4 pages TASTE

WP2: Land use assessment in Rural Europe

Land use change
Rural development
European regions
Land use management

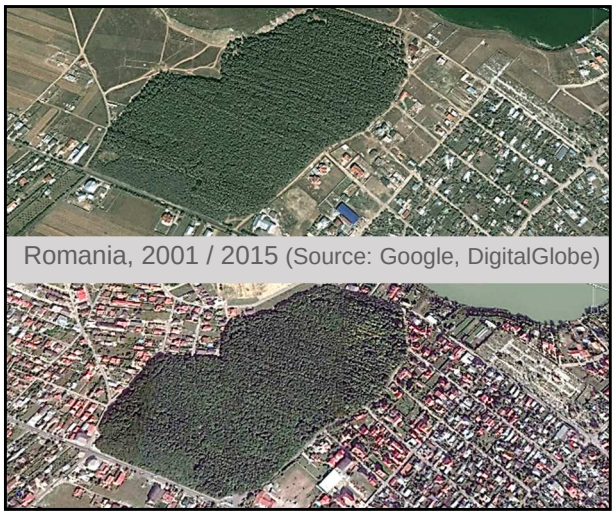
- Socio-economic changes in rural and peri-urban areas are leading to changes in the way the population consider, use and valorize land. They raise concerns when some human activities are compromised by the lack of available land or when land use conflicts are resulting from these evolutions.

- What are the main land competition issues in rural areas due to the recent evolutions in the European regions?

- Rather than one common trend, the spatial rearrangement of land use activities is creating a variety of land use management issues at the regional level, leading to various regional and territorial challenges all over Europe.

Main topics

- **In terms of land use changes**: to which extent are land use changes a common process concerning the whole European Union ? What are the shared trends and what are the specific ones ?
- **In terms of land use competition**: to which extent land use changes raise concerns at the regional level for the impacted activities?
- **In terms of land use management:** is it possible to identify the main risks due to land use competition? What is the potential for a valorization of local resources, useful to overcome this risk, based on land use competition assessment ?



Romania, 2001 / 2015 (Source: Google, DigitalGlobe)

Contribution to smart development

Smart development policies aim at enhancing **social and territorial cohesion**, while supporting **economic development** (European Commission, 2010), through the implementation of **smart specialization strategies at the regional level**. These strategies are based on the identification of the **unique characteristics and assets** which determine **regional competitive advantages** (Naldi et al., 2015). The necessity of **not developing one-fits-at-all regional policy models** is crucial to promote **place-based and knowledge-based policies**.

In line with this approach, land use studies help to identify the **types of challenges that regions, and moreover rural localities are facing** in terms of land uses and **the specific resources** they can use to overcome them. Our results demonstrate that:

- **Land uses shares vary through space and time** across European rural and peri-urban areas, but the structure of the differences between European regions is quite stable for the studied period.
- **Dynamics of local land use specialization** are observed through the increasing intensity of land use in the most suitable areas (more permanent culture or arable lands, less pasture; less unused and unprotected natural areas), while a farming withdrawal is usually observed in the less suitable places (more pasture or heterogeneous agricultural area). **Dynamics of land use diversification** (expansion of residential area transformed into rural and agricultural areas, expansion of protected area transformed into urbanized regions) creates new opportunities of development but also new risks of competition.

Team leader

André TORRE, University Paris Saclay / INRA,
torre@agroparistech.fr

Team

Ségolène DARLY, University Paris 8 Vincennes Saint-Denis, Umr LADYSS,
segolene.darly@univ-paris8.fr
Camille OLLIVIER, University Paris Saclay / INRA,
camille.ollivier@inra.fr
André TORRE, University Paris Saclay / INRA,
torre@agroparistech.fr

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A four-steps method

1) Bibliographic analysis

The first step has been a literature review of the studies on land use, land use changes, land use competition and land use conflict, as well as a survey of the available database for the European territory.

Literature analysis

Literature review on land use changes in Europe during the last decades reveals the following major items : assessment of land competition figures, rural functions in expansion, models of land use changes, land use conflicts, and potential for synergy between land functions, based on Land Use Land Cover Change (LULCC).

Database assessment (see Fig. 1)

Assessment of the available indicators at the NUTS 2/3 level to quantify the current changes in land functions from 1990 to 2012. Main sources: ESPON, European Environmental Agency, National dataset, UMS-RIATE, IUCN-WPDA, Eurostat.

2) Study of land uses in 2012, and of Land Use Land Cover Changes (LULCC) between 1990 and 2012

In order to assess the current situation, a descriptive analysis of land use and land cover has been performed through the harmonization of datasets at NUTS 2/3 level. First we studied land uses in 2012 at the European, national and regional level. Then we performed a calculation of the regional surfaces of the following Land Cover Flows (LCF):

- Residential sprawl on agricultural land
- Residential sprawl on forested and semi-natural land
- New economic activity sites or new infrastructures agricultural land
- Creation of new economic activity sites or new infrastructures on forested and semi-natural lands
- Deforestation due to agricultural land expansion
- Afforestation due to agricultural land withdrawal
- Intensification of agriculture practices
- Extensification of agriculture practices

The analysis of the changes location was made with a concentration analysis of each LCF for each period. Finally, our results have been completed by and assessment of the protected areas development at the regional level, on farmlands and forested or natural lands.

3) Assessment of land competition at the regional level

Methodology for land use competition assessment

Regional clustering based on land use data (in % of the regional surface in 2000 for 5 land uses) and LCFs for 2000-2006 (in % of the total regional surface of change). The clustering method is based on a Multiple Component Analysis in order to create uncorrelated discriminative data, and then on a Hierarchical Clustering Analysis to identify the main regional patterns.

Trend in land use competition

Comparison of the cluster average for each LCF for the period 2000 - 2006 (valued used to build the typology) with data for the periods 1990 - 2000 and 2006 - 2012. It only includes countries with available data for the three periods.

4) Proposal for smart land use management principles

Linking land competition with territorial development

Results are studied in the light of other socio-economic data, in order to evaluate the societal stakes behind land use changes: demographic trend, sectoral evolution of primary productive activities, development of protective measures.

Proposing land use management principles

We used our results to identify smart development principles, based on the following two hypothesis, :

- Too many incompatible uses is harmful (land use conflicts, impossibility to launch joint projects, uneasy joint development expectations).
- A territory whose land is fully dedicated to a single use is quite vulnerable to major changes (major concerns, lack of alternative solutions in case of climate changes or economic crises for example).

Ref.	Cat.	Ind.	Def.	Spatial coverage	Time coverage	Source	URL	LULC 1
UMS RIATE	SOC	Population	Total population	NUTSX level (NUTS 2 AND 3)	1990-2011	UMS-RIATE / ESPON Db	Population Totale 1990-2011.xls	Residential use
CLC	LULC	Artificial, non-agricultural vegetated areas	Green urban areas (leisure park, sport equipment), private garden	NUTSX level (NUTS 2 AND 3)	1990-2006	EEA	Pivot table _eeea	Infrastructure or other economic activities

Figure n° 1. Assessment of existing dataset useful to evaluate land use competition in Europe

A unique table has been created in order to asses all datasets available at the European scale

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Results

1) The evolution of Regional land uses in Europe. Literature review (Fig. 2)

Land use competition is a global issue, with a fear for land shortage due to land degradation, pollution and conversion. However, **in Europe, land use dynamics are specific**: the deforestation is limited, while it is a major global concern, and farmlands are reducing both because of artificialization and due to a farming withdrawal.

Land uses at stake in Europe

Like in the rest of the world, the **urban expansion provokes soil sealing**, especially of **farmlands,** but also of **forested lands**, all over Europe. Rural areas are also reshaped by **intensification of farming activities**, associated with **farming withdrawal** dynamics in the less suitable areas. The **forested surface is in expansion** for Europe but **deforestation** occurs in some places. The **implementation of protective measures is permanent** among all Europe, leading to modifications or even limitations of the human activities development according to their environmental impact. Finally the **touristic activities are expanding** in Europe, especially in rural places and near natural amenities.

Land use competition figures

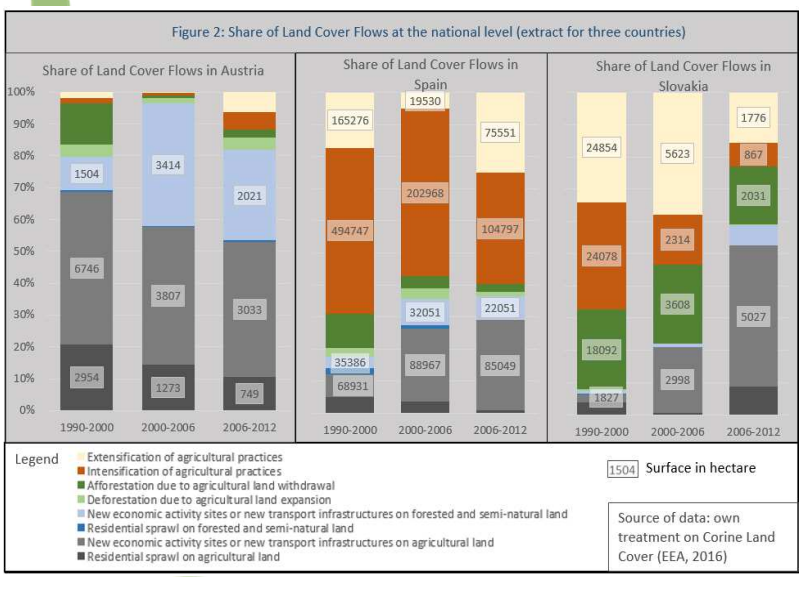
The place of farming activities near urban areas in expansion, and within expanding protected areas to a minor extent are the major figures of land competition in rural areas. **The place of natural lands is limited by expanding urban areas but also in intensively cultivated regions.** Touristic activities are drivers of urban expansion near natural sites, but could also be a support for financing the creation of protected areas, this double impact illustrating the complex interactions between human activities in rural and peri-urban areas. Spatial evolutions are inducing **social, environmental, political and economic changes** which **could lead to a co-development of involved activities despite spatial competition**.

Future challenges expected

The development of **bioenergy** crops and of **renewable energy** are considered as a potential economic development path for rural areas, but they are also a new factor for land competition. Changes in food consumption patterns and demographic changes support a focus **of farming practices and productions** as a crucial issue in the coming decades.

2) Evolution of European land use processes through space and time (based on LULCC Analysis)

The main land use changes observed in Europe by LULCC analysis are in line with the literature. However, their intensity (surfaces of changes) and geography (location of changes) evolve through time, as shown on Fig. 2, illustrated with three examples.



3) Variation of Land use competition figures through space and time (based on a clustering procedure of LULCC data, Spatialized results in Fig. 3)

Land competition evaluated by the eviction of natural and cultivated lands

- **The replacement of naturals areas is limited** in Europe. Close to the biggest cities, the forested land are often protected and valorised for leisure, while cultivated lands are available for city expansion. In the forested, mountainous and coastal areas, where available space is limited, forested lands are also undergoing artificialisation process or local deforestation.

- **Farmlands are converted for building energy, transport or economic infrastructures** in most of the regions studied. Large residential sprawl occurs mainly within densely populated areas (Netherlands, West Germany, Belgium, London area), coastal areas or regions close to large cities. However converted surfaces of farmlands are increasing in more rural and sparsely populated regions, especially in France and Poland.

Land competition evaluated by the intensification of land uses

When land competition is strong, each piece of land is used to get the most of the function expected (mainly dense urban areas, intensive farming practices, protected lands).

- **Most of the cultivated areas have accomplished the intensification and modernisation transition of farming practices.** However, in some places trends are still visible through the intensification of farming practices and the deforestation of forested lands in the most suitable lands for farming (Spanish rural region).

- **Most of the natural areas are concentrated on forested lands** near the urbanized places, or in places with a high natural amenity value (mountains, specific landscapes). Farmlands are more and more included within protected areas. These natural and forested protected lands are increasing in surfaces and differentiated from left-aside unmanaged spaces.

Absence of land competition

- **Some regions are characterized by small surfaces of changes**, or a farming withdrawal, indicating rather an absence of land pressure than a land competition, especially Bulgaria and Latvia between 1990 and 2000.

Figure n° 2. Share of land cover flows at the national level (sample for 3 countries on 3 time periods)

Between countries and European regions, the process reshaping the rural areas vary according to the places and the time periods

Results: land use changes and smart development principles

Smart land use management issues based on land competition pattern

Issues raised by land use diversification (too many incompatible uses is a factor of vulnerability for territorial development). For example:

- **Residential development near the natural amenities of some forested regions** (blue in Fig. 3). New opportunities of valorization of rural resources but increase of spatial pressure on accessible lands (slow and continuous conversion of farmlands and forests to other land uses).
- **Rural areas with a diffuse spatial pressure** (yellow in Fig. 3). They appear to be the most diversified areas in terms of land use but also of land use changes, revealing a diversity of interactions.

Discussion of the European land use management targets in the light of smart principles of land use management

European target : limiting farmland conversion. Conversions are partly resulting from rural development (roads, development of economic activities) and partly due to residential sprawl. Farmland conversions are not restricted to the most urbanized region and both "rural" and "agricultural regions with a diffuse spatial pressure" are following a common trend of regional development associated to urban expansion. The challenge is then to look for new development paths for rural and peri-urban areas, in order to support their development without creating similar land use context than in "regions under urban influence with land competition", where the space for forested land and farming activities is highly limited.

European target : enhancing environmental quality and biodiversity conservation. The current development of protected areas, in order to improve biodiversity conservation in Europe, is mainly performed on natural and forested areas, without including cultivated lands. Thus, in agricultural regions, a large share of the regional space is left-out of the environmental protective measures because of the land cover (ex.: in the French Mayenne Region, more than 80% of the territory is covered by farmlands, only 11% of which being included in a protected area in 2012).

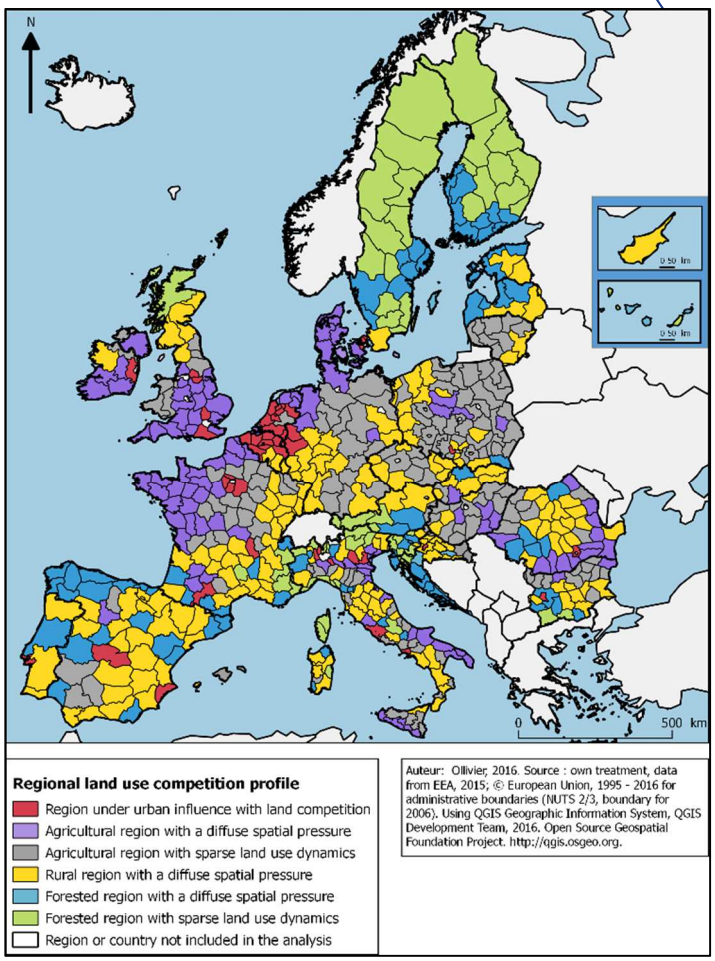


Figure n° 3. Regional typology of land use competition in rural Europe, based on the results of the hierarchical clustering procedure

To go further ...

- *OLLIVIER, C., DARLY, S., TORRE, A, (2016). Report on spatial and social figures of land use competition in the European rural and peri-urban regions, based on a bibliographic analysis, WP2, TASTE Project, France, Collection WP Report*
- *OLLIVIER, C., DARLY, S., TORRE, A, (2016). Land use competition assessment in European regions: data and methods, WP2, TASTE Project, France, Collection WP Report*
- *OLLIVIER, C., DARLY, S., TORRE, A, (2016). Land use management in rural Europe: a new regional typology for a smart development strategy, WP2, TASTE Project, France, Collection WP Report*

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For further information about the TASTE Project :
taste-smarteurope.eu

Contacts :
TASTE Author(s) : Camille OLLIVIER – camille.ollivier@inra.fr
Scientific Coordinator : André TORRE (INRA)- torre@agroparistech.fr
Project Manager : Frédéric WALLET (INRA)- wallet@agroparistech.fr

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