Assessing the vulnerability of Mediterranean forests to climate change by using free tools: the case of pilot sites in North African and Near-East countries

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Introduction

The multifunctionality of Mediterranean forest ecosystems has long been known. Mediterranean forests are the core of multiple environmental, social and economic practices which include *e.g.* wood and non-wood products, picking, grazing, tourism. However, increasing anthropogenic pressures and climate change are responsible for degradation of forest ecosystems and consequently for the risk of a reduction in the provision of goods and services.

The need to enhance sustainable forest management practices in the Mediterranean region is strictly related to the need of assessing the vulnerability of those specific ecosystems to climate change.

Objective

The objective of the analysis was to identify the effects of global changes on the forest cover in the pilot sites in collaboration with local and international experts.
The methodology promotes:
- ✓ the capacity building of national experts
- ✓ the use of free data and software

Düzlerçamı Forest
Maâmora Forest
Siliana Forest
Senalba Forest
Jabal Moussa Reserve Biosphere

The analysis produces three main kind of information:

1. cartographic material to estimate land-use changes and forest cover changes in the pilot sites by using tools developed by the Flemish Institute for Technological Research

2. vulnerability maps produced using the multifactorial spatial approach developed by the *Gesellschaft fur Internationale Zusammenarbeit* (GIZ) for the project "Supporting implementation of the United Nations Framework Convention on Climate Change (UNFCCC)" (CCC/GIZ project) implemented in Tunisia

3. climatic data and climatic projections according to the IPCC Fifth Assessment Report

Forest cover changes (2000-2010) Senalba Forest (Algeria)

2000

Forêt Dense
Forêt Claire
Maquis
parcours
Reboisement

2005

2010

0 2 4 8 12 Km
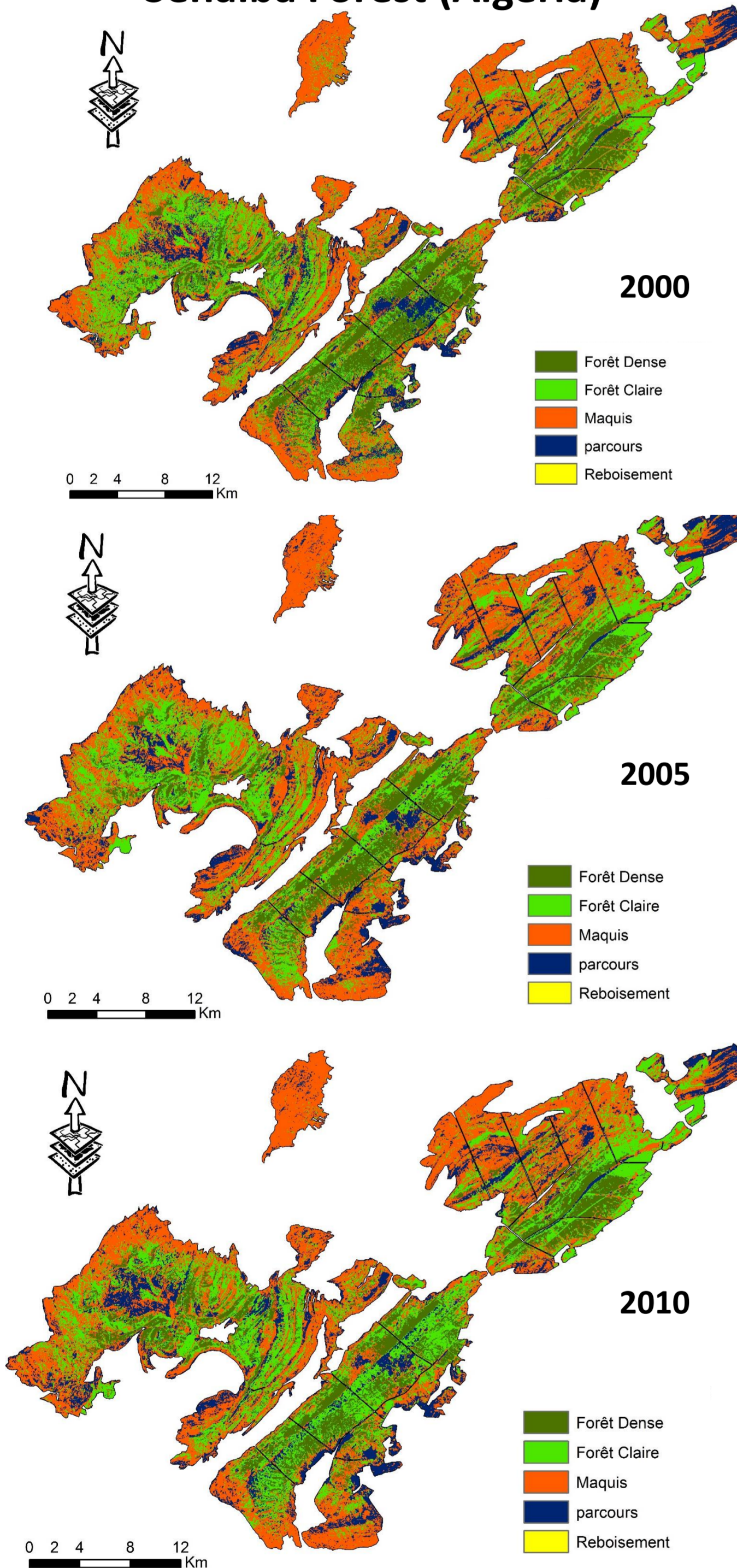
An automatic composite step then combines the selected Landsat images to create a single cloud free data set for each reference year (1990, 2000, 2005 and 2010). In addition to the reflectance bands available for Landsat, the normalized difference vegetation index is calculated and used as input for the land cover (change) classification.

### Vulnerability of Maâmora forest ecosystem (Morocco) to climate change (2010)
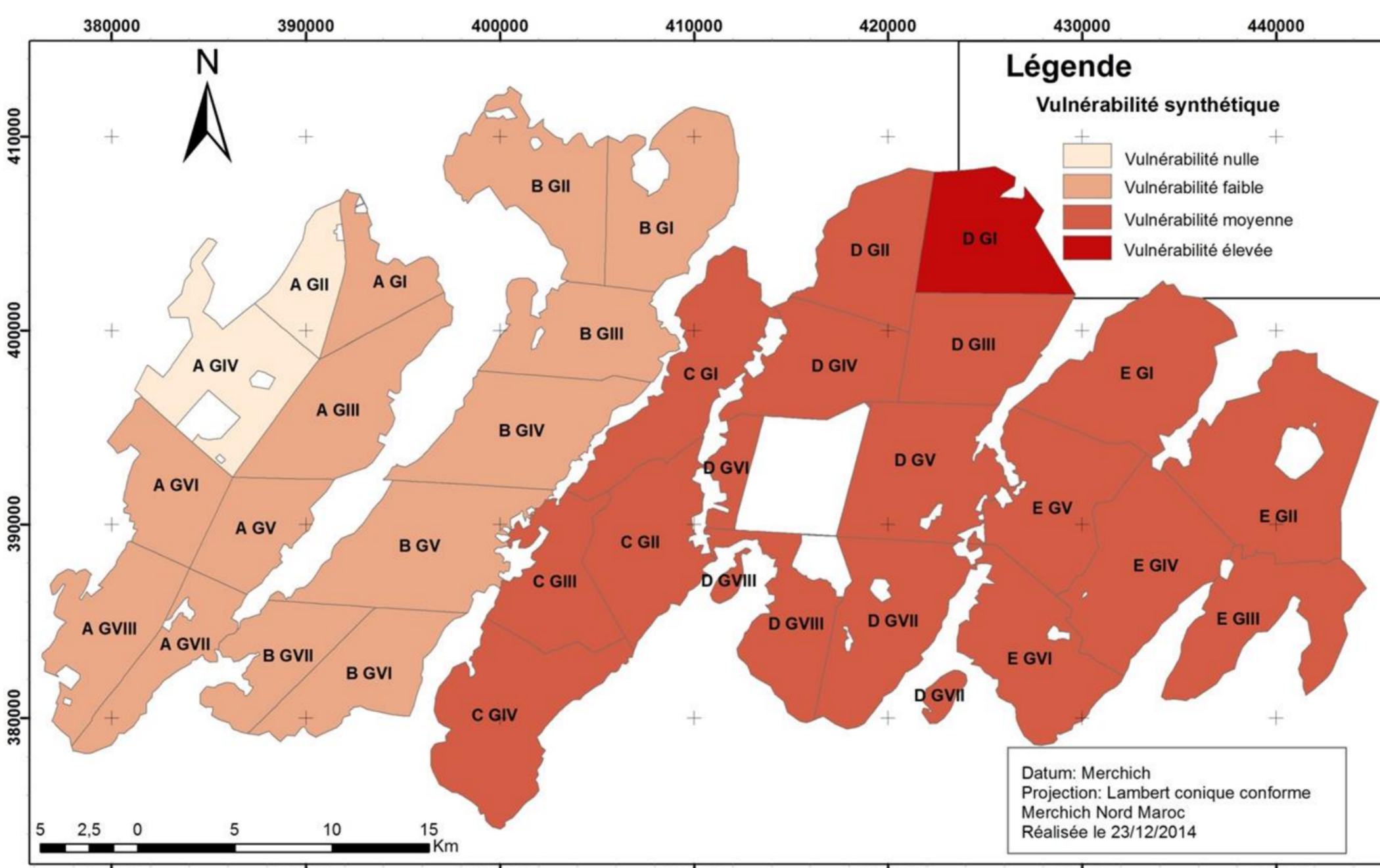
The methodology developed by GIZ is a multifactorial spatial analysis that takes into account the complexity of the forest ecosystem by evaluating different factors that characterize it:

- ✓ biophysical,
- ✓ climatic
- ✓ anthropogenic factors.

Vulnerability of Senalba Forest (Tunisia) to climate change (current and future projection)

Future vulnerability is estimated by applying IPCC models RCP 4.5 (optimistic) and RCP 8.5 (pessimistic) (IPCC, 2013) to the horizons 2016-2036 and 2046-2065 in order to evaluate future dynamics in the vulnerability of the forest cover to the selected biophysical, climatic and anthropogenic factors.

Year 2000

Horizon 2016-2035 RCP 4.5
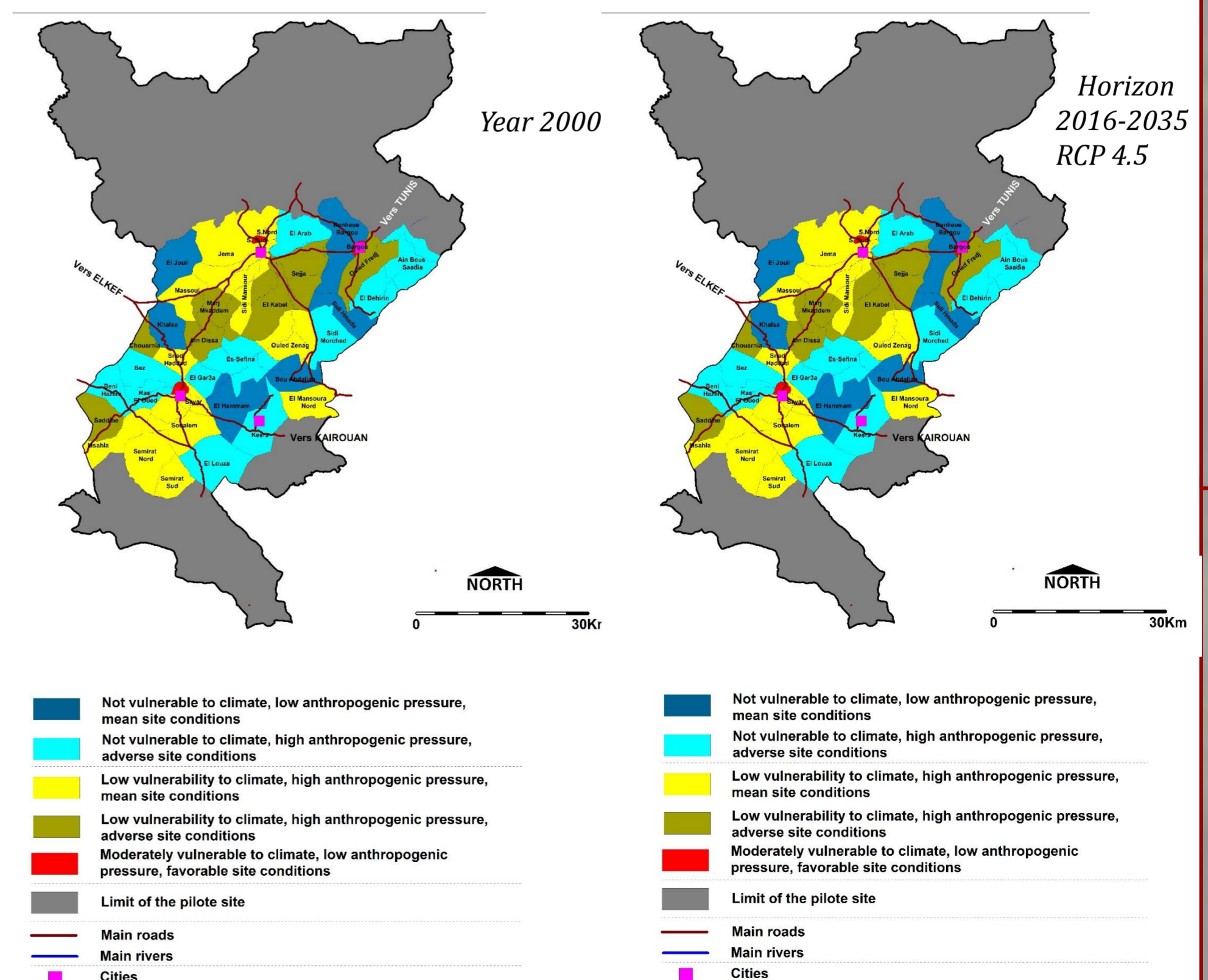
Conclusion

The combination of different tools and methodologies contributed in the creation of a **flexible approach** that can be **adapted to different forest ecosystems**, depending on the available information and on the factors that most influence the forest cover distribution.

The presented methodology based on free data and tools to is a starting point that creates a useful database for elaborating proposals and supporting decision making with regard to adaptive management of Mediterranean forest ecosystems.