Foresight approach and Forest adaptation strategies to climate change: a regional case

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ALIMENTATION
AGRICULTURE
ENVIRONNEMENT

contents

I- Introduction and methodology

Foresight study to prepare the future of Landes of Gascony

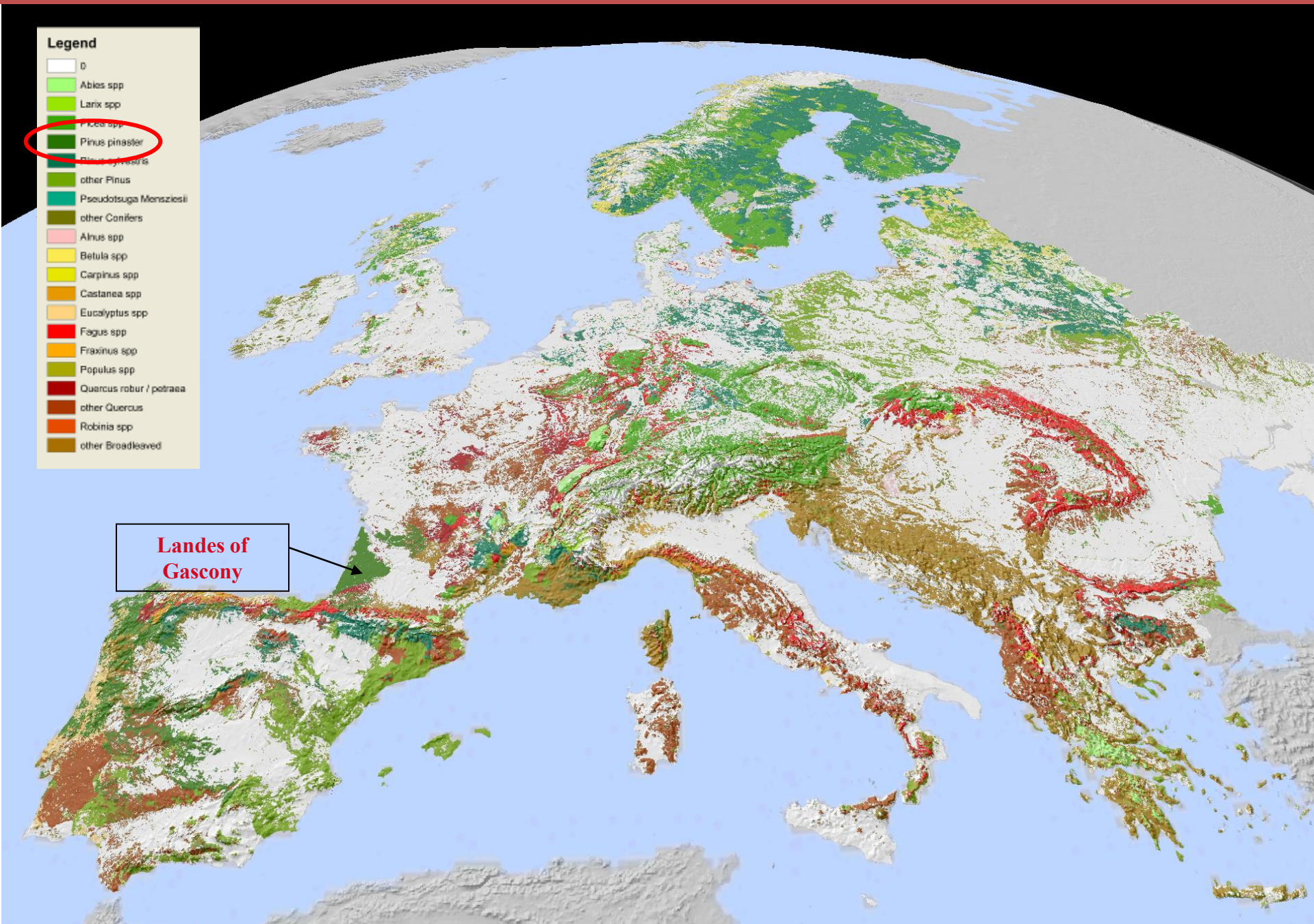
Diagnostic « Forests under threats in a changing territory »

- ➔ Destructive storms (1999, 2009), increasing biotic risks (2010-2011)
- ➔ Demographic pressure and economic changes
- ➔ Land-use conflicts (infrastructures, solar farms, urban planning…)

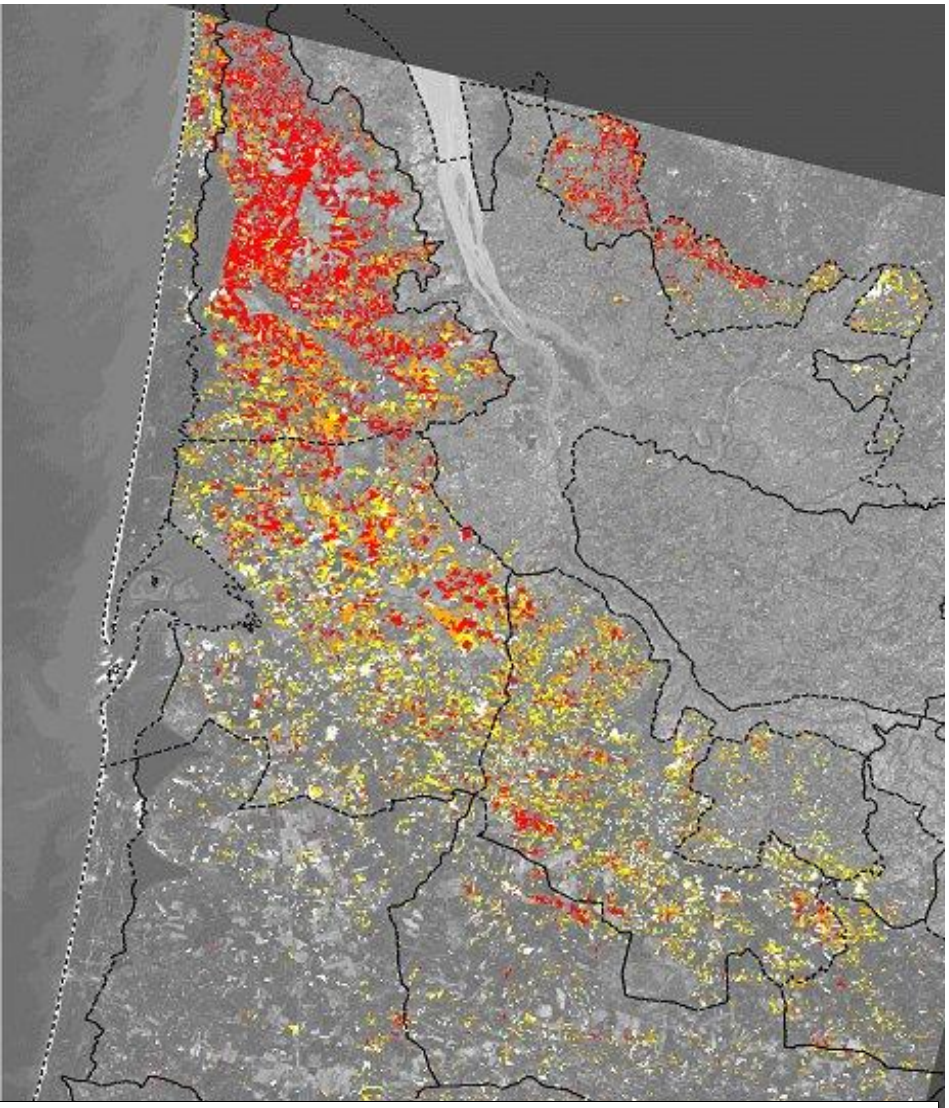
Objectives:

- ➔ support public policies for forestry sector (Regional Council)
- ➔ development of methods and tools for adaptation of rural territories to CC (INRA)

high resolution - tree species map of European forests



DECEMBRE 1999 STORM -Aquitaine

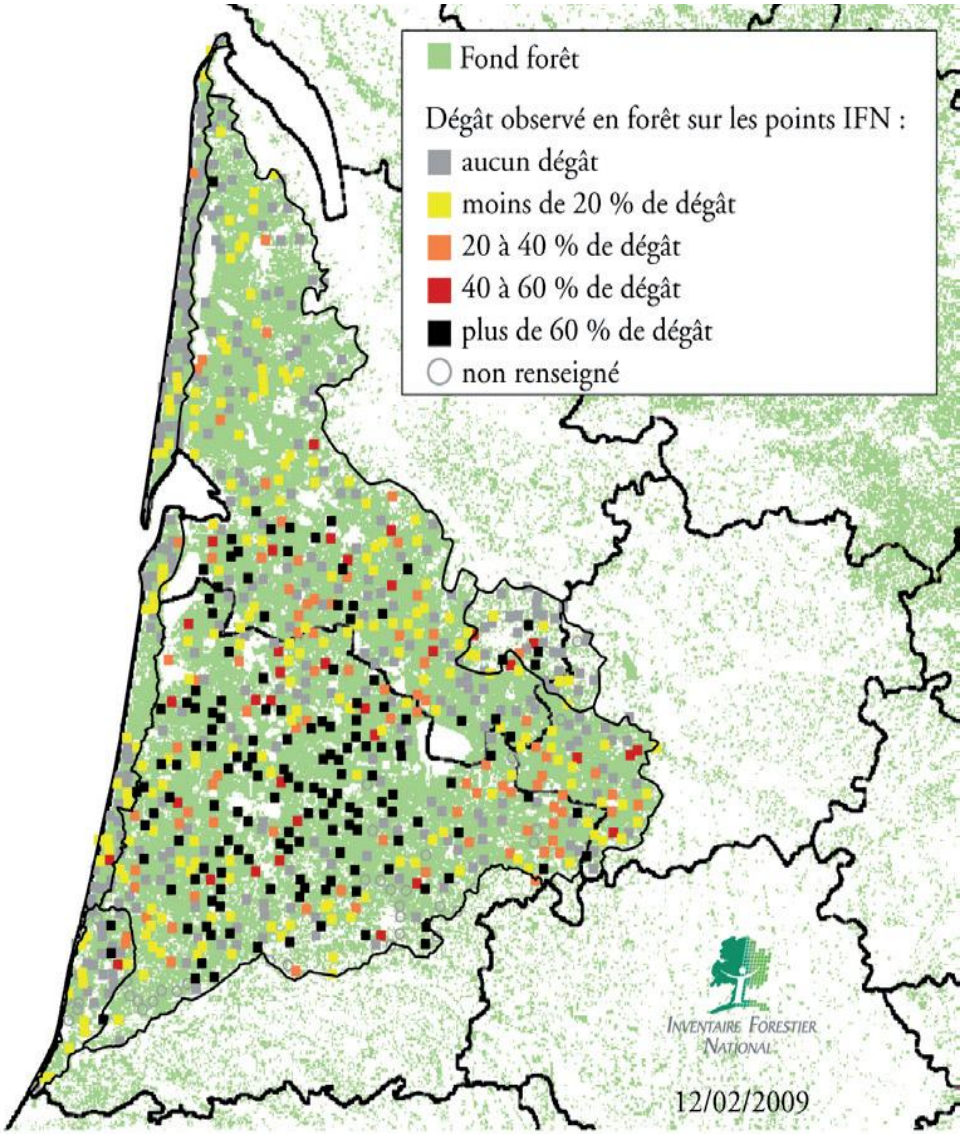


Intensité des dégâts

0 à 20% | 20 à 40% | 40 à 60%

60 à 80% | 80 à 100%

JANUARY 2009 STORM



Massif des Landes de Gascogne

État d'avancement de l'évaluation des dégâts en forêt au 12 février 2009 par retour sur les points IFN des quatre dernières campagnes d'inventaire.

Foresight methodology & elaboration of scenarios

- Foresight scenarios are **not predictions or projections, but debating tools** to**:**
  - ✓ consider the plurality of possible futures
  - ✓ anticipate evolutions and abrupt changes
  - ✓ identify key points for action

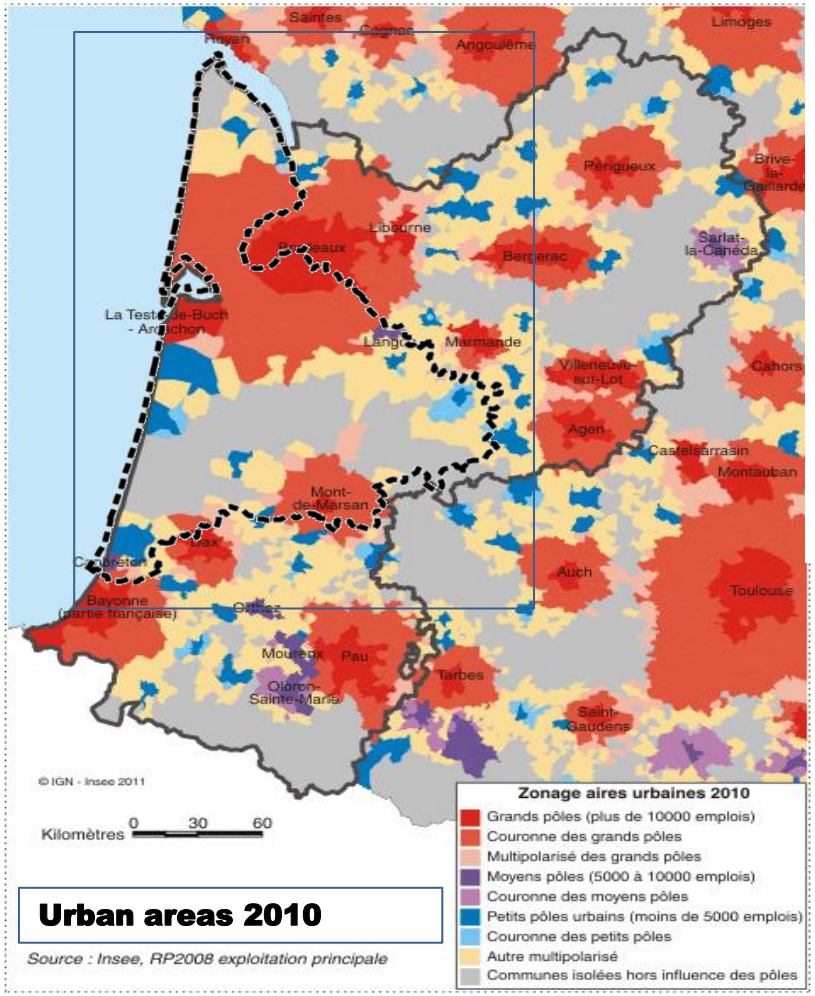
- Collective approach combining diverse view points to generate **contrasted futures:**
  - ✓ mutlidisciplinary expert group (20 people)
  - ✓ stakeholders interviews (200)
  - ✓ territorial forums (5)

- 3 key issues in the scenarios for Landes of Gascony:
  - ✓ climate change
  - ✓ transformation of the territories
  - ✓ evolutions of the forestry sector

→ **Time horizon: 2050**

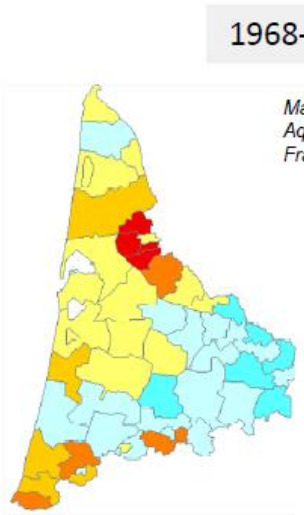
II- Context and trends

Landes of Gascony territorial context

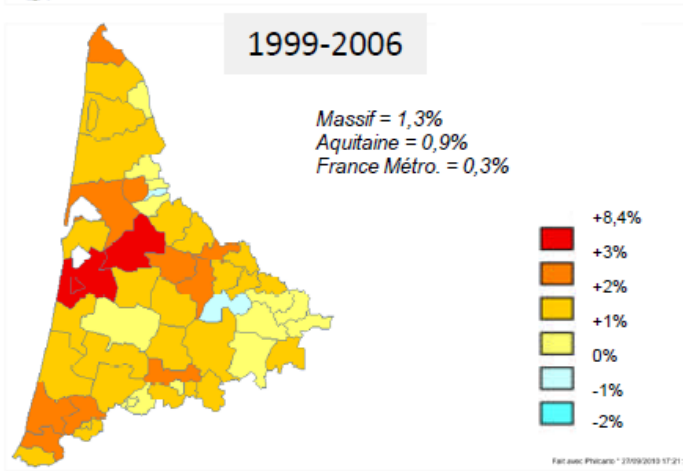


Urban areas 2010

Source : Insee, RP2008 exploitation principale



a population growth in all types of areas (rural and peri-urban)



Annual **population variation rate** due to the net **migration** rate between 1968-1975 and 1999-2006 (% by *canton; Bergouignan, 2011)*

Biogeographic subregion of Aquitaine

→ Area of 1 463 670 hectares (# Flandres region or Koweit), 386 communes

→ **Land-use**: 63 % forest, 18% agriculture, 7% urban, 9% water and others (2009)

→ **Demography**: 839.207 inhabitants (2006) => 60 % increase in 40 years,

=> 43% of the municipalities are located in urban spaces (red, yellow, and blue)

Forests and Forest-based sector

Context

➢Traditional long rotation maritime Pine production

➢ Strong complementarities between local industries for resource sharing

➢High rate of private owners (>90%)

Source: CRPF Aquitaine

Maritime Pine attacked by bark beetle (Source: Sud-Ouest)

Current issues

➢High vulnerability of a monospecific forest to climate events and pests and diseases

➢Increase of tensions between forest-based sectors stakehholders

➢ Uncertainties about private owners strategies

Trends

➢Developement of multiple functions for forests

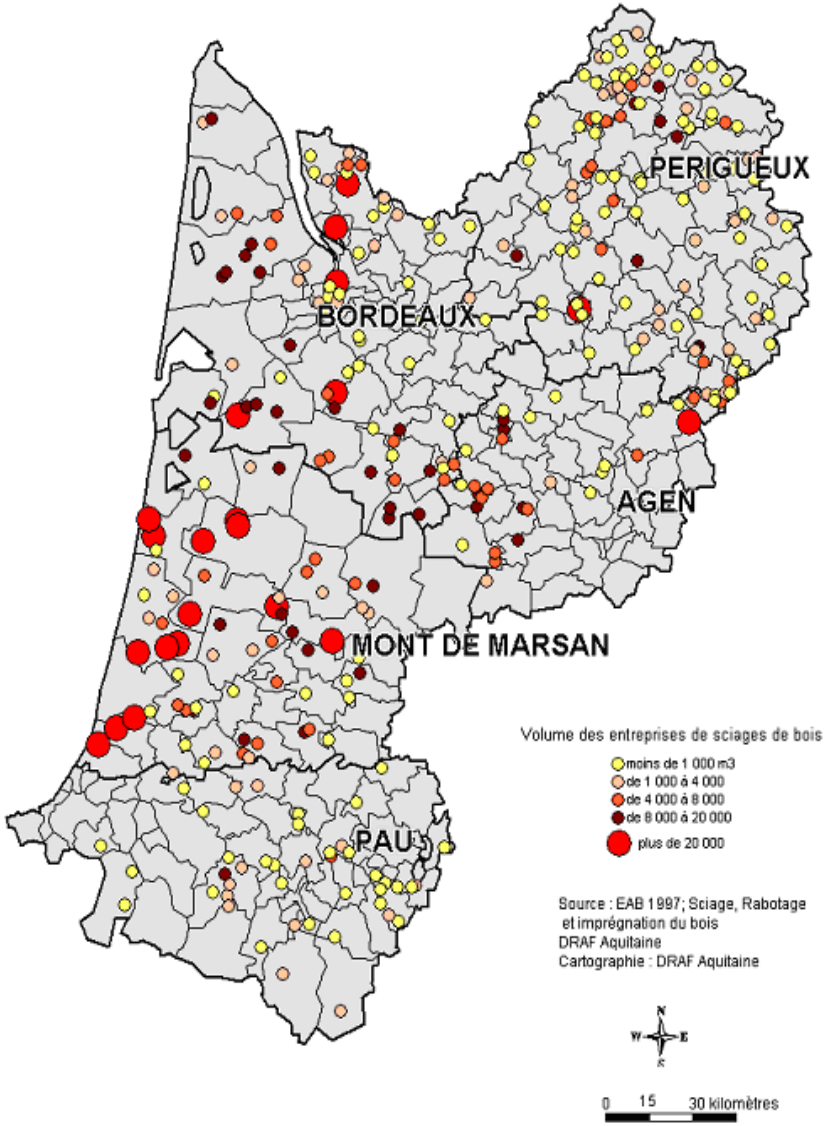
➢ Increase of climate change and carbon storage concerns

➢ Development of local forest policies

Local debates about forest, forest-based sector and territories (Source:PQA)

WOOD INDUSTRY

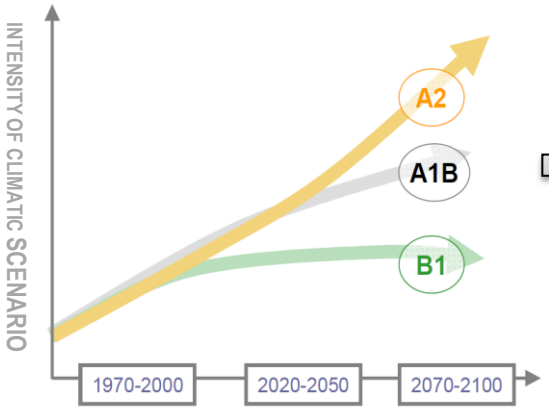
MAP OF TIMBER ENTERPRISES



Impacts of climate change

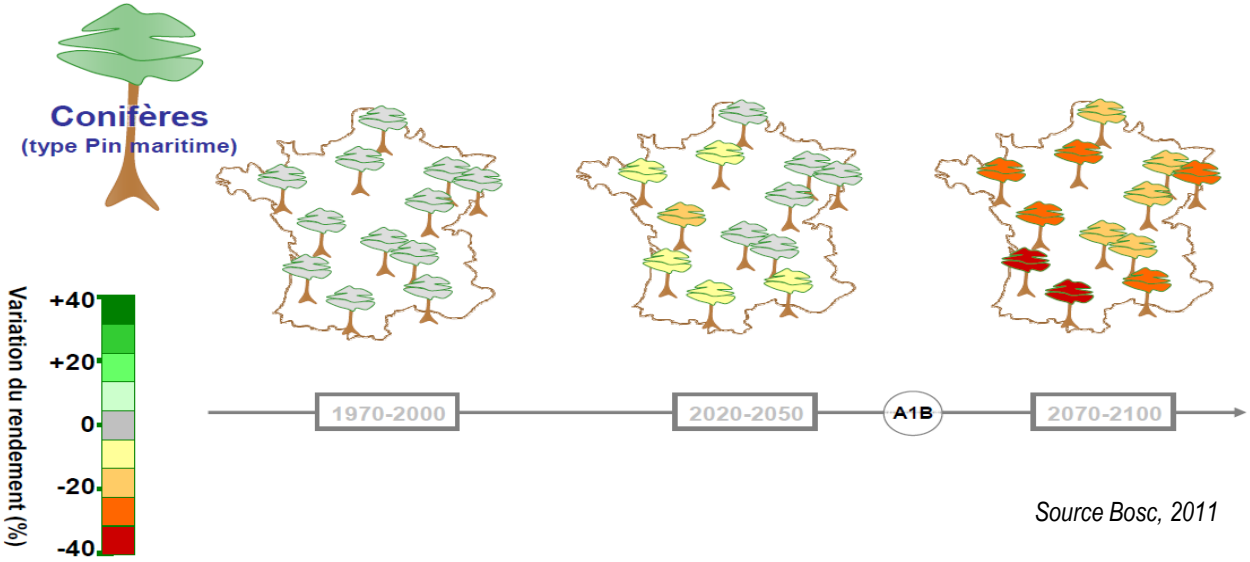
***Droughts**: increase of average temperatures, decrease of annual rainfall, increase of water deficit (Climator, 2010 & rapport Jouzel, 2011)*

3 climatic scenarios considered in Climator (Source Bosc, 2011)



Scenario A1B	2020-2050	2070-2100
Temperatures	+1,44 °C	+2,83°C
Mean Rainfall	-73 to -146 mm	-182 to -219 mm

***Impacts on productivity of maritime pine:** – 20 to 40 % after 2050 (Climator, 2010)*



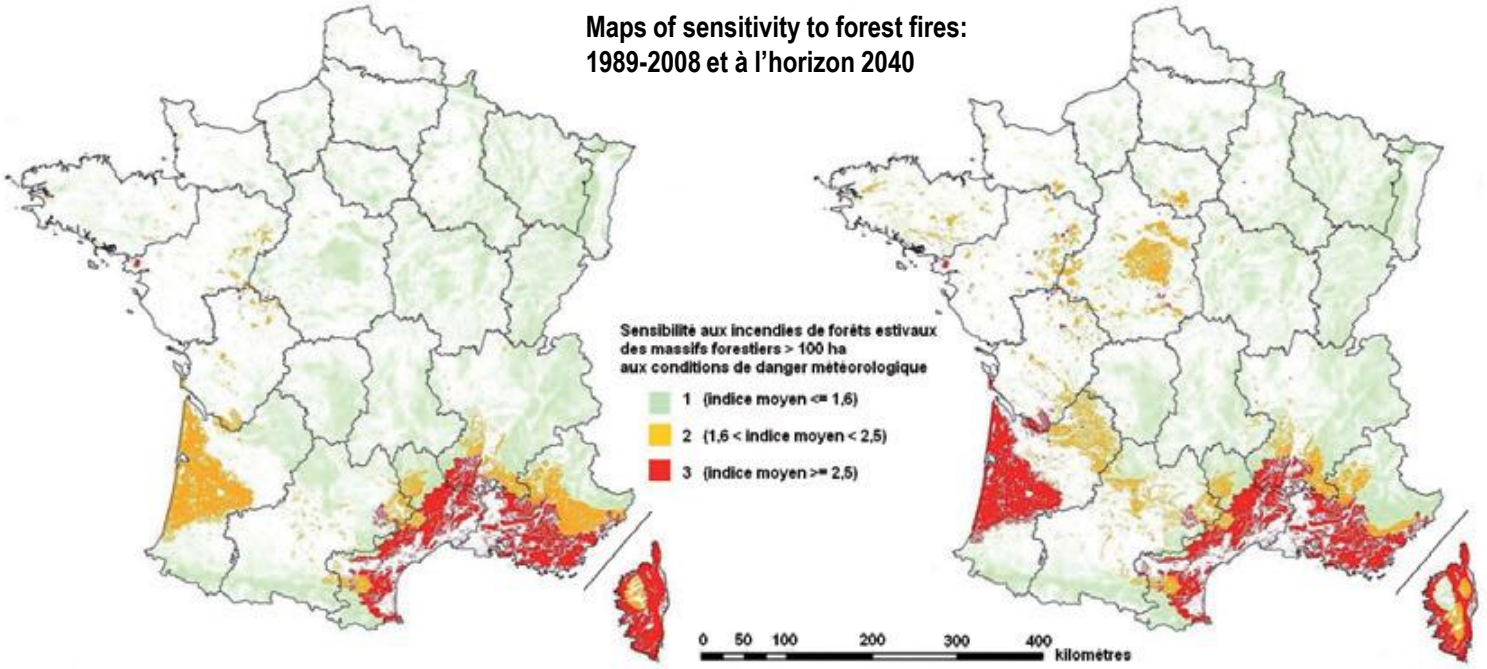
Evolution of maritime pine productivity in France based on GRAECO model and regionalisation method type tps, under scénario climatique A1B

Source Bosc, 2011

Climate change

→ **Forest fires:** increase of sensitivity to summer fires in 2040 (Rapport interministériel, 2010)

Maps of sensitivity to forest fires:
1989-2008 et à l'horizon 2040



Source : rapport de la mission interministérielle « Changement climatique et extension des zones sensibles aux feux de forêt », 2010

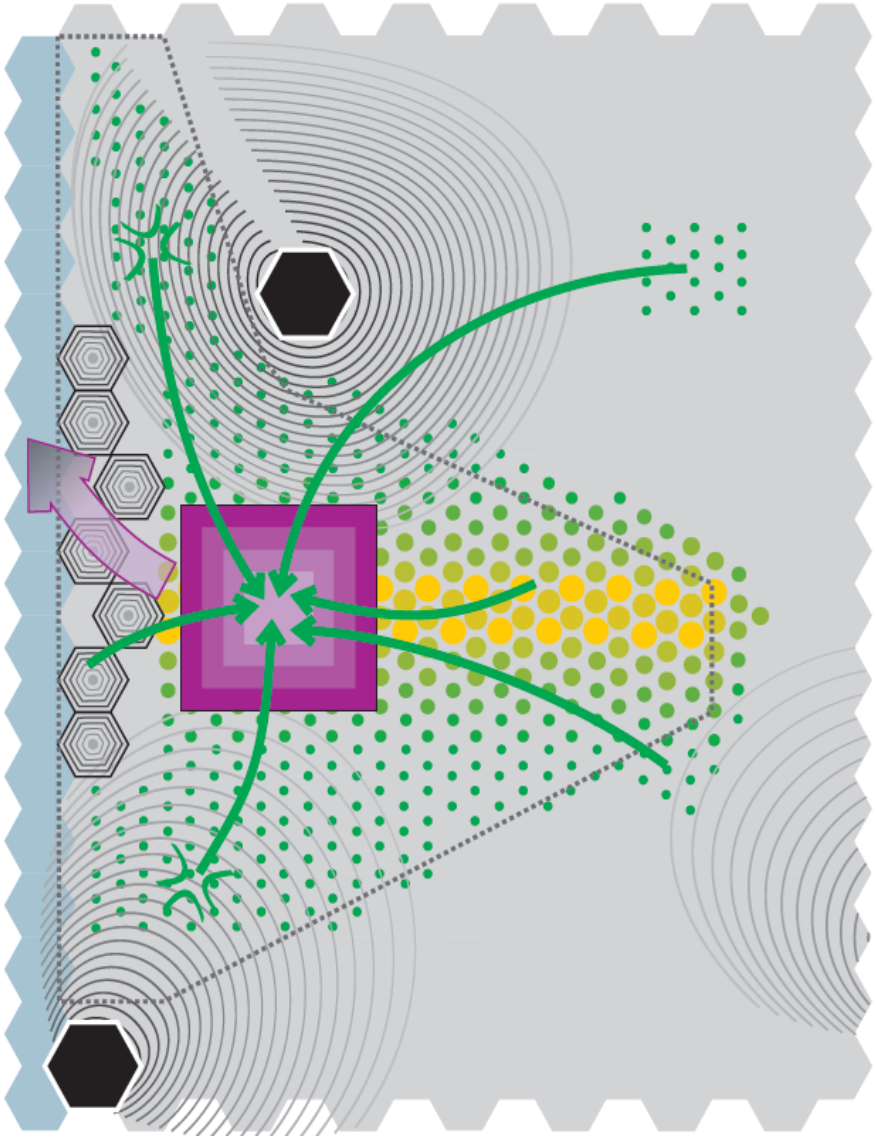
→ Sensitivity of South-West in 2040 = sensitivity of South-East today

III- Foresight scenarios

Components	Hypothesis of evolution at 2050			
1. Mobilities and Urbanization	Diffuse urbanization around metropolis and along the coast	Attractivity of rural and coastal areas	Densification of metropolitan areas and urban hospitality	Network of cities and market towns
2. Dynamics of economic activities	Residential economy with migrant and alternating workforce	Residential attractivity of rural-coastal areas, economic engine for innovation	low density areas dedicated to productive activities	Territories combining residential economy and productive activities
3. Wood chain	concentration of activities around biomass and cellulose production for energy&chemistry sectors	creation of added-value through innovative SMEs and reorganisation of the wood sector	forest and wood sector serving the euroregion for energy, construction, and ecosystem services	Diversification of wood products for local needs and exports
4. Forests	Intensive forest management alternatives for dendrobiomass production	adaptation and protection of maritime pine forests with broadleaves in edges and islands	forest planning with segregation of functions for ecosystem services, wood production and recreation	Patchwork of diversified forests and landscapes with open areas
5. Agriculture and agro-industries	Concentration of agricultural enterprises and agro-ressources industries	Interdependance of agriculture and industries for development of quality	Agriculture dedicated to euroregion needs (energy, food)	Territorial agricultural systems and diversified value chains
6. Natural resources management and land-use planning	artificialization of soils and competing uses of natural resources	natural and cultural heritage in coastal and rural areas	environmental zoning for resource protection and land-use planning	integrated ecosystem management and land-use planning
7. Governance and territorial organisations	Metropolitan power served by their hinterlands	Public/private partnership and contract between territories	Euro-region planification in synergy with metropolis	Territorial fora and regional coordination
SCENARIOS	**Opportunities and laissez-faire**	**Attractivity and quality**	**Euroregion and self-sufficiency**	**Patchwork and diversity**

Scenario 1 : Opportunities and « laissez-faire »

pursuit of peri-urbanisation and lack of coordination between actors



Metropolitan pole

Urbanization spread around metropolis

Scattered coastal urbanization

Mobilisation of bioresources

Tensions on land resources

Concentration of biomass industries

Export of products on international markets

Dendrobiomass production forests

FORESTS & FORESTRY SECTOR in SCENARIO 1

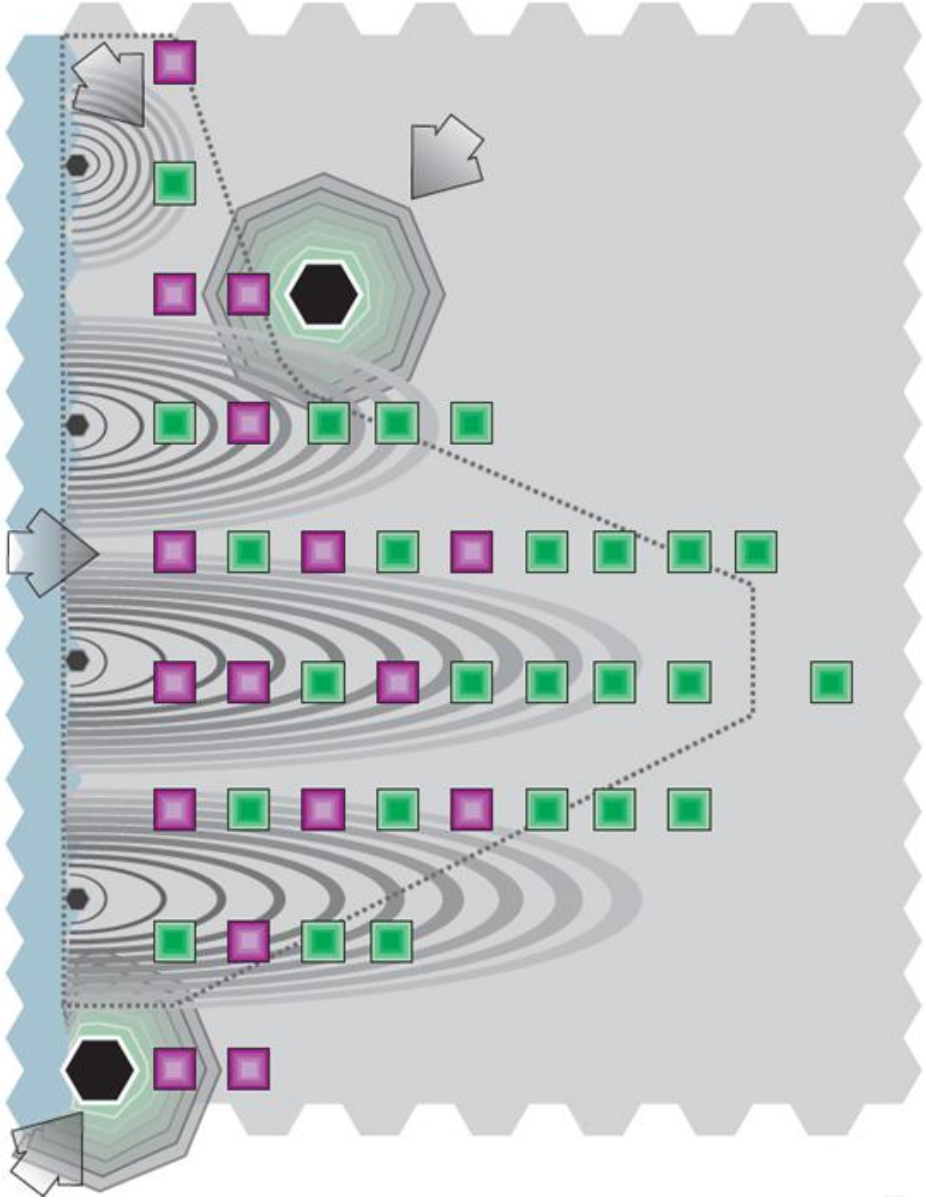
Forests: intensive forest management regimes for dendrobiomass production (coppice systems, new tree species..) – land-use changes and deforestation

Forest-Wood chain :

- multinational companies (energy, chemistry)
- concentration of activities around biomass and cellulose production and processing
- disappearance of small forest owners

Scenario 2 : Attractivity and quality

Attractivity of coastal territories and quality of products and landscapes



metropolitan area

coastal-rural system

SME and high added-value industries

Forests for production of high-quality wood

Demographic and economic attractivity

FORESTS & FORESTRY SECTOR in SCENARIO 2

Forests: adaptation and protection of maritime pine stands with broadleaves in hedges and islands – forests remain the dominant land-use

Forest-Wood chain :
-creation of added-value through innovative SMEs
-reorganisation of the wood sector with new players
-payments for forest carbon credits and recreation services.

Scenario 3 : Euroregion and self-sufficiency

Broad European Region self-sufficient for food and energy

Processing pole and transport platform

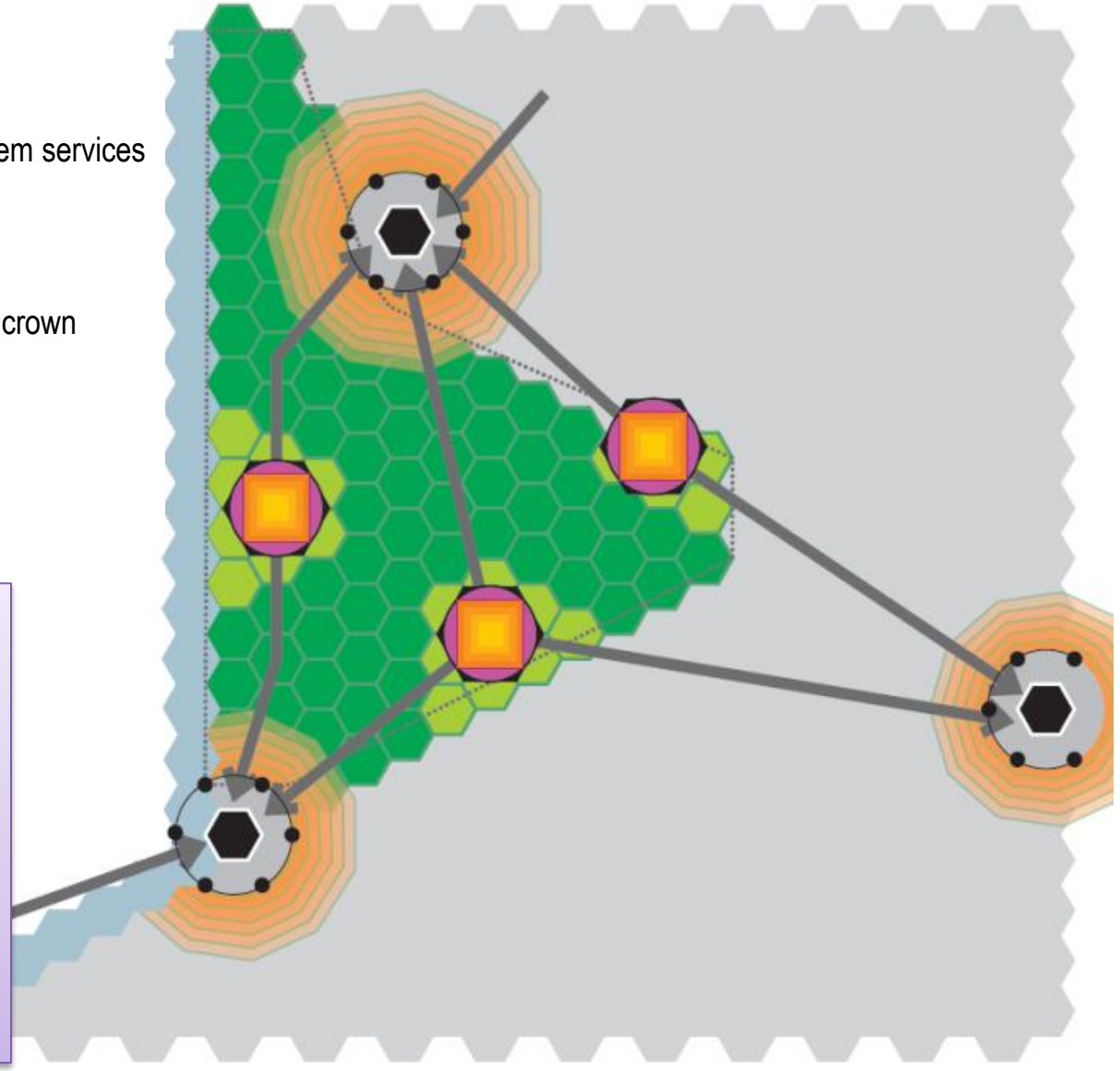
Forests for wood production and ecosystem services

Biomass production areas

metropolitan pole and densely populated crown

Green belt for agriculture and amenities

Axis for flux of people and goods



FORESTS & FORESTRY SECTOR in SCENARIO 3

Forests: long rotation maritime pine production in remote areas. New Species (Robinia, Eucalyptus…) for biomass production. Mixed forests for recreation closed to the cities

Forest-Wood chain:

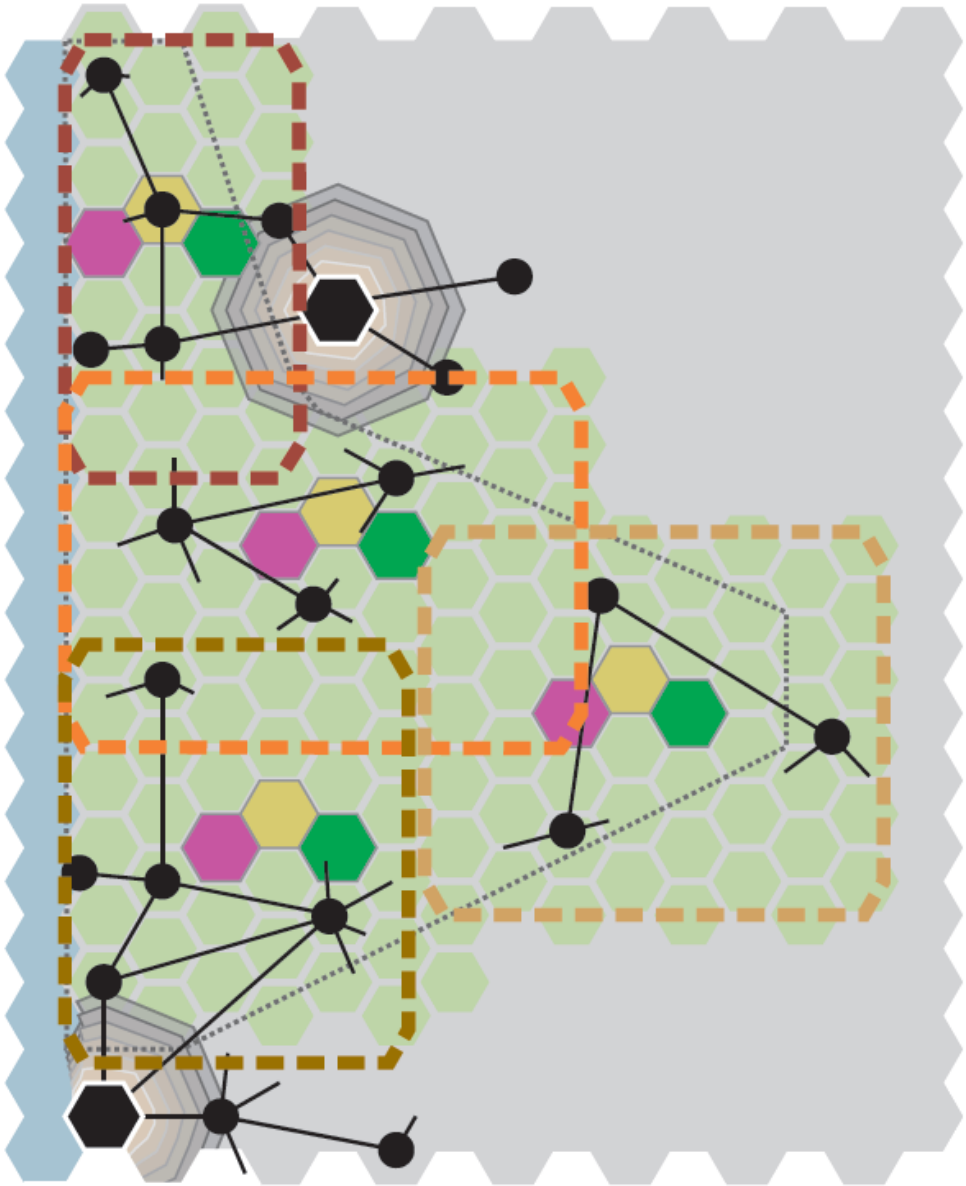
- role of macro-actors: cooperatives, investment funds, international companies….

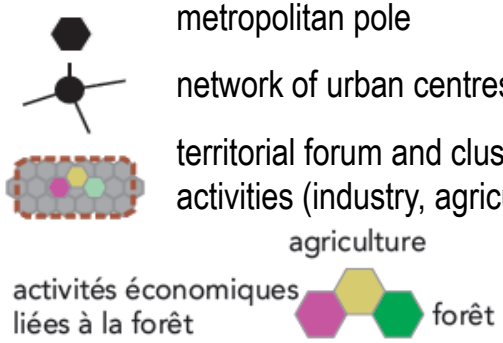
- processing activities concentrated near transport platform

-planification of forest-based activities for the service of the euroregion (energy, construction,..)

Scenario 4 : Patchwork and diversity

Mosaic of territories and diversity of forest value chains





FORESTS & FORESTRY SECTOR in SCENARIO 4

Forests: mixed tree species at landscape scale including maritime pine and broadleaf species. Forests remain dominant land-use in many territories

Forest-Wood chain:
- territorial forums including forestry component
- innovative organisation of forest-wood chain actors
- diversification of wood-based products for local needs and exports

IV- Forest Adaptation Strategies

Strategies for adapting forests to climate change

- **selecting new tree species** or provenances and adapting maritime pine varieties for drought tolerance (*scenarii 1 and 3*)
- **shortening production cycles** to minimise exposure to climatic hazards and damage costs (*scenario 1*)
- **associating broadleaf species to maritime pine** at management unit level to increase stand resistance (*scenario 2*)
- **diversifying tree species at landscape scale** and **managing ecotones** between forests and other land-uses for improving habitat connectivity and water regulation (*scenario 4*)

Governance adaptation strategies

- **sectoral** strategies for adapting forest-wood chains to climatic changes
  - organisation of actors & optimisation of economic behaviour
  - role of macro-actors (industries, cooperatives..) on international markets

- **public-private** mutual strategies (resource protection, products and services, quality labels..)

- public policies and **regional planification** in cooperation with private macro-actors and coordination with other sectors

- **territorial adaptation strategies** based on stakeholders' participation and interactions between sectors

Concluding remarks

- pertinence of foresight « participative » approach to deal with climate change uncertainties through a dialogue platform on various adaptation strategies:
  - depending on the futures of forest-based industry and territories
  - based on scenarios that combines biophysical, sectorial and territorial pathways
- foresight study underlines
  - the need to integrate all the sectors and territorial actors
  - the key role of innovations (technology, organization, policy) for future trajectories
  - that adaptation strategies are multiscale from forest stand to regional level
  - the importance to consider multi-level, multi-actor and territorial governance

➢ **further steps**: economic analysis of scenarios, elaboration of regional policies…

➢ **knowledge gaps**: ecosystems interactions including urban/rural interface, multiple risk management and risk perception, socio-economic conditions of forestry-wood chain, …..

REGION AQUITAINE

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Thank you for your attention

more info on:

http://www5.paris.inra.fr/depe/Projets/Massif-Landes-de-Gascogne