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## The project of Zone Atelier Pyrenees-Garonne (ZA PYGAR) Pyrénées-Garonne LTSER

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### ► To cite this version:

Jl Prosbtt, Annie Ouin, Sandra Beranger, Simon Blanchet, Julien Cucherousset, et al.. The project of Zone Atelier Pyrenees-Garonne (ZA PYGAR) Pyrénées-Garonne LTSER. International Long Term Ecological Research Network- Zones Ateliers & Critical Zone Observatory Networks (LTER-France), Oct 2017, Nantes, France. 2017. hal-01659265

**HAL Id: hal-01659265**

**<https://univ-tlse2.hal.science/hal-01659265>**

Submitted on 8 Dec 2017

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### Session in which your presentation proposal fits\*:

- Decision making, management and adaptive governance
- Social-ecological system (SES) research, or “Putting the “S” in LTSER
- Global initiatives
- Biogeochemical cycles
- Biodiversity and ecosystem services
- Environmental risks
- Poster session: Sensors and analytical tools
- Free poster session

### SUMMARY

#### The project of Zone Atelier Pyrenees-Garonne (ZA PYGAR)

Probst JL, Ouin A. *and the team project*: Beranger S, Blanchet S, Cucherousset J, Darrozes J, Deconchat M, Dejoux JF, Del Corso JP, Delire C, Delmas F, Duru M, Galop D, Gibert M, Hautefeuille F, Heintz W, Hewinson M., Jamoneau A, Lerigoleur E, Macary F, Polidori L, Schrive C, Sheeren D, Stevens V, Tabacchi E, Valdeyron N, Valette P

LTSER “Zone Atelier PYGAR” (labelling in progress) – CNRS-INEE, EcoLab, Campus ENSAT, Avenue de l’Agrobiopole, Auzeville Tolosane - 31320 Castanet Tolosan – France.

The ZA PYGAR project aims at studying the spatial dynamics of socio-ecological systems (SES) in South-Western France, going from the Pyrenees mountains to the plains of the Garonne river basin. PYGAR tries to answer three main scientific questions: 1/ What are the respective contributions of climate change and local anthropogenic disturbances to ecosystem changes (biodiversity, bio-physical characteristics)? 2/ How human practices drive ecosystem services? 3/ What are the relationships between resources availability and their accessibility, and the historic and prehistoric human population structure? The main transversal question of PYGAR is the adaption and response time of the different SES to global changes. The SES are studied at different time scales from the last glacial maximum to the present-day.

PYGAR clusters 17 Labs (40 full-time permanent staffs: 23 researchers/professors & 17 engineers/technicians) from Toulouse and Bordeaux, supported by the University of Toulouse and several French research organisms (CNRS, INRA, IRSTEA, IRD, CNES, BRGM, Météo France). Socio-economic partners (companies, farmer’s associations...) and public services (Occitania Region, Water Agency...) are strongly interested in the project. PYGAR includes 4 territories (sites ateliers): the central Pyrenees mountain range, the Garonne River, the agricultural hills and valleys of the Gascogne region and the Viaur-Aveyron river basin. The theory of SES provides a valuable tool to set up an interdisciplinary approach to deal with the co-evolution and resilience of the social and ecological templates of the studied systems facing global changes (climate change and land cover).

#### KEYWORDS

Agriculture, Biodiversity, Mountains, Resilience, River water

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**French LTSER ZA PYGAR – CNRS-INEE, EcoLab, Campus ENSAT, Avenue de l’Agrobiopole, Auzeville Tolosane - 31320 Castanet Tolosan – France.**

### GEOGRAPHIC LOCATION

The ZA PYGAR covers the whole Garonne river basin up to the upper part of the Gironde estuary, at La Reole station.

**Sites Ateliers :**  
 AV -Aveyron Viar,  
 AFG - Axe Fluvial Garonne,  
 VCG - Vallées et Coteaux de Gasconne,  
 PYR -Massif Pyrénéen Garonne amont)

Within this territory, research is structured around 4 main sites: the Pyrenees, covering the upstream part of the Garonne basin (PYR), the eastern part of the Valleys and hills of Gascony (VCG), the Garonne Fluvial Axis (AFG) and the Aveyron and Viar river basins (AV). The natural link between two mountainous massifs, the Pyrenees and the Massif Central, and the large Garonne river basin located at their foot, provides a unique opportunity to study the question of continuity/discontinuity between upstream and downstream.



### CONTEXT AND OBJECTIVES

The main objective of the ZA PYGAR is to study the spatial and temporal dynamics of socio-ecological systems (SES). PYGAR focuses on the interactions (nature and kinetic) between the socio-system and the ecosystem, incorporating spatial transitions along an upstream-downstream gradient, from the Pyrenees and the Massif Central to the Garonne floodplain. Transitions of scale and spatial modelling are supported by the expertise in remote sensing of participating teams. The SES are studied over different time scales, from the last Glacial Maximum to the present-day. More specifically, the objectives of PYGAR are :

- to quantify the responses of ecosystems and socio-ecosystems to global change
- to understand complex processes within these systems over the long term
- to acquire data for theoretical modeling and to parameterize and validate these models
- to provide a platform for collaborative studies and to promote interdisciplinary research
- to generate data and a better understanding of socio-ecological systems for decision-making and management
- to develop scenarios to support the implementation of policies within the domain of the environment

### MAIN SCIENTIFIC QUESTIONS

The simultaneous study of these systems provides a quantification of adaptation and response time of these SES to global change. The resilience of SES, that is, their capacity to resist a perturbation or to change their state, constitutes the main transversal question of the ZA PYGAR.

The ZA PYGAR teams address 3 scientific questions situated at the interface between the socio-economic system and the ecosystem.

- What is the respective contribution of climate change and socio-economic activities to the modification of biodiversity and ecosystem functioning ?

**Climate Changes**

**Pastoralism**

**Soil Cover**

*Results of OHM « Pyrénées Haut-Videssos (INEE-CNRS)*

- What are the interactions between human practices and ecosystem services ?

**Negative effect**

*Pollination by wild and domestic bees*

*Agricultural practices such as pest regulation with pesticides*

- What are the relationships between resource availability, resource access and the structure of the human population over historic and pre-historic time scales?

- ### RESEARCH GROUPS
- AGIR, UMR INRA-INPT
  - AMIS, UMR CNRS-UT3
  - BRGM, Dir Rég. MiPy
  - CESBIO, UMR CNRS-IRD-CNES-UT3
  - CEFS, UMRA INRA
  - CNRM-GAME, UMR CNRS-Météo Fr.
  - DYNAFOR, UMR INRA-INPT
  - EABX, UR IRSTEA,
  - ECOLAB, UMR CNRS-UT3-INPT
  - EDB, UMR CNRS-UT3-ENF
  - ETBX, UR IRSTEA
  - GEODE, UMR CNRS-UT2
  - GET, UMR CNRS-UT3-IRD
  - LEREPS, UMRMA UT1-IEP-ENFA-UT2
  - ODR, US INRA
  - SETE, UMR CNRS-UT3
  - TRACES, UMR CNRS-UT2-MCC

- ### SOCIO-ECONOMIC PARTNERS
- Company of Gascony Hills development (CACG)
  - Farmers' Grouping of Toulousian Gascony (GAGT)
  - Acceptables Avenirs Company
  - ADICT Solutions Company
  - EDF Group
  - VEOLIA Company
  - Pyrenees National Park (PNP)
  - French Water Agency (AEAG)
  - French Agency for Biodiversity (ONEMA)
  - DRAAF, DREAL, SMEAG
  - Occitania Regional Council
  - Departmental Councils
  - Toulouse Metropole
  - Dptal Agricultural Chambers
  - National Botanical Academy ...

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