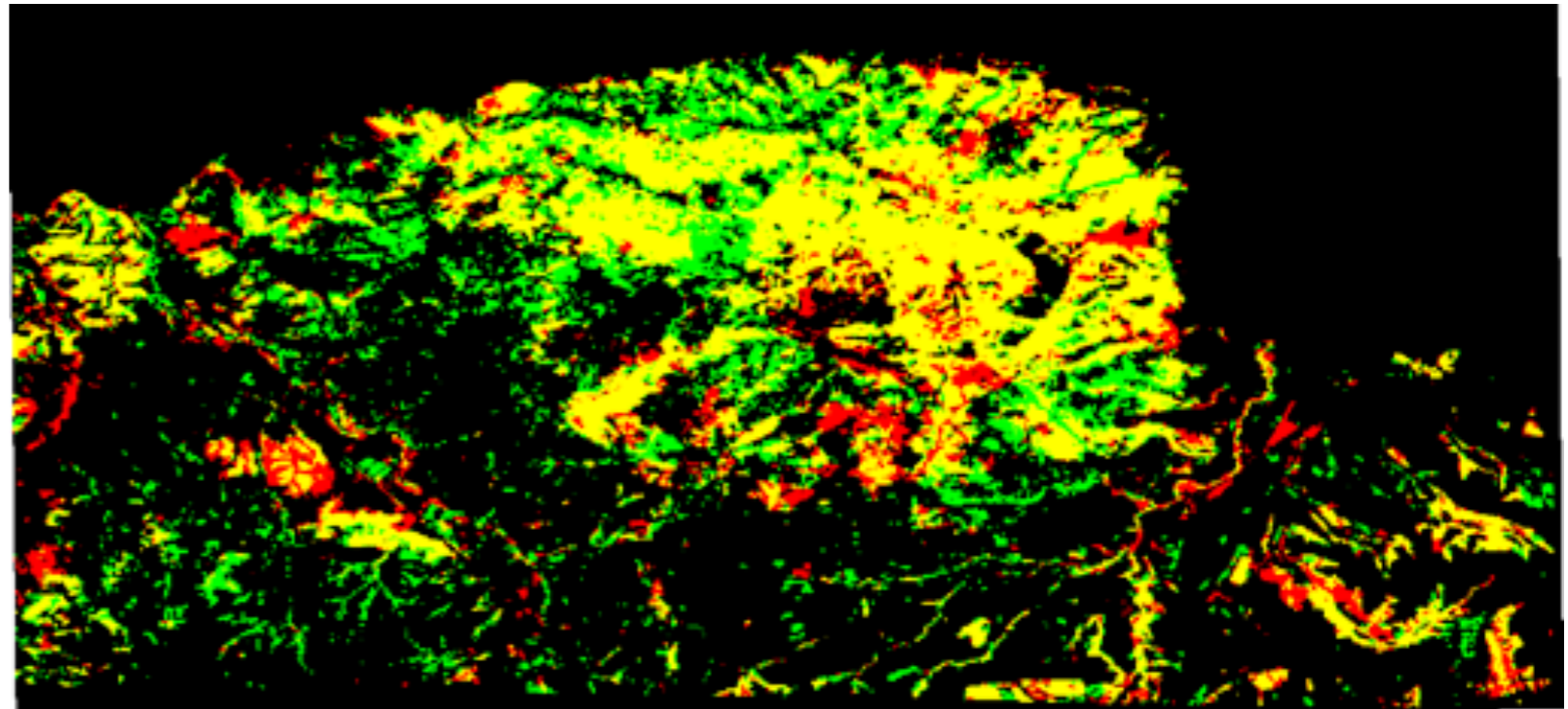


Combination of the two classified images



In red : situation in 1987
In green : situation in 2018
In Yellow : unchanged

Change Map



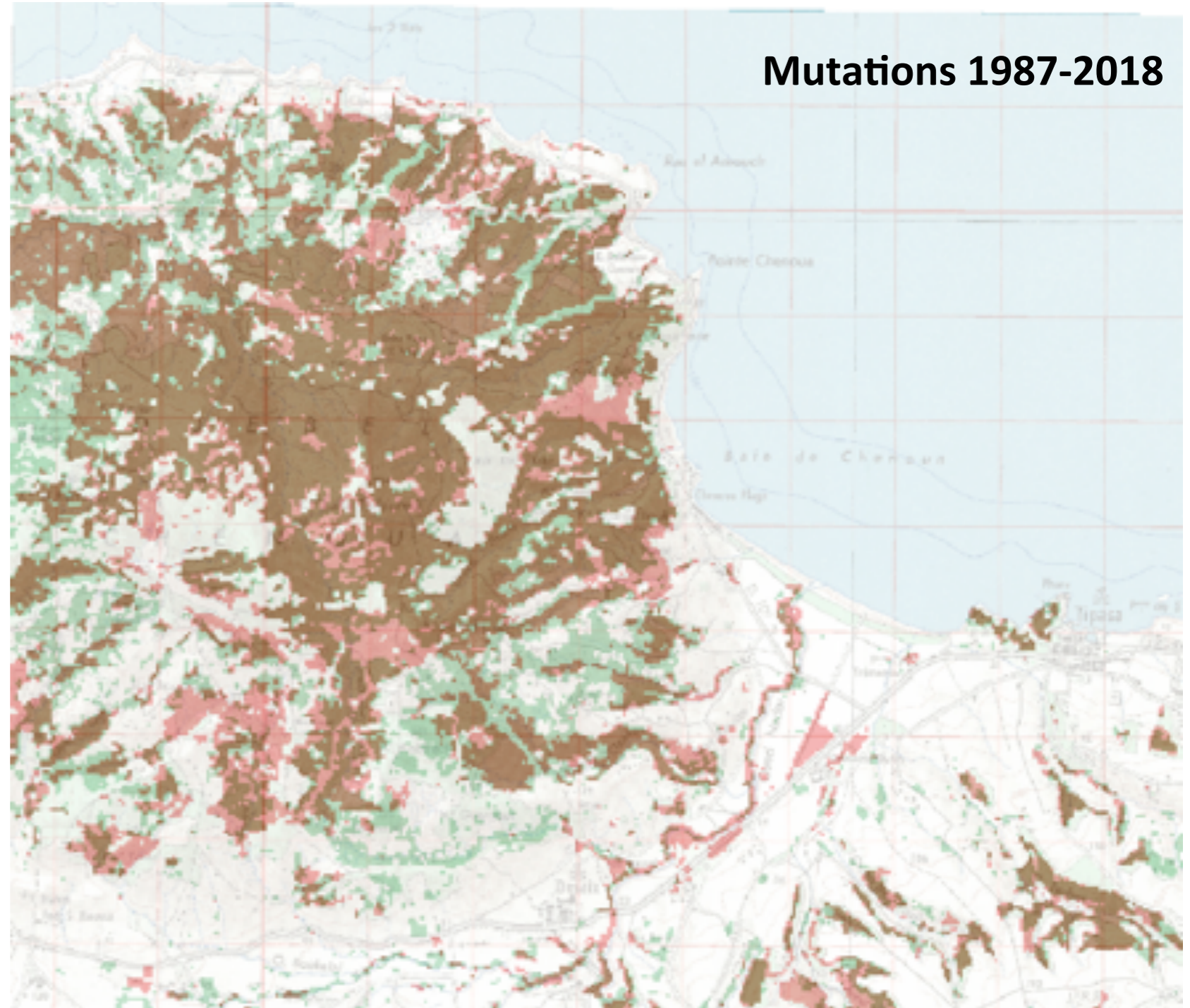
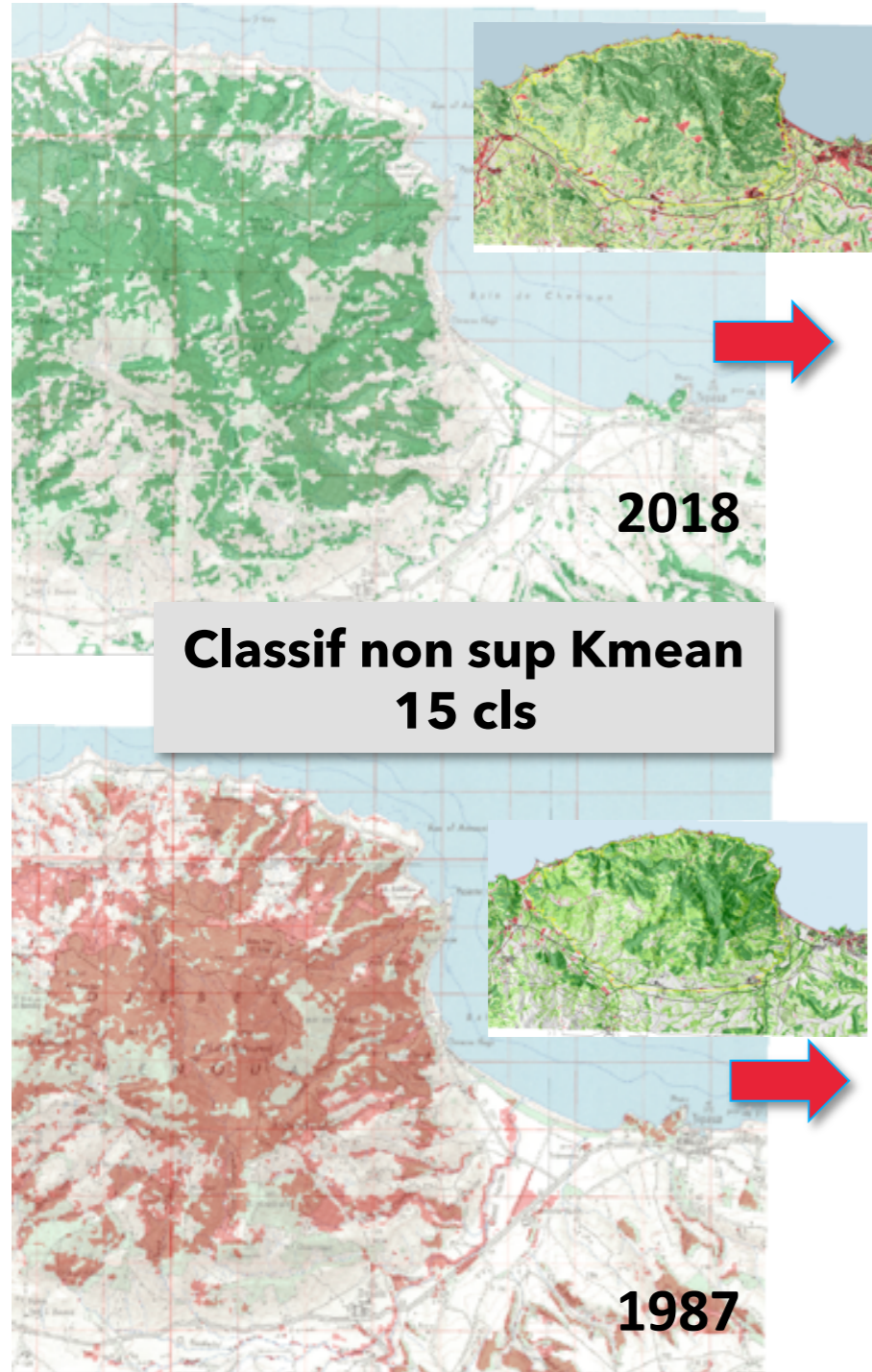
4. IPAs diachronic study



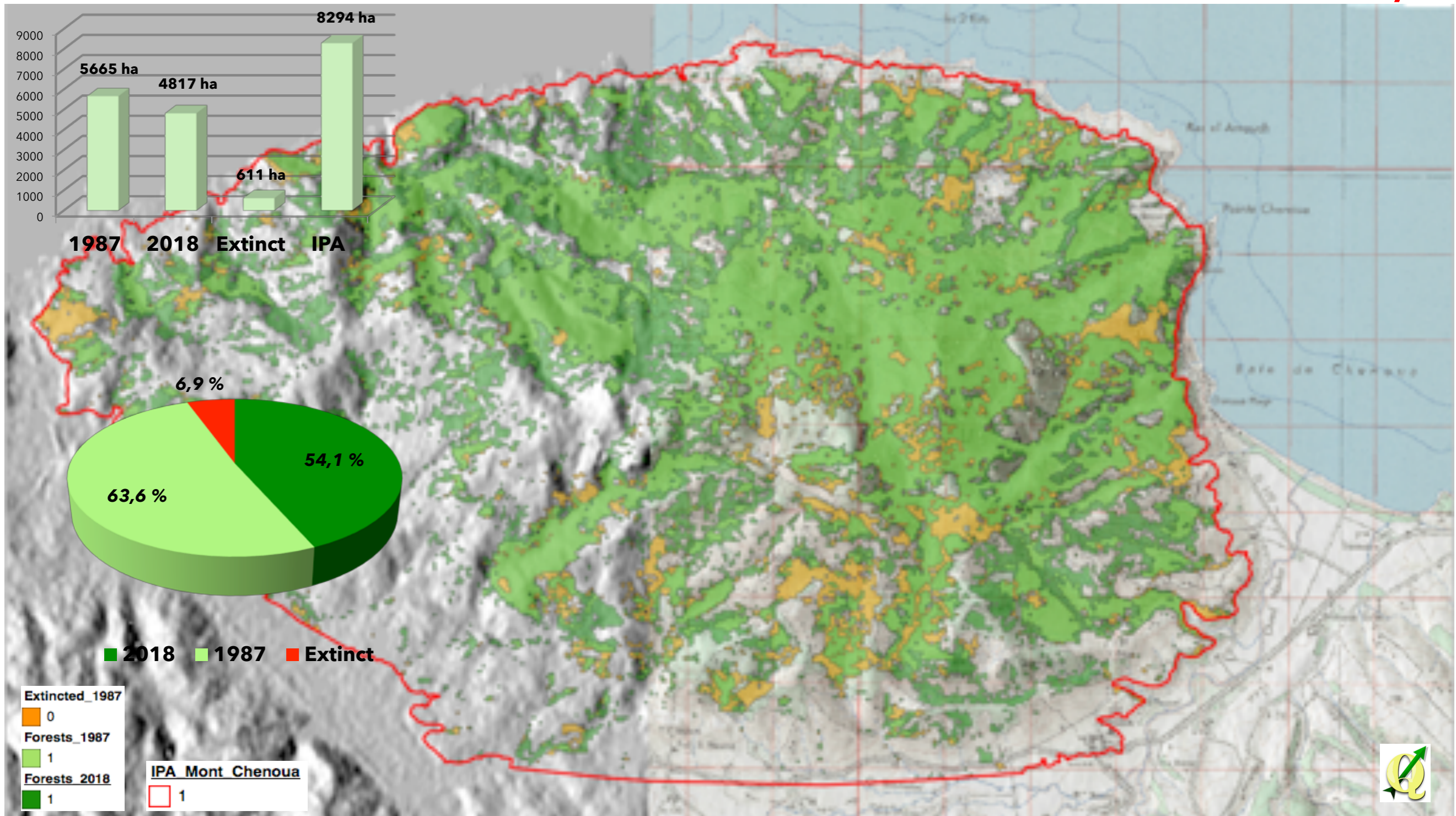
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4. IPAs diachronic study

Dense forests theme



4. IPAs diachronic study



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Conclusions

Some reflexions

Natural habitats mapping within IPAs should be based on:

- a perfect mastery of the **concepts used in ecology**;
- the **degree of resolution of the GIS** ;
- Habitat mapping could be a **land cover mapping** (i.e. vertical and horizontal structure, type of plant formation (forest, maquis), with the first and second physiognomically dominant species which are discriminating to characterize the habitats.
- the choice of a **same typology for all IPAs** at the **national and regional levels** ;

A **Regional discussion** seems essential on the typology adopted to describe the habitats as well as a **systematic interdisciplinary concertation** between **scientists and managers**.



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«The **typology of habitats** must be undertaken as soon as possible in response to an important **national and regional need**. It is a long-term project which requires **collaboration of different partners, especially researchers and managers** ».

FENNANE M. 2006, Bulletin de l'Institut Scientifique, section Sciences de la Vie, 2006, n°28, 1-5.



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