

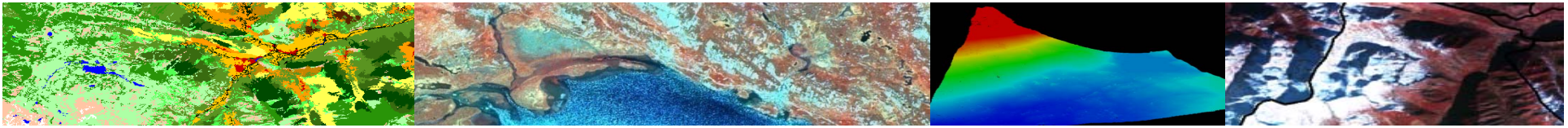
L'exploration du futur dans les OHM

Quelles méthodes pour quels objectifs?
Apports (et limites) de la dimension spatiale.



HOUET Thomas
Chargé de recherche CNRS
thomas.houet@univ-tlse2.fr
GEODE UMR 5602 CNRS/UTM



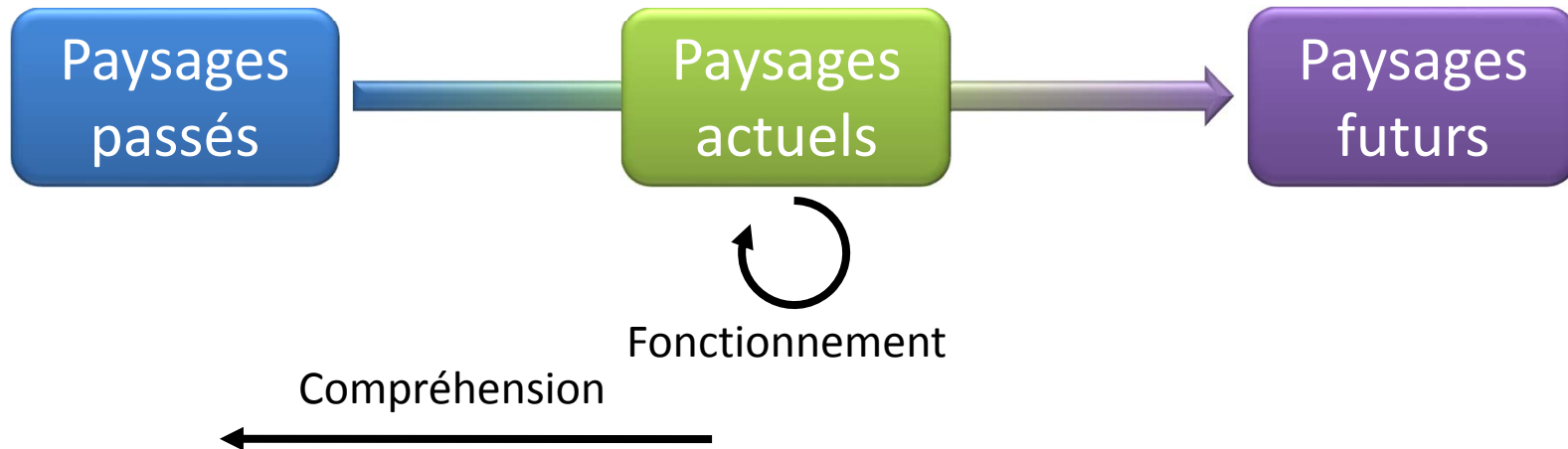


Pourquoi ?

1976

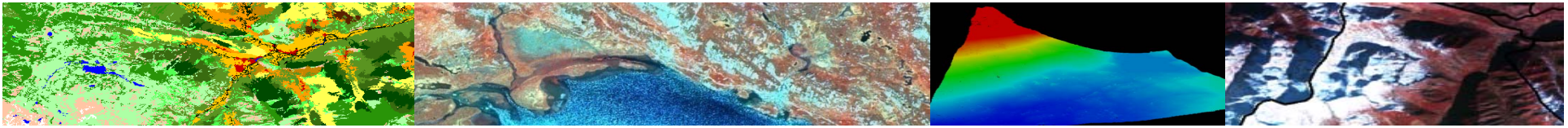


2008



OBECTIONS



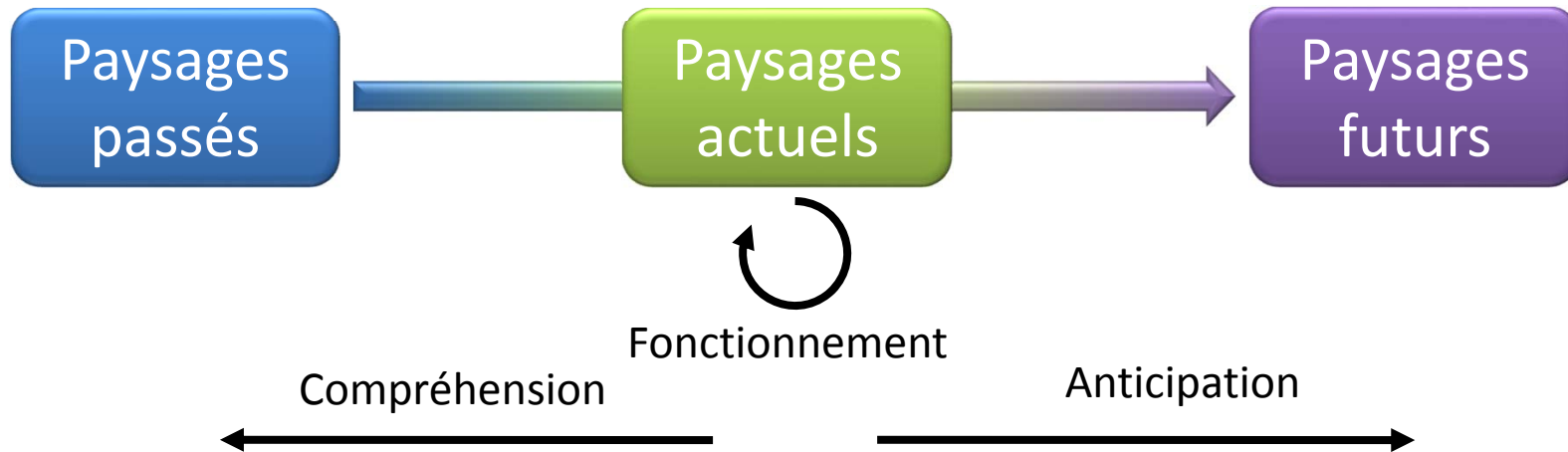


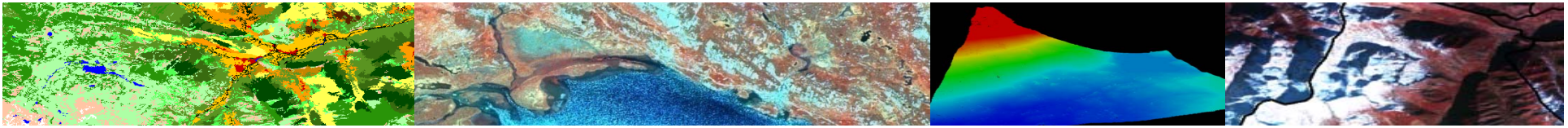
Pourquoi ?

1976



2008



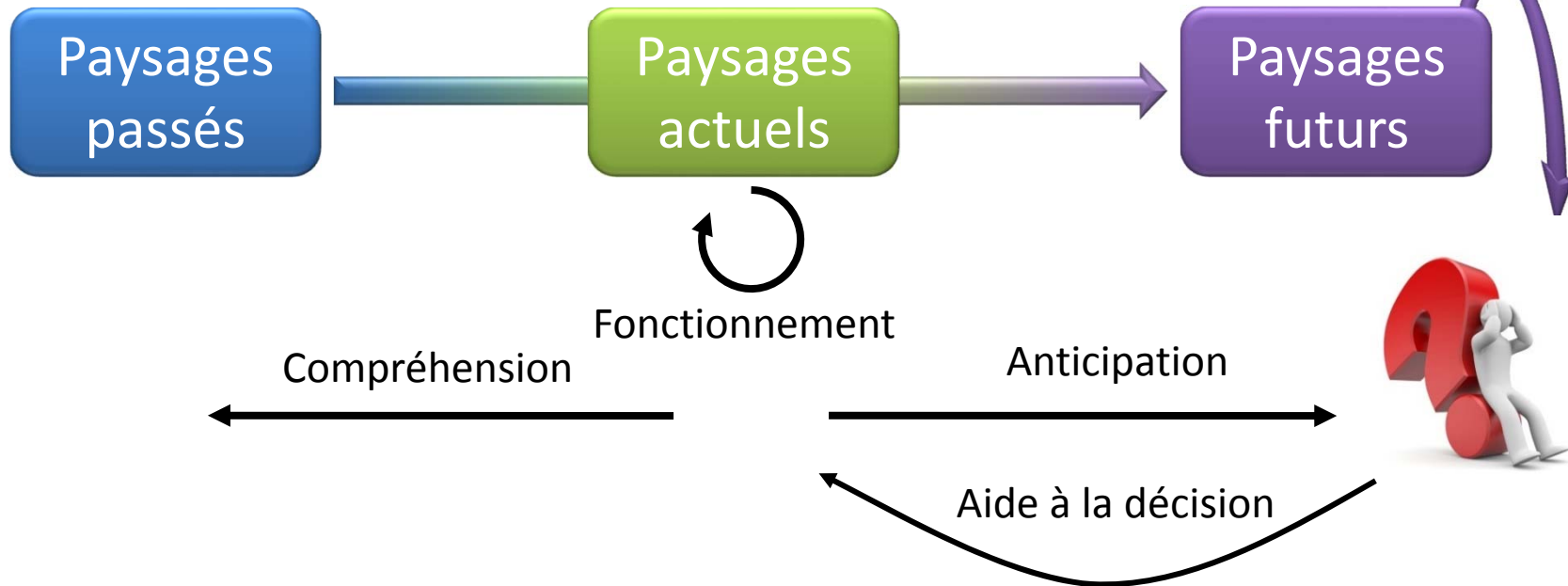
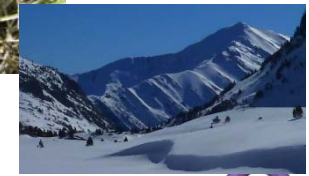


Pourquoi ?

1976

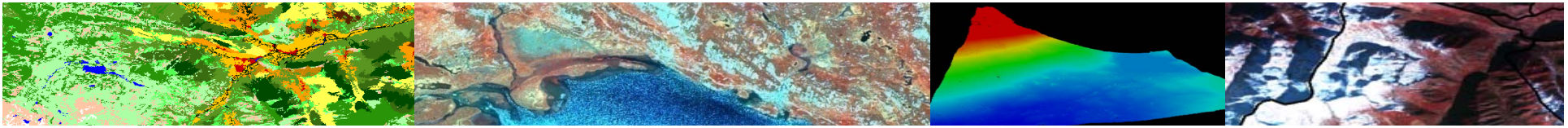


2008



OBECTIONS





Positionnement

APPROCHES

Rétro-observation

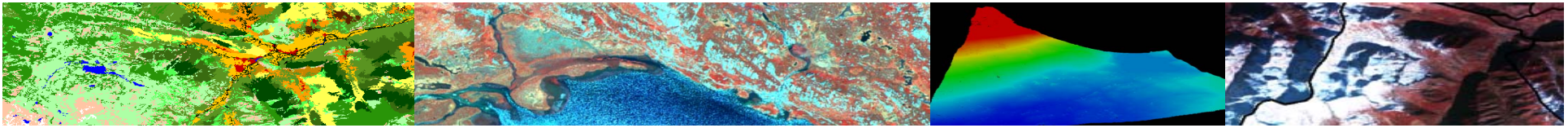
Modélisation prospective



OBECJTIFS

Compréhension

Anticipation



Apport de la dimension spatiale

Prospective territoriale vs. Prospective spatialisée

CESR Midi-Pyrénées, 1998

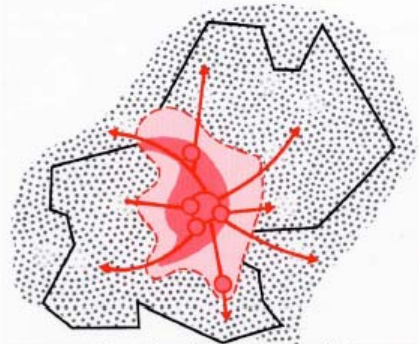
Verburg et al, 2010



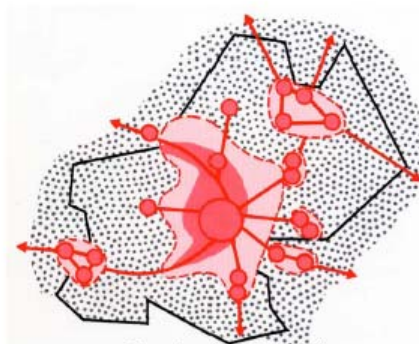
Un scénario "Tendanciel" :
la métropolisation passive du "croissant rose".
La diversité des logiques du "fond gris"



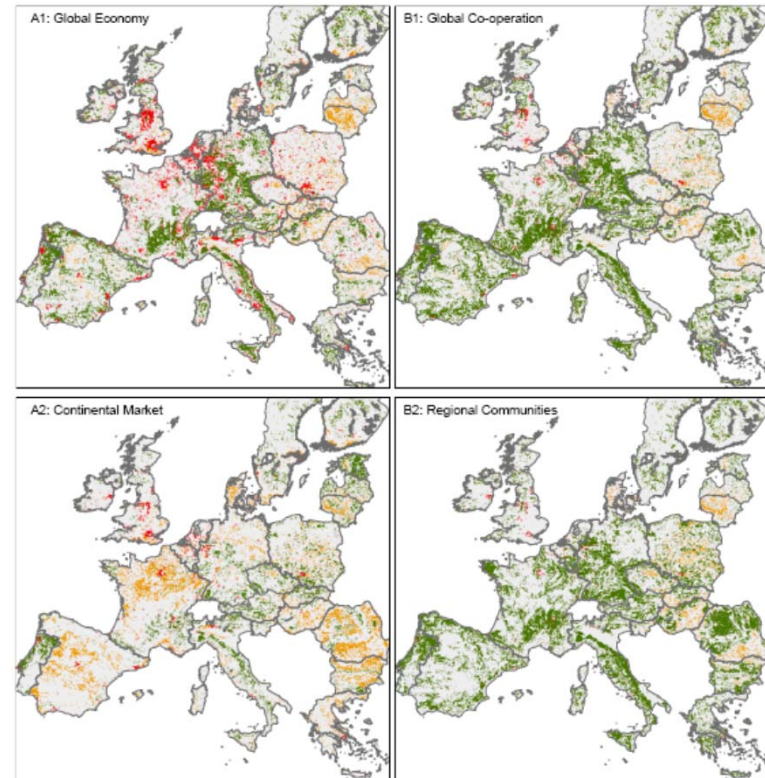
Un scénario "Noir" :
la régression du "croissant rose".
Les chutes et les résistances du "fond gris"



Un scénario "Métropolitain" :
la métropolisation organisée et réussie.
Des retombées sur le "fonds gris"



Un scénario "Régional" :
Une organisation volontariste du territoire région.
Des pôles d'équilibre dans le "fonds gris"

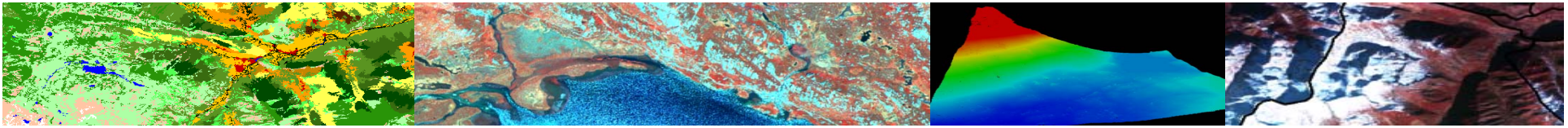


Legend

- Stabile
- Abandonment
- Agricultural expansion
- Urbanisation
- Urbanisation and abandonment
- Urbanisation and agricultural expansion

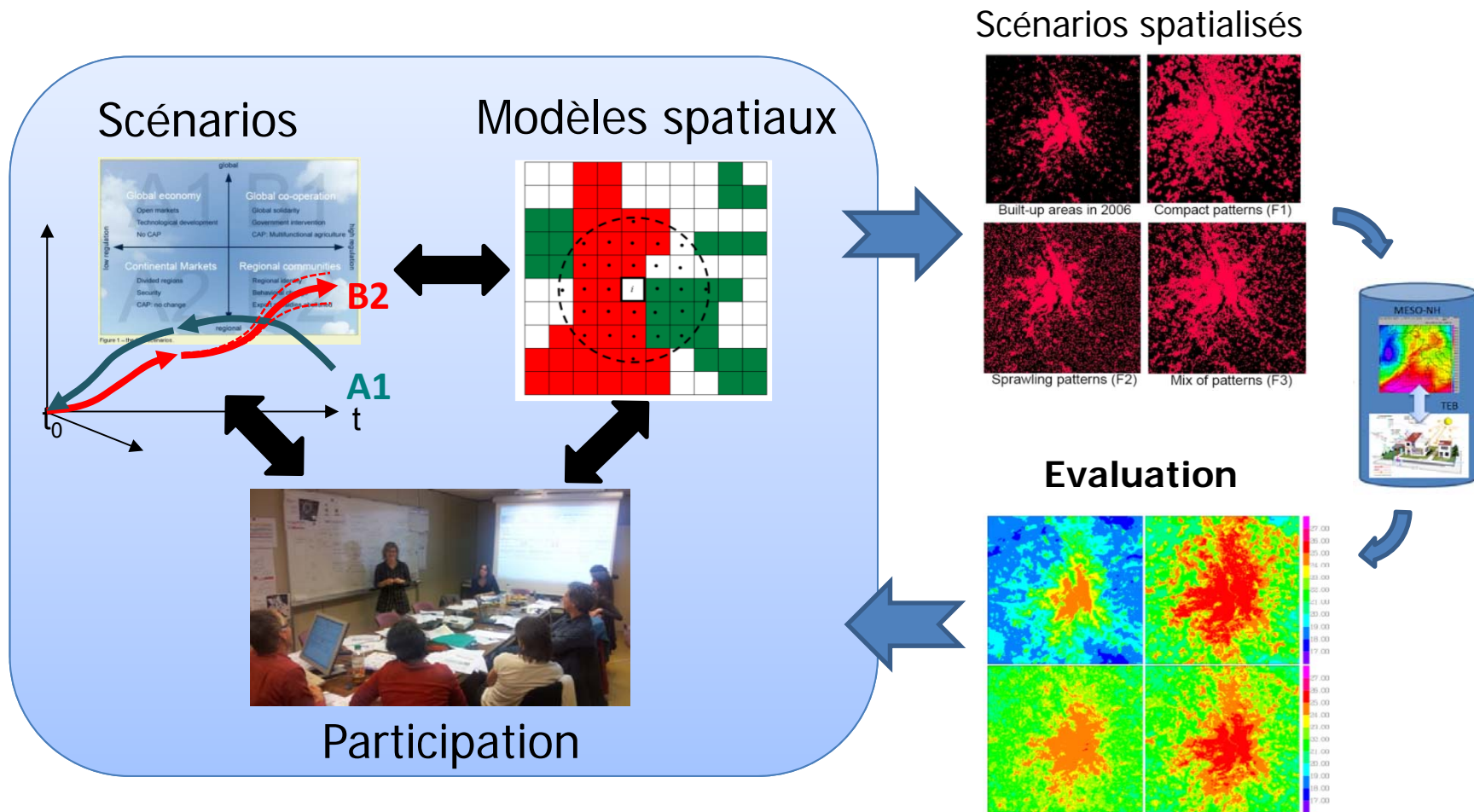
0 250 500 1,000 Kilometers

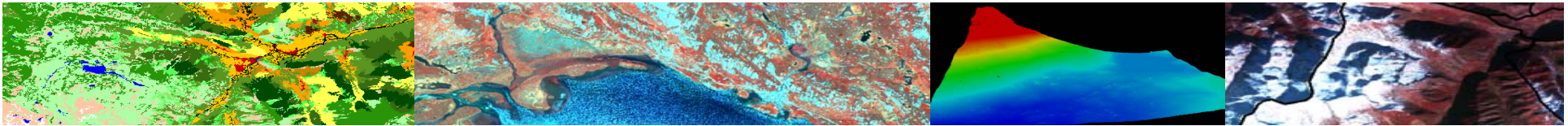




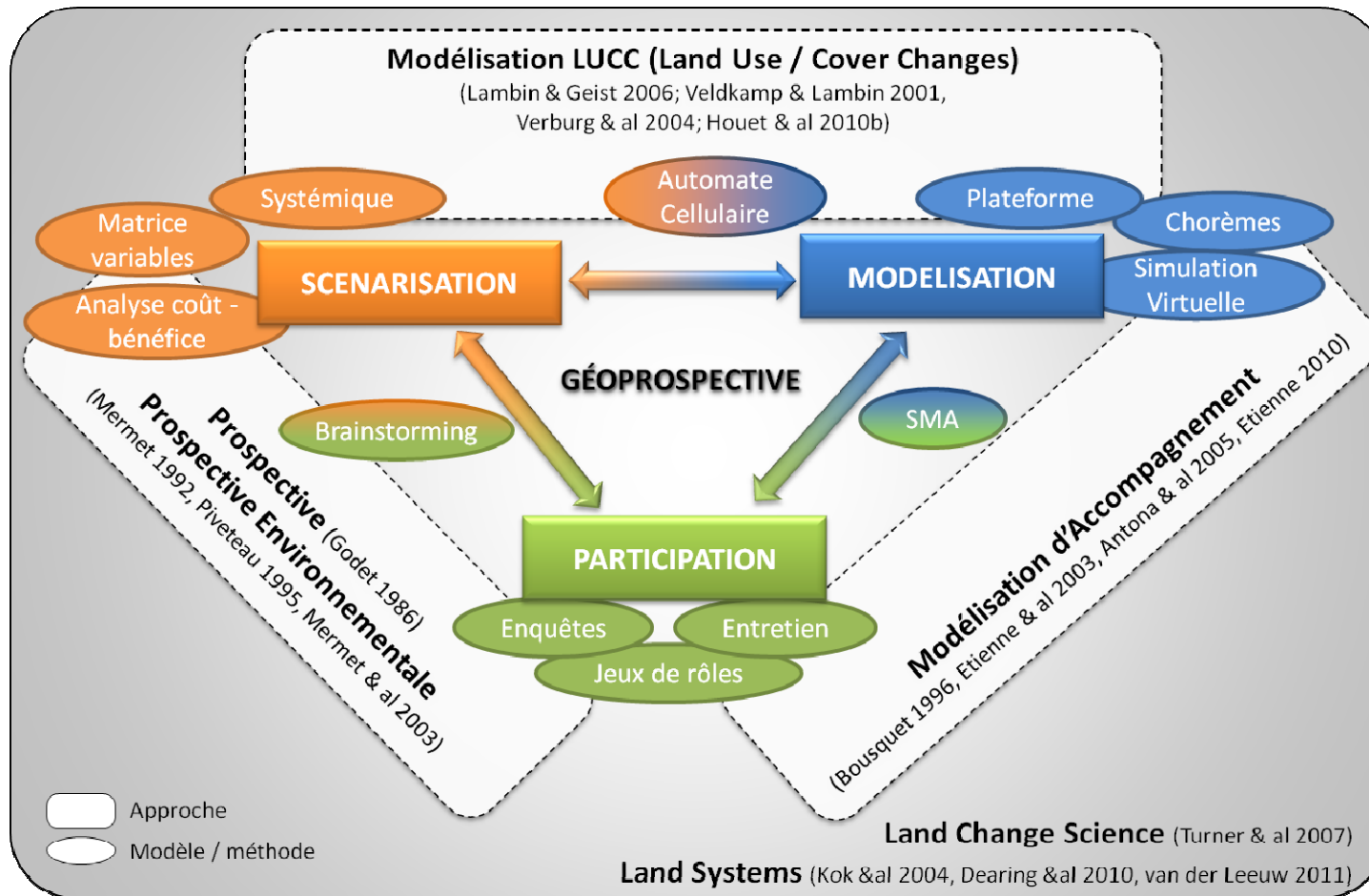
Apport de la dimension spatiale

LUCC : trait d'union entre "SESA" et évaluation quantitative

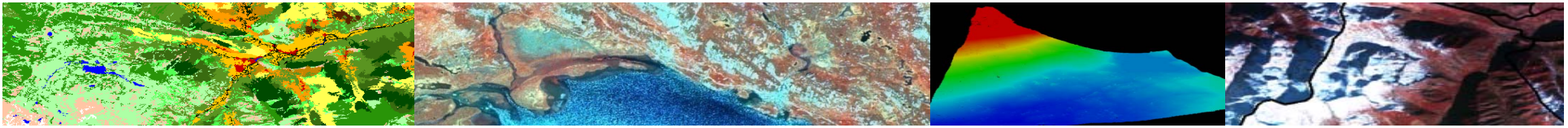




Scénarios, modèles, participation

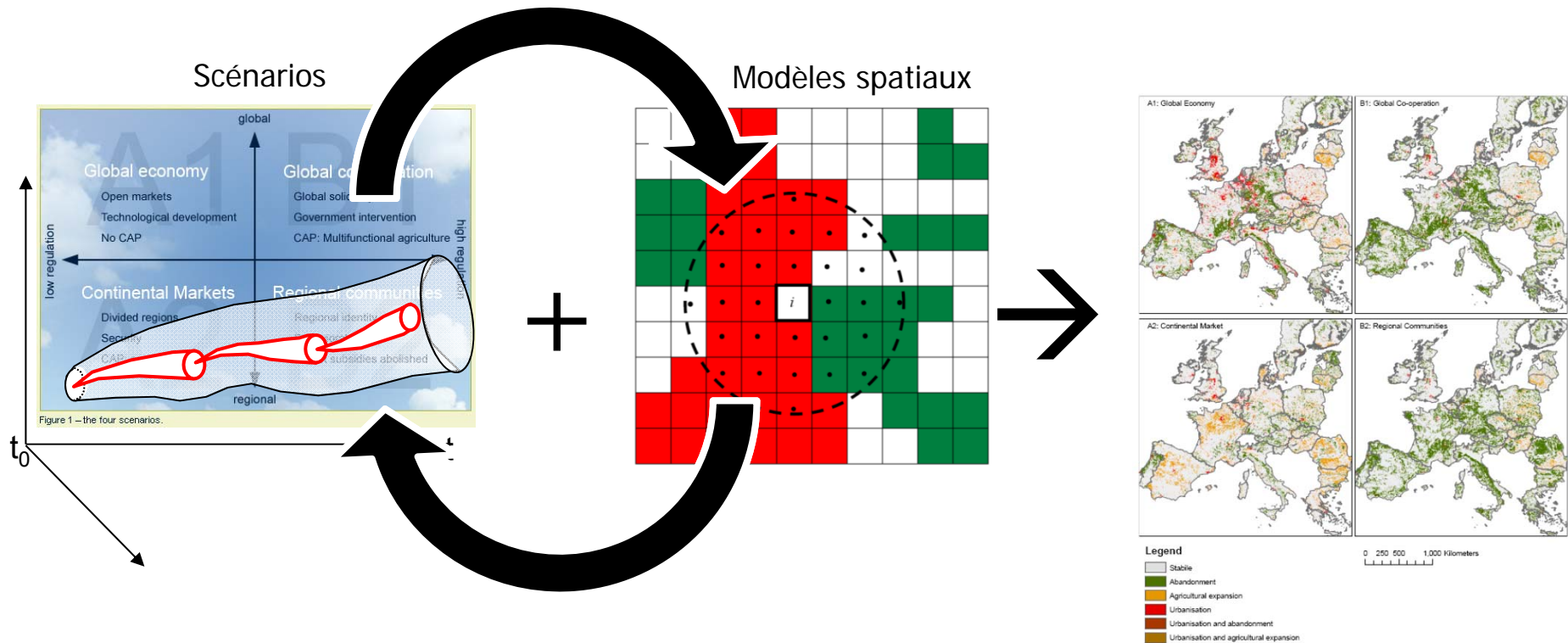


Houet et Gourmelon, 2014 (Cybergéo)

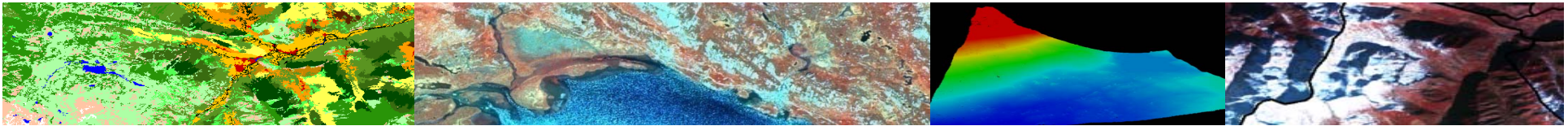


Modélisation prospective (spécialisée)

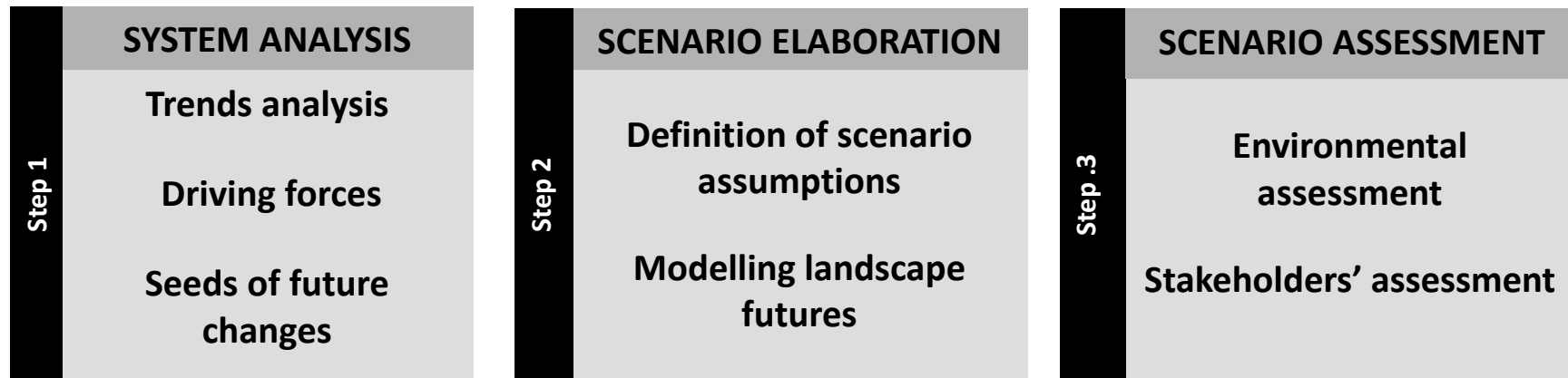
Storyline and Simulation (SAS approach – Alcamo, 2008)



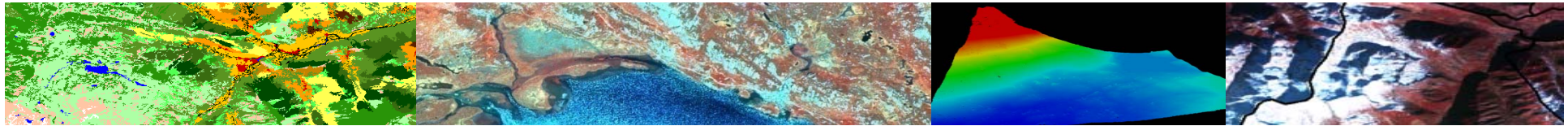
Path-dependence (Brown et al 2005)



Adaptation de la méthode des scénarios



Houet et al (2010) *Landscape Ecology*



Exemples d'application

Dissertation Defense

Laure Vacquié

Prospective modelling and spatial scales in mountainous areas.

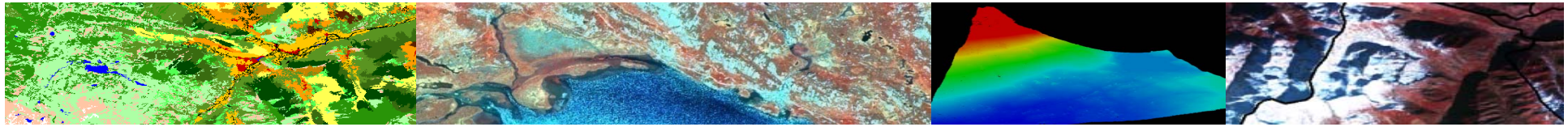
Application to the French Pyrenees

Martin Paegelow	Directeur de thèse, Professeur, GEODE, Toulouse
Thomas Houet	Co-directeur de thèse, Chargé de recherche CNRS, GEODE, Toulouse
Arnaud Banos	Rapporteur, Directeur de recherche CNRS, UMR Géo-Cités, Paris
Delphine Leenhardt	Examinatrice, Directrice de recherche INRA, UMR AGIR, Toulouse
Jean-François Mas	Rapporteur, Professeur, UNAM, Morelia, Mexique
Peter Verburg	Examineur, Professeur, IVM, Université d'Amsterdam, Amsterdam
Christine Voiron	Examinatrice, Professeure, UMR ESPACE, Nice

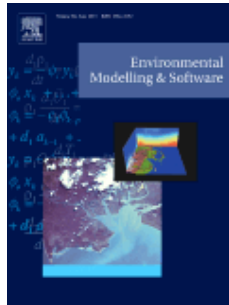


June 3rd, 2015
GEODE – UMR 5602/CNRS

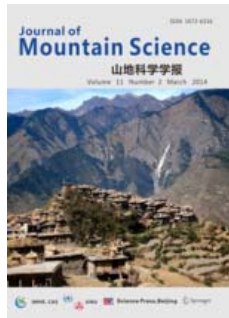




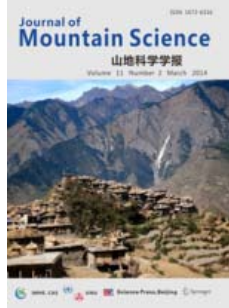
Exemples d'application



Vacquié L., Houet T., Sheeren D., de Munnik N., Roussel V., Waddle J., (Submitted) Adapting grazing practices to limit the reforestation of mountainous summer pastures: an agent-based model (SHIELD), Environmental Modelling and Software



Houet T., Vacquié L., Sheeren D., (Accepted) Evaluating the spatial uncertainty of future land abandonment in a mountainous valley (Videssos, Pyrenees - France): insights from model parameterization and experiments. The Journal of Mountain Science, (Accepted with minor revisions)

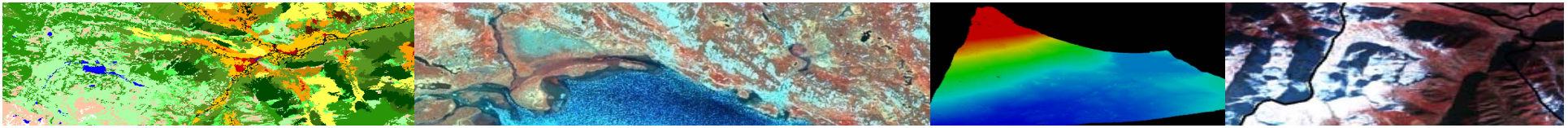


Vacquié L., Houet T., Sohl T., Reeker R., Saylor K., (In press) Developing scenarios to project LULC changes in the Pyrenees (France): a model-based approach to assess land abandonment and reforestation dynamics. The Journal of Mountain Science



Source : IPCC SRES





Bassiès

- Evaluate the influence of contrasted pastoral management strategies on LUCC and reforestation dynamics



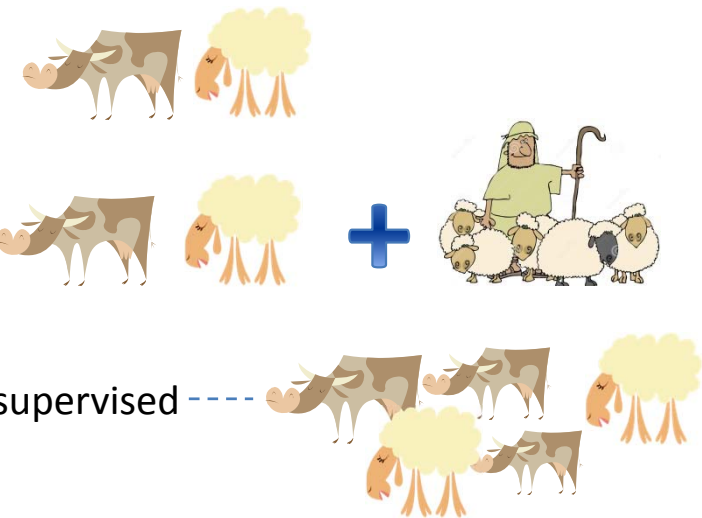
4 scenarios
up to 2050

Business As Usual sc. --- No grazing activities

Low management ----- Herd / not supervised -----

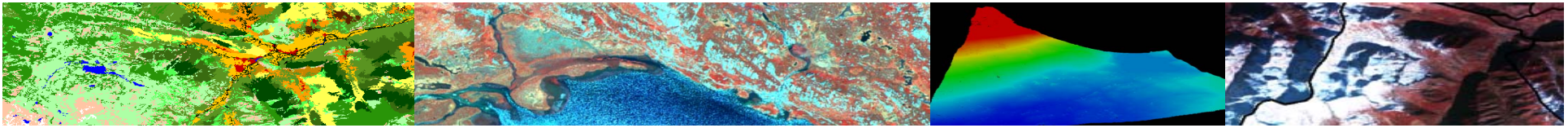
High management ----- Herd / supervised -----

Increased cattle load --- Herd (10% increase) / not supervised -----

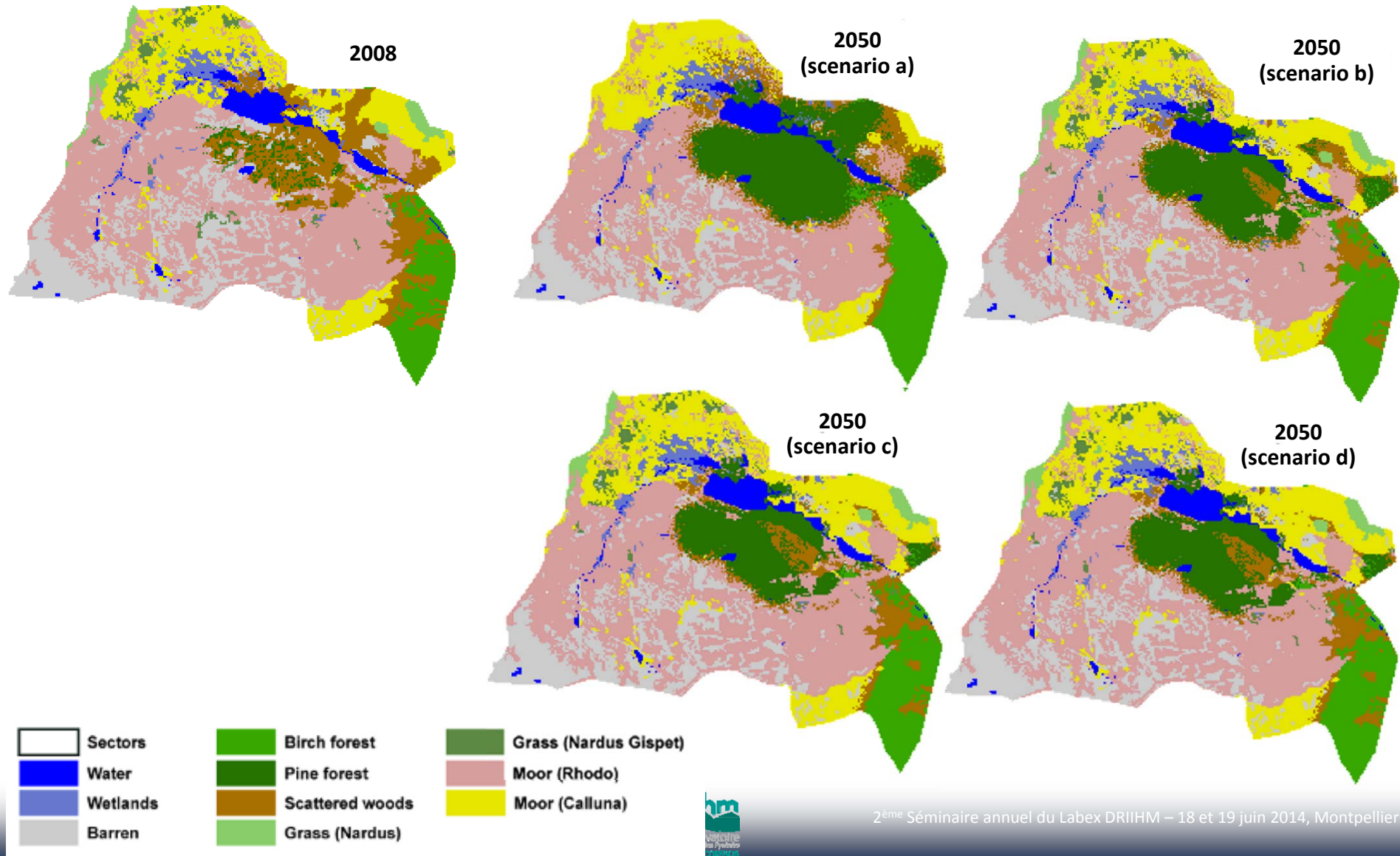


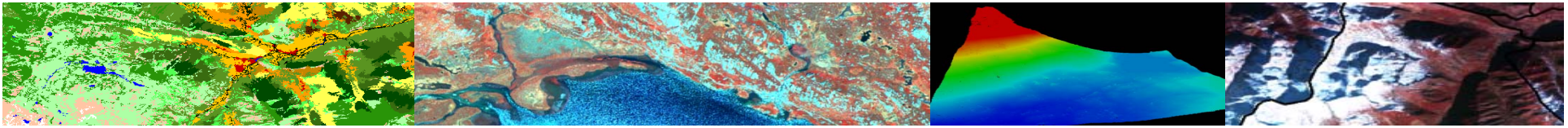
Source : IPCC SRES



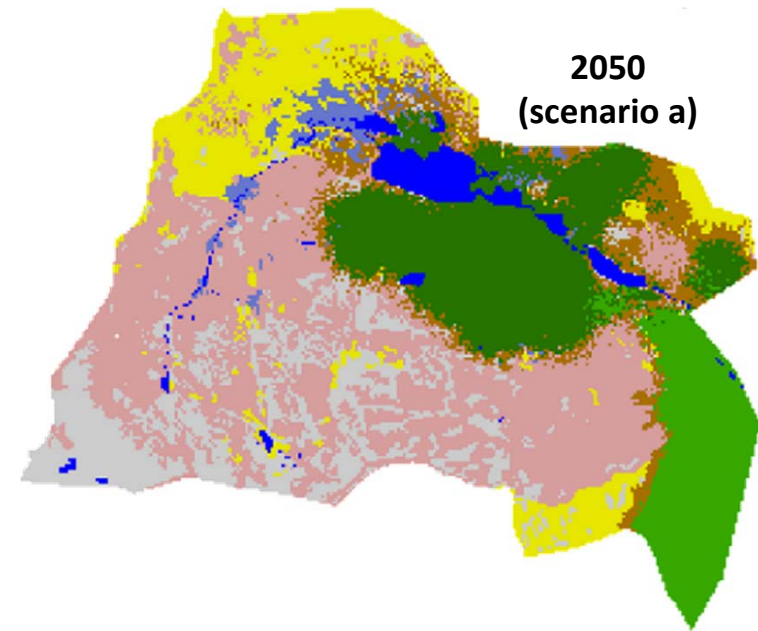
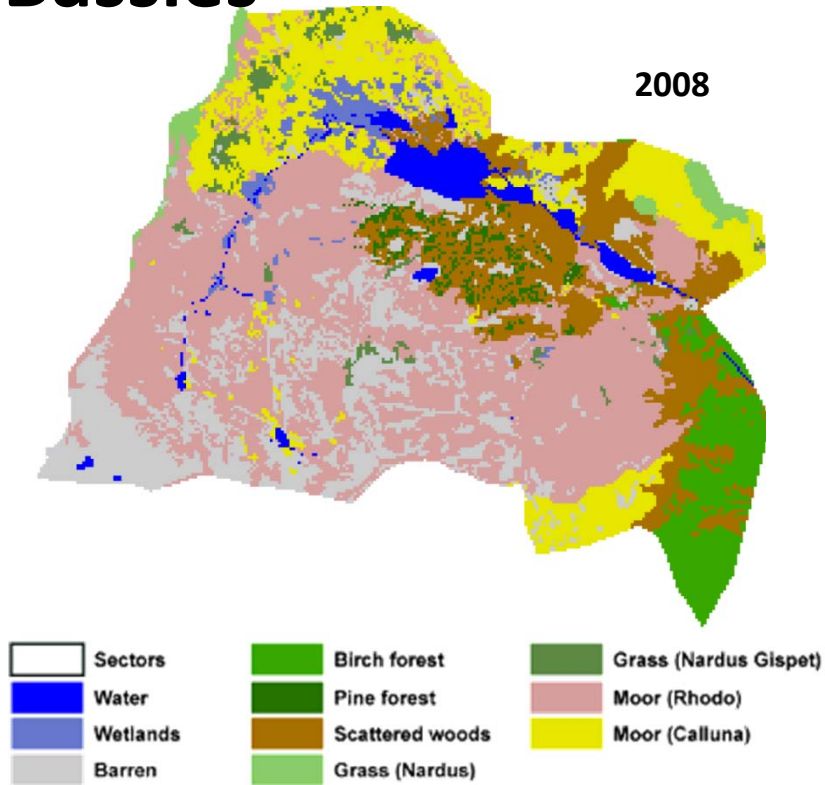


Bassiès



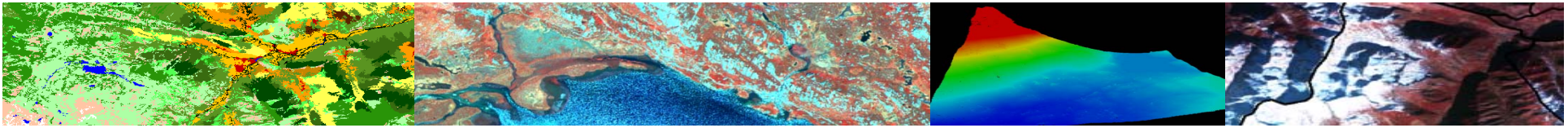


Bassiès

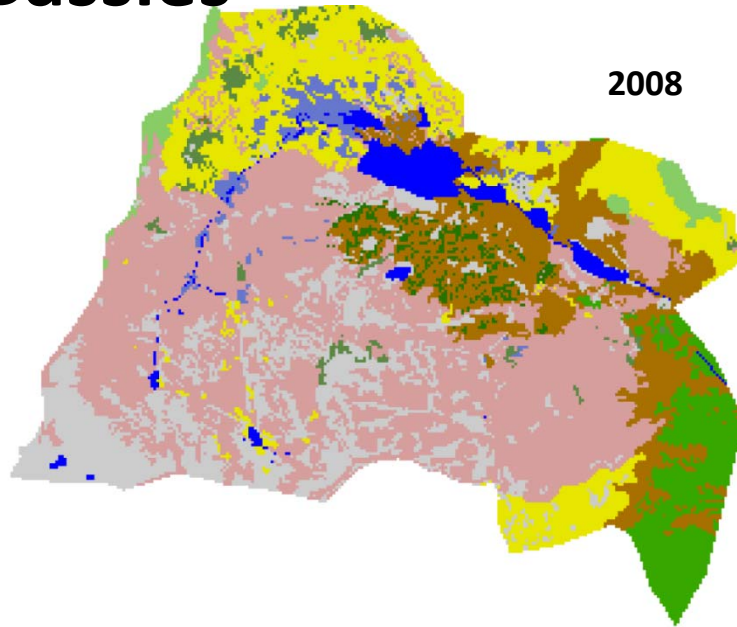


Influence of land use strategies

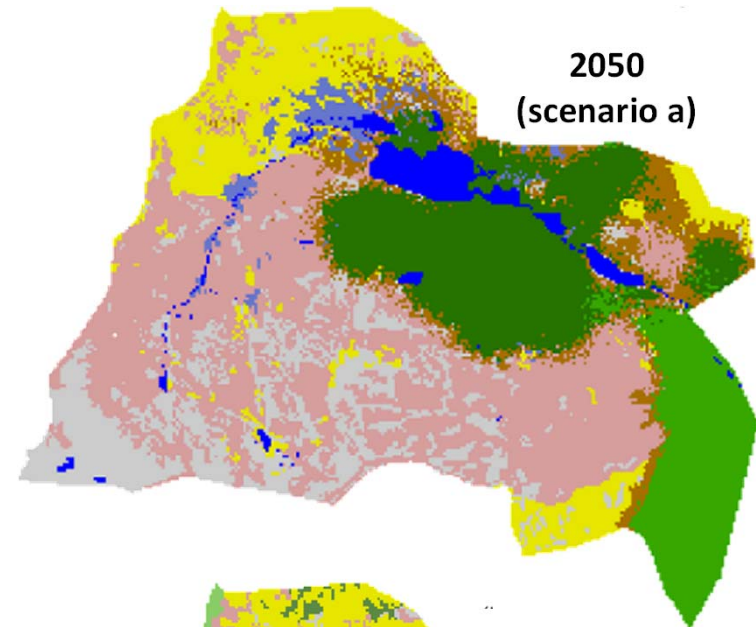
- **No strategy (scenario a)** = + 232 ha of forest



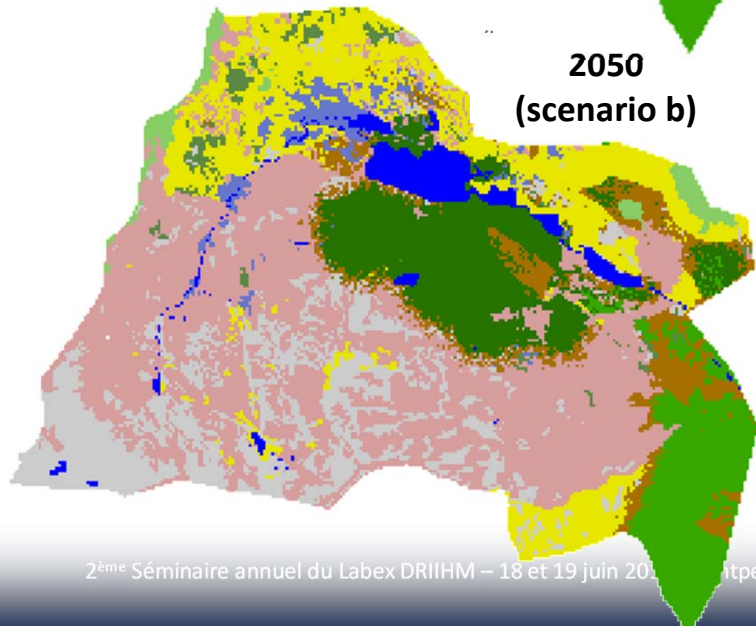
Bassiès



2008



2050
(scenario a)

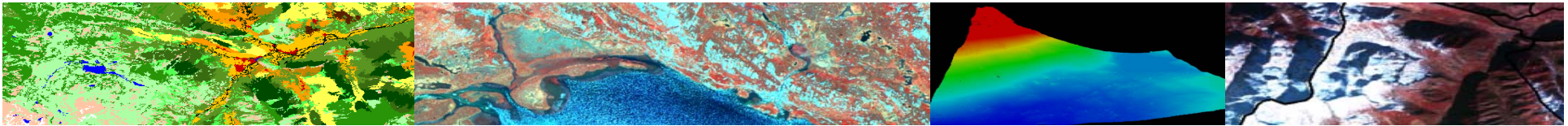


2050
(scenario b)

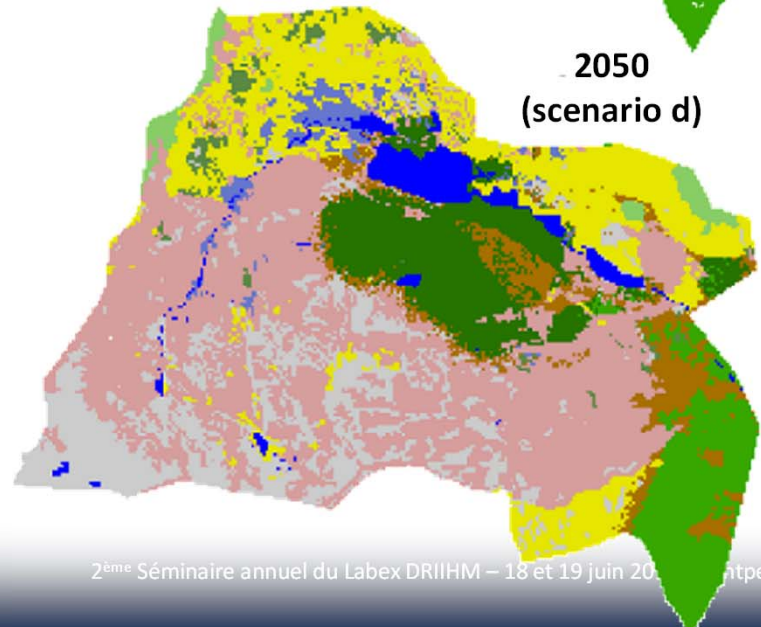
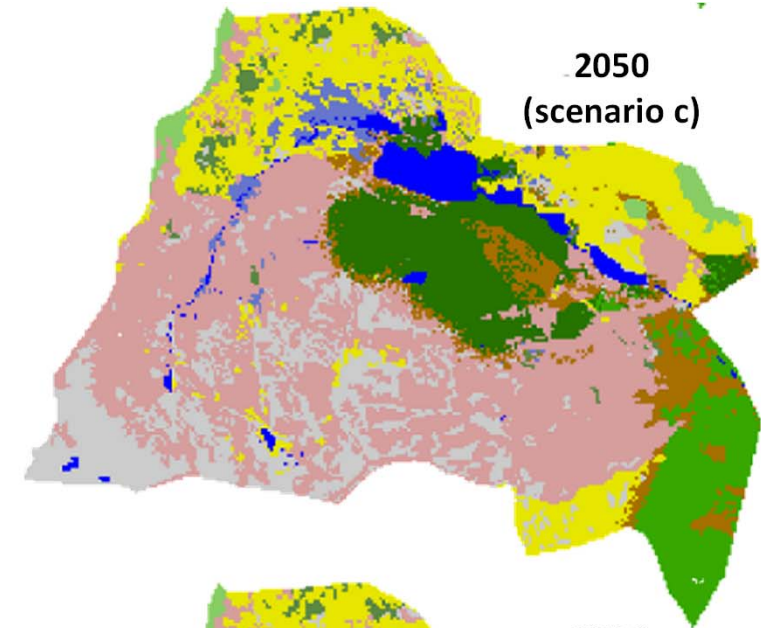
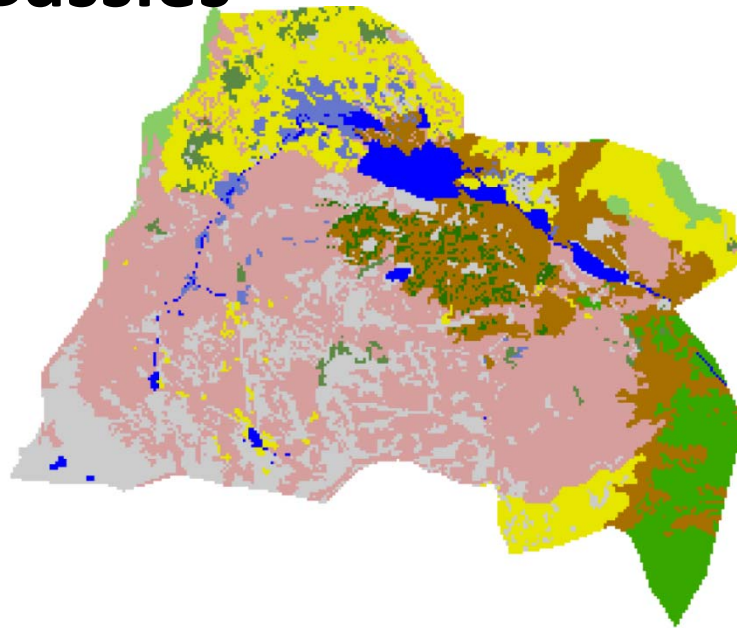


Influence of land use strategies

- **No strategy** (*scenario a*) = + 232 ha of forest
- **Pastoral activity** (*scenario b*) = +140 ha



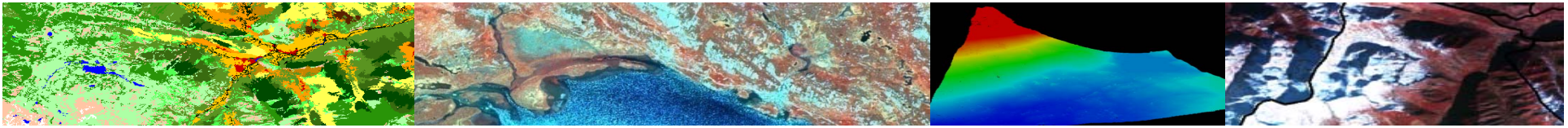
Bassiès



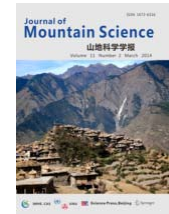
Sectors	Birch forest	Grass (Nardus Gispet)
Water	Pine forest	Moor (Rhodo)
Wetlands	Scattered woods	Moor (Calluna)
Barren	Grass (Nardus)	

Influence of land use strategies

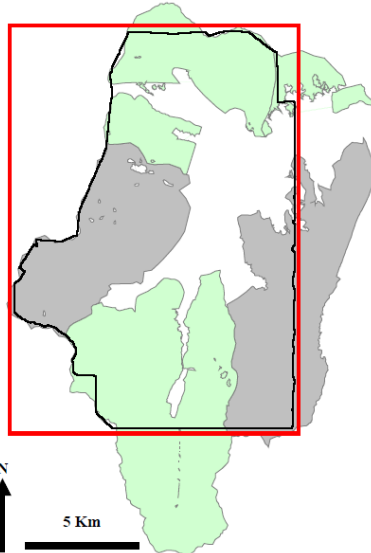
- **No strategy** (*scenario a*) = + 232 ha of forest
- **Pastoral activity** (*scenario b*) = +140 ha
- **Grazing pressure** (*scenario c*) = + 110 ha
- **Herd supervision** (*scenario d*) = + 112 ha



Vicdessos

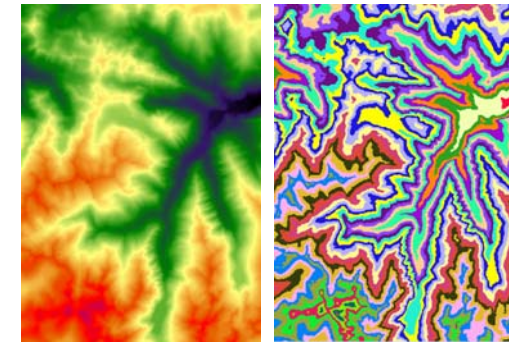


- Assess the degree of probability of LUCC by combining the uncertainties related to the model's parameters and the prospective scenarios



4 different parameters by scenario

- Qualitative + Dynamic
- Qualitative + Non-dynamic
- Quantitative + Dynamic
- Quantitative + Non-dynamic



Elevation : quantitative (left) and qualitative (right)

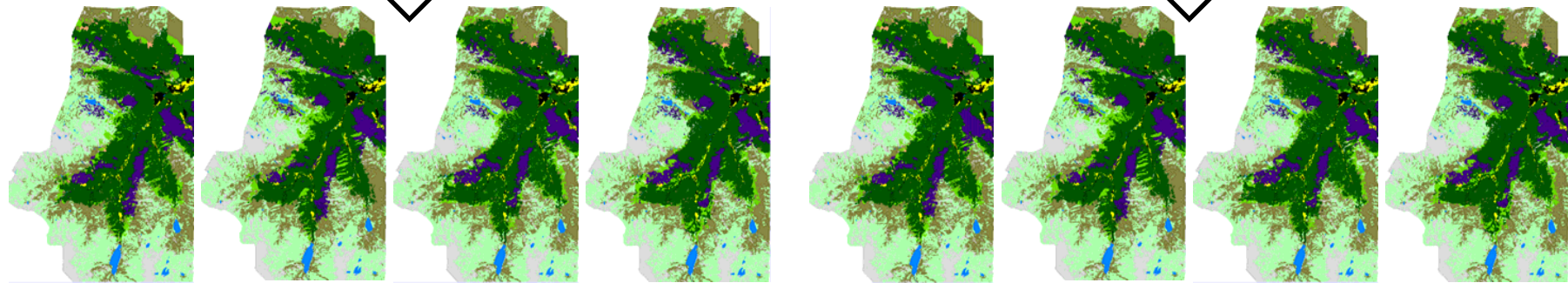
2 scenarios up to 2080

- Model-based Business As Usual (MBUA)
- Prioritizing High Value Uplands (PHVU)

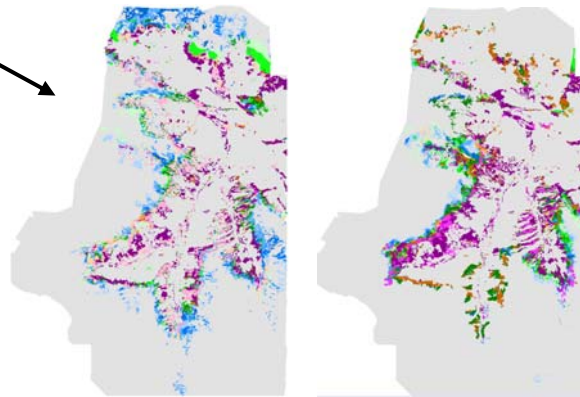


Source : IPCC SRES

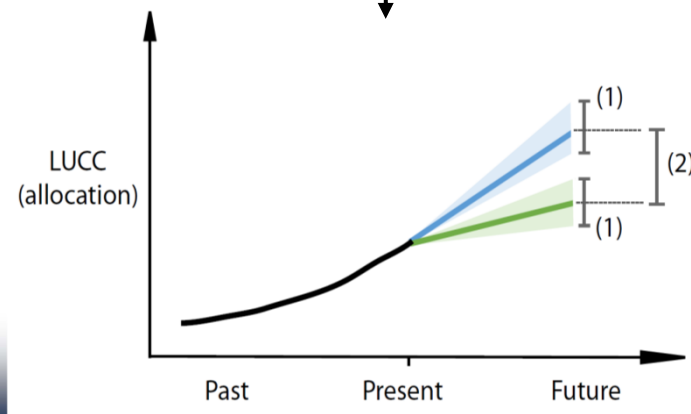




- Persistent land covers
- Encroachment (1 simulation)
- Encroachment (2 simulations)
- Encroachment (3 simulation)
- Encroachment (4 simulation)
- Forest (1 simulation)
- Forest (1 simulation) / Encroachment (1 simulation)
- Forest (1 simulation) / Encroachment (2 simulations)
- Forest (1 simulation) / Encroachment (3 simulations)
- Forest (2 simulations)
- Forest (2 simulations) / Encroachment (1 simulation)
- Forest (2 simulations) / Encroachment (2 simulations)
- Forest (3 simulations)
- Forest (3 simulations) / Encroachment (1 simulation)
- Forest (4 simulations)

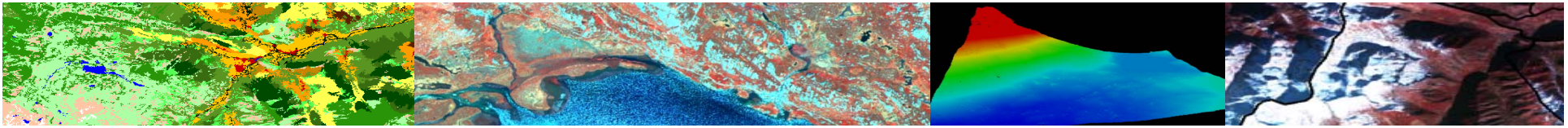


Occurrences of future LUCC
(1) Inherent **model uncertainty**



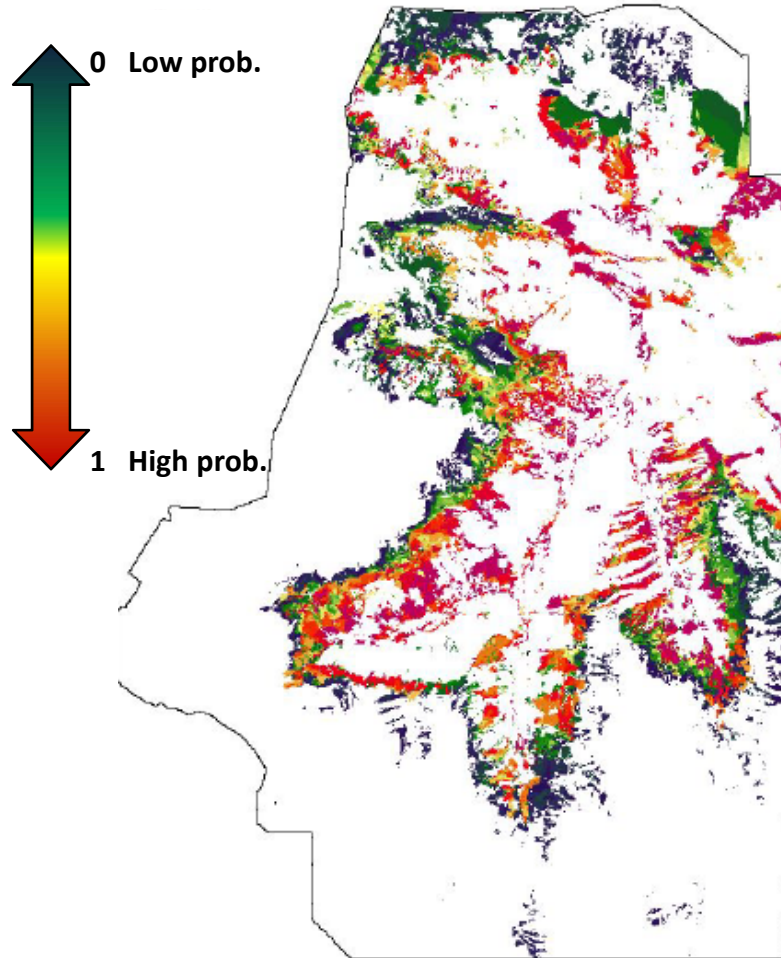
Spatial uncertainty of future LUCC
(2) **Ensemble uncertainty**

- Enclosure probability map
- Land use strategies uncertainty map

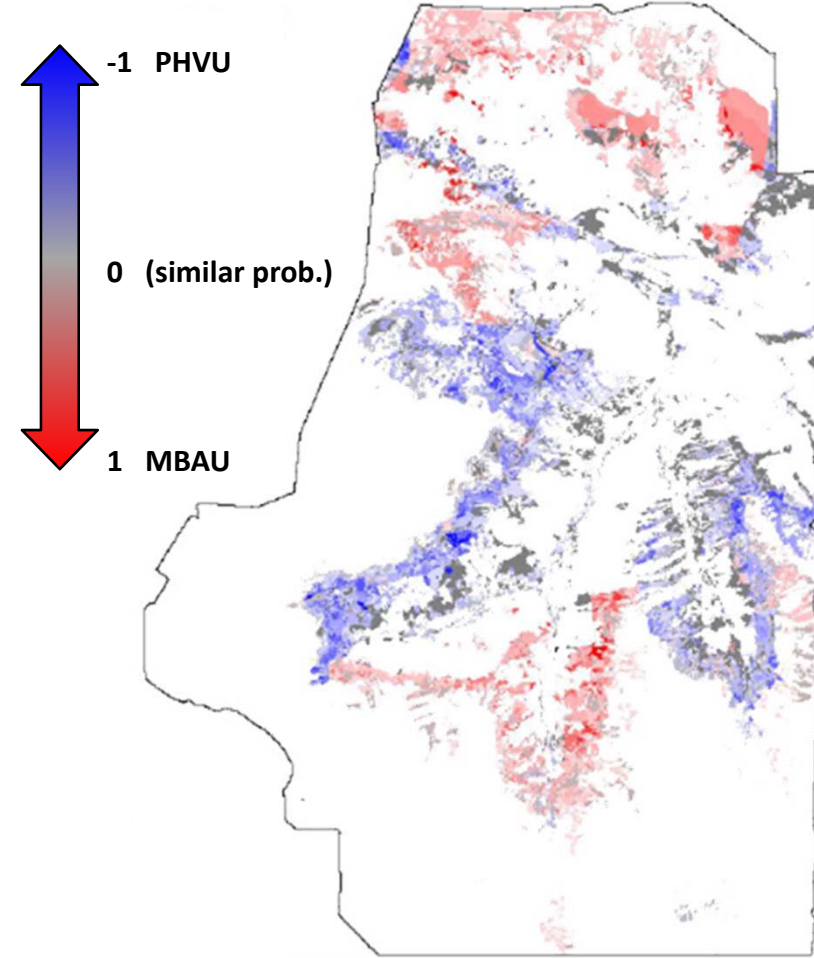


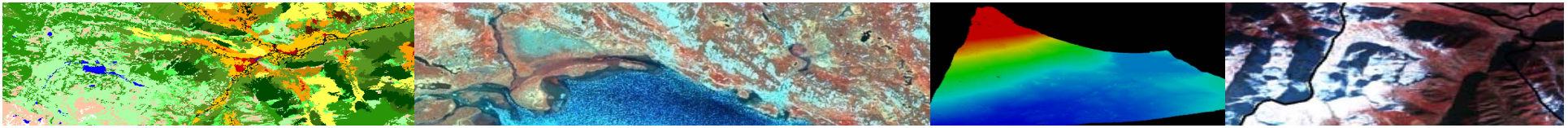
Vicdessos

Enclosure probability map

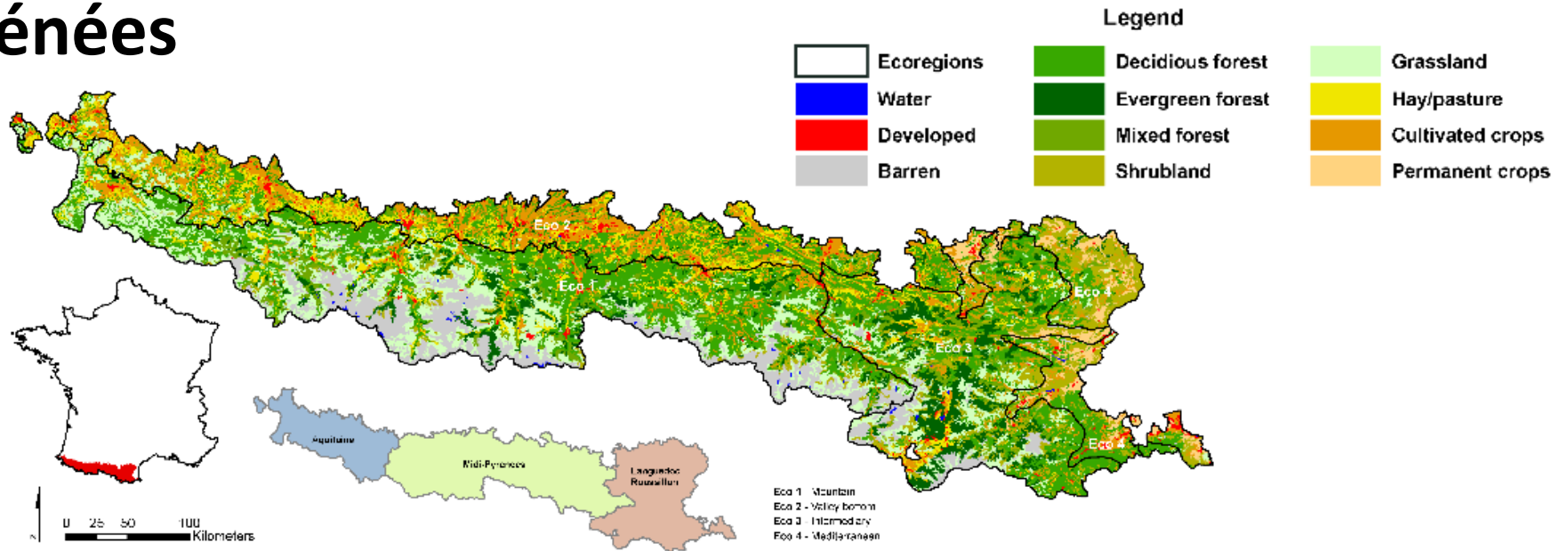


Land use strategies uncertainty map



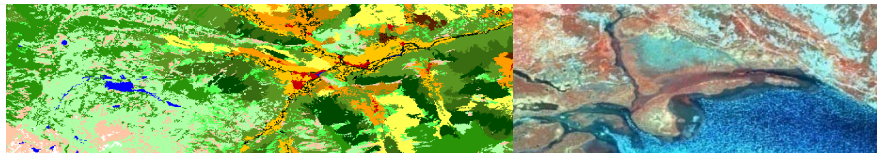


Pyrénées



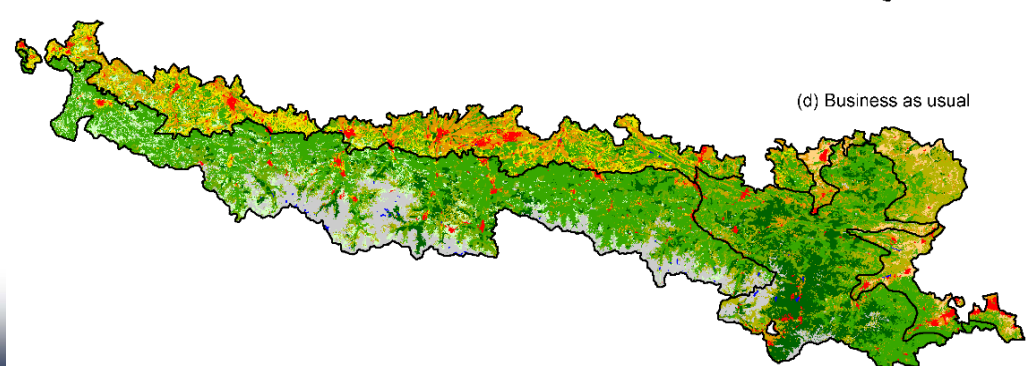
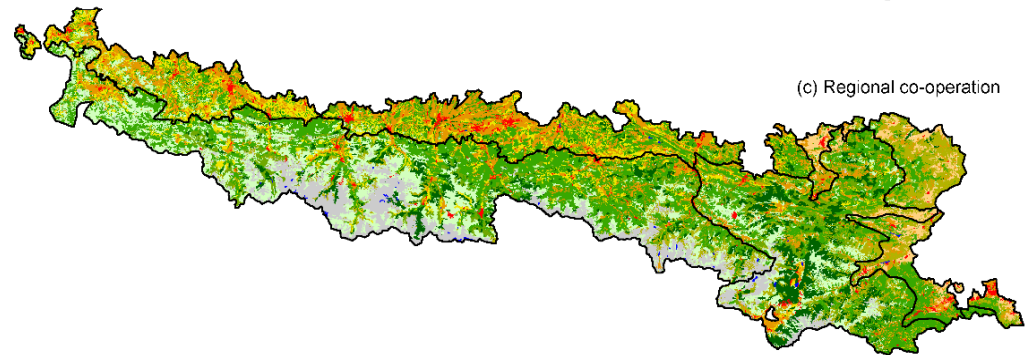
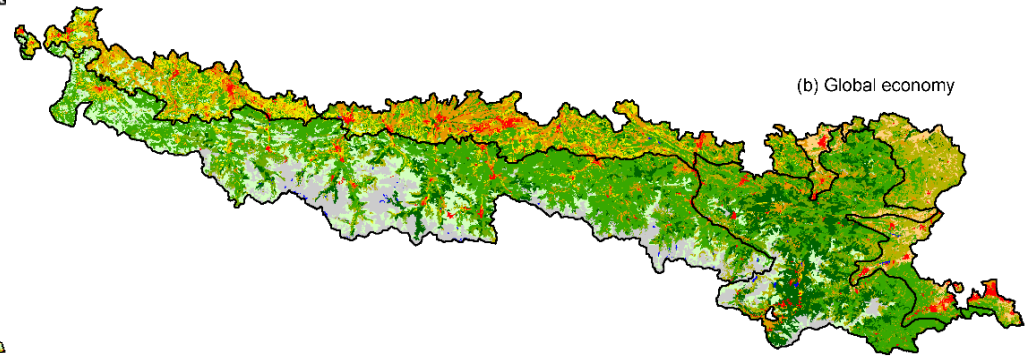
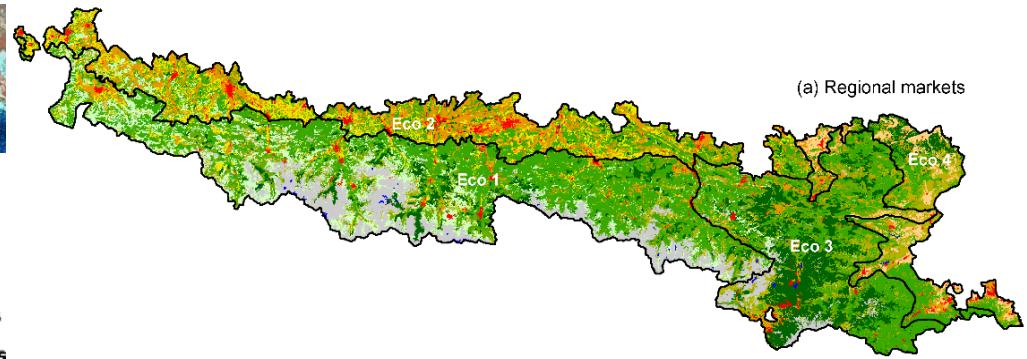
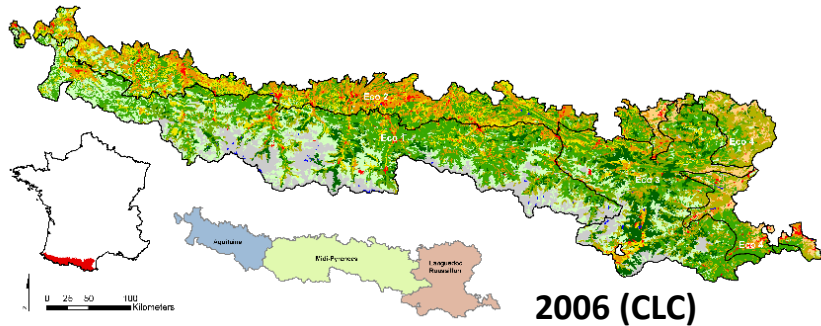
Source : IPCC SRES





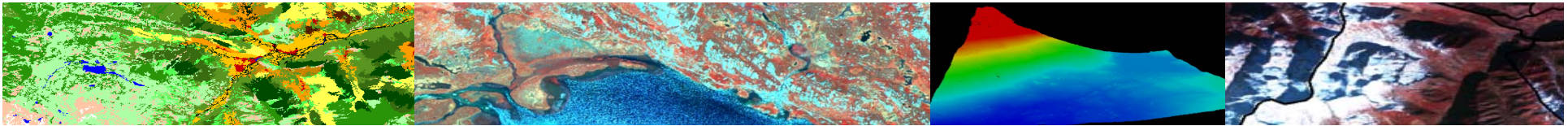
Legend

	Ecoregions		Deciduous forest		Grassland
	Water		Evergreen forest		Hay/pasture
	Developed		Mixed forest		Cultivated crops
	Barren		Shrubland		Permanent crops

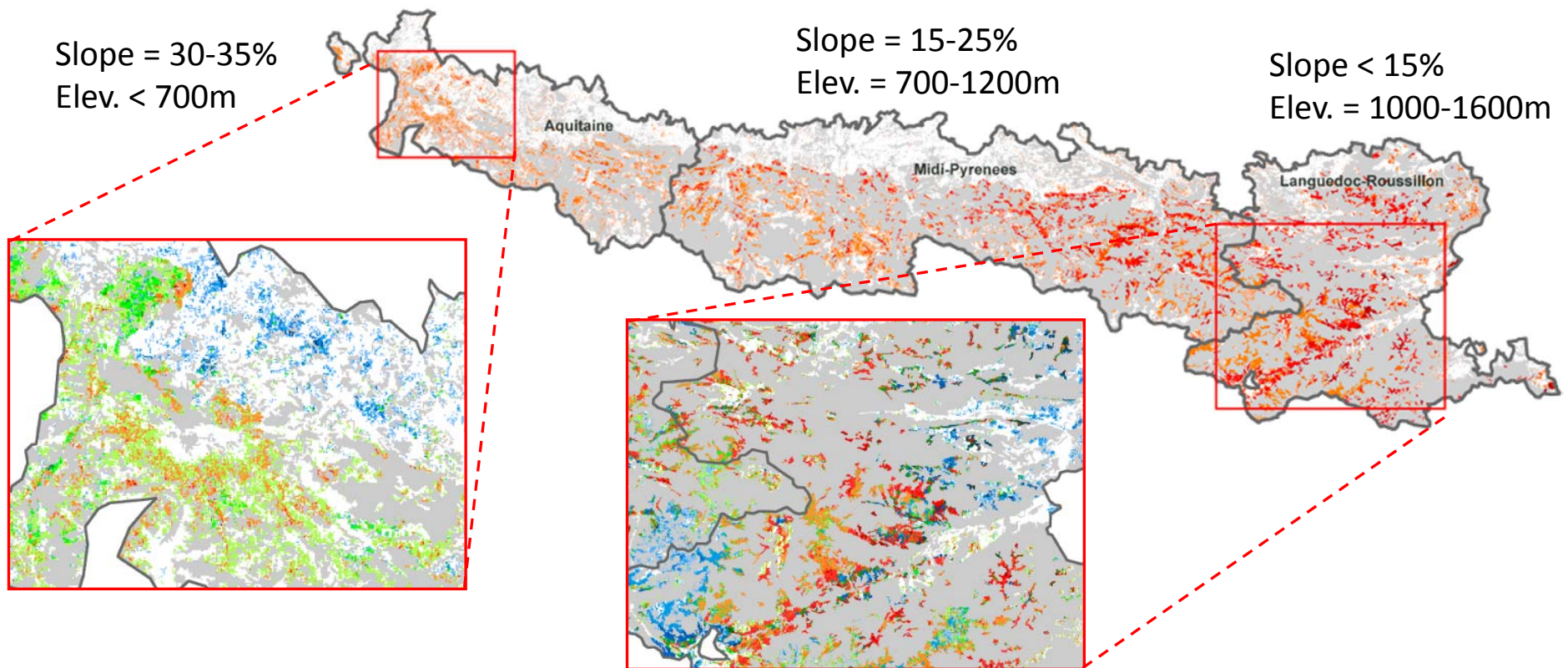


Source : IPCC SRES





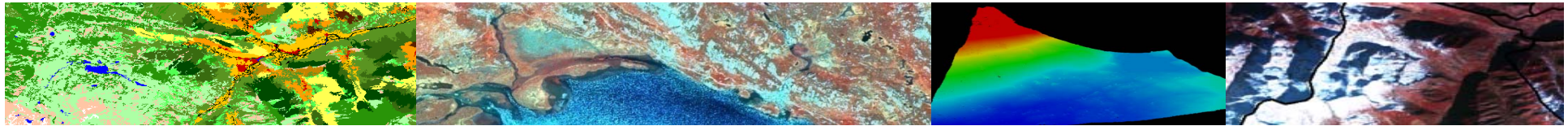
- **Areas** subjected to **encroachment and reforestation** dynamics in all scenarios
- **Highest rates** : productivity highly dependent on **socio-economic context + environmental and climatic conditions**



Low enclosure probability

High enclosure probability





Conclusion partielle

Une fermeture inéluctable du bas d'estives dans les Pyrénées centrales / orientales

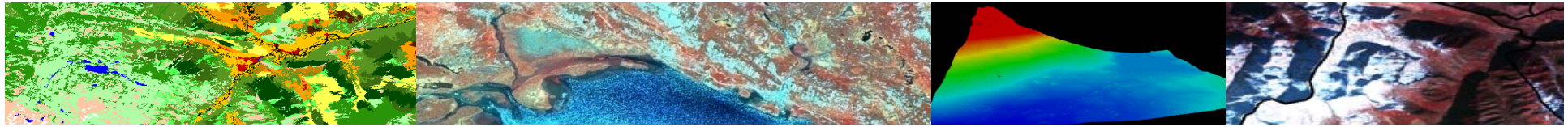
→ Est-ce grave ?

Evaluation des impacts des SES, perception des changements par les usagers, risques ...

Apporter des connaissances pour aider les décideurs à choisir leur modèle de développement futur qui tienne compte des spécificités locales

→ Etape suivante ?

Co-construction de scénarios pour évaluer des essais de modèles de développement (usages des sols)



Conclusion

De multiples méthodes, un seul objectif (éclairer l'action présente)

Des enjeux scientifiques forts en matière de

- méthodes de validation
- méthodes d'évaluation des impacts sociaux et environnementaux

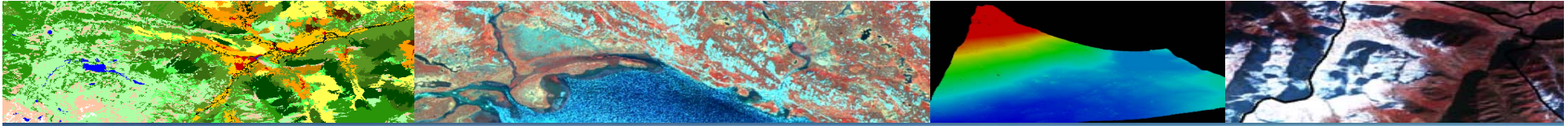
Des enjeux pédagogiques (formation)

Ecole Thématique du LABEX DRIIHM – "SCEMSITE"

Scénarisations, modélisations et simulations
spatialisées pour le territoire

6 au 11 mars 2016 à Puy-Saint-Vincent (05 – Hautes Alpes)





Merci de votre attention

