

# Landscape heritage and sustainable development in a border region of Hungary

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## 1. Abstract

Landscape functions reflect the goods and services provided by regions, highlighting the cultural, economic and environmental factors. As a complex assessment method, a landscape function analysis can reveal the state of the pillars of sustainability, analyse the potentials, resources and limits of landscapes and land use systems and thus provide a basis for reaching balanced and effective rural development.

As study area we chose a peripheric, rural micro-region located along the Hungarian-Slovakian border including settlements of Ipolyvece, Patak, Nagyoroszi, Horpács, Hont, Drégelypalánk. The region is rich in natural and cultural values, large part of the area belongs to Börzsöny, from North as the Hungarian-Slovakian border we find the Ipoly river as one of the most natural rivers in Hungary. The successful rural areas are able to preserve the ecological value of the landscape and at the same time, provide appropriate income for the population. To highlight the connection of landscape functions, landscape heritage and rural development, we have chosen a peripheric micro-region rich in cultural and natural values.

Using wide range of indicators we analysed ecological value, agriculture, forestry, tourism, aesthetics, accessibility, and economic value. The landscape function analysis revealed the conflicts, limits of landscape resources and where certain landscape functions can be considered lower than the appropriate level. Natural and cultural assets are unevenly distributed in the area, tourism and the traditional but shrinking high added value fruit production can contribute to increase the income level of the population which is crucial for maintain the population retention capacity of the region.

## 2. Introduction

Landscape functions reflect the goods and services provided by regions, highlighting the cultural, economic and environmental factors. As a complex assessment method, a landscape function analysis can reveal the state of the pillars of sustainability, analyse the potentials, resources and limits of landscapes and land use systems and thus provide a basis for reaching balanced and effective rural development.

In rural regions for sustainable landscape management and rural development is extremely important to analyze the level of landscape functions as in rural regions people still live from the goods of the landscape (agriculture, tourism), or people have chosen rural settlements for living because of the quality of the environment (Gómez-Sal, 2003).

Recently the terms of ecosystem services and landscape functions became popular terminologies within the scientific community. Term of ecosystem services was originally designed for the assessment of (semi-)natural ecosystems (Costanza et al. 1997), while the approach of landscape functions originated from landscape ecology and planning (Bastian et al., 2006; De Groot and Hein 2007).

Ehrlich and Ehrlich (1981) were the first to mention ecosystem services and COSTANZA et al. in 1997 assessed the economic value of ecosystems. There are a number of options to group assets offered by nature, very often the next being an advanced version of the previous one, thus so much similar to one other (de Groot, 1992, 2006; Costanza et al., 1997; MEA, 2005).

The term of landscape functions has been developed parallel with the term of ecosystem services in other scientific field. This concept as an integrative framework establishes the connection between natural, economic, social sciences and policy sectors. So landscape services are more often defined as ‘the capacity of the landscape to provide goods and services that satisfy human needs, directly or indirectly’ (Willemsen et al., 2010). Bastian (1997) grouped landscape functions according to the three pillars of sustainability, as, production (economic), anthropocentric (society) and regulatory (ecological) functions.

Rural regions in all over the world are facing rural decline, decreasing employment, depopulation, economic depression, low income level due to industrialisation and urbanisation processes (Li et al., 2019), but it is widely accepted that “Rural is not synonymous with agriculture and is not synonymous with economic stagnation” (OECD, 2006) anymore. By utilizing immobile assets, many rural areas have diversified their economies beyond agriculture for example based on tourism (Randelli and Martellozzo, 2019). Our rural landscapes are generally the most important food production places, but at the same time rural landscapes need to fulfil important social/cultural and landscape/nature protection functions as well (EEC, 1992) in order to maintain their population. This diversity is reflected in high level of wide range of landscape functions.

Rural regions face often population decline despite the landscape diversity, landscape values. Especially peripheric situation hinders the full utilization of endogenous resources. In the study area we try to describe the spatial distribution/differences of landscape functions and reveal the gaps furthermore find solutions for development based on the endogenous potentials.

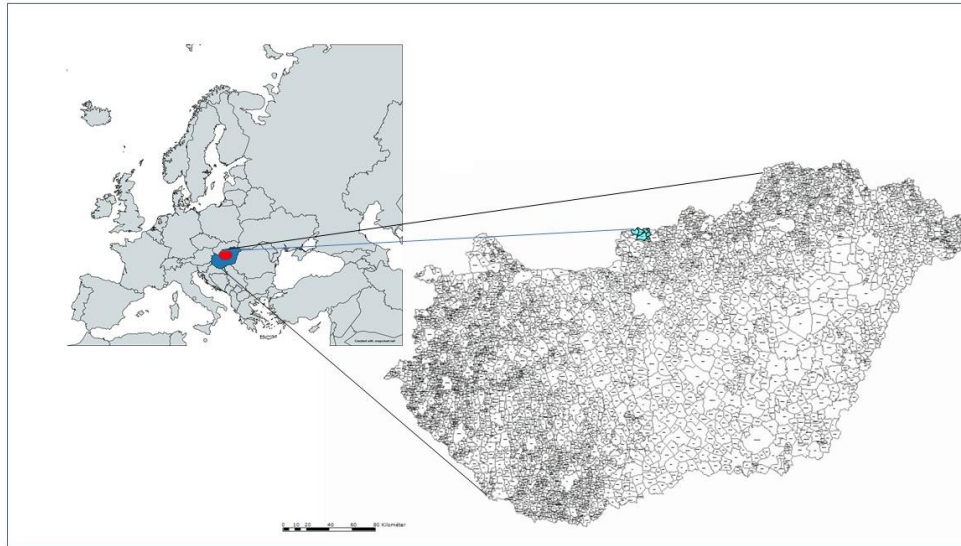
Our research focus on the following objectives: to explore/define cultural and natural values, and their spatial distribution; to assess the land use changes, to reveal stable, and the least changed land use forms in the region; to analyse the landscape-ecologic and economic characteristics of the selected micro-region through landscape function assessment method; based on the complex assessment to highlight the gaps and imbalances of the region as a base of the appropriate strategic rural development approach.

The research was started in a student workshop organized by the Department of Landscape Protection and Reclamation and the Department of Landscape Planning and Regional Development, at the Hungarian University of Agriculture and Life Sciences (former Szent István University) in 2019. During the student workshop, data collection, GIS processing and analyses were carried out with the supervision of the editors of the landscape protection and development study (Hubayné et al. 2021).

### **3. Method and Data**

As study area we chose a micro-region located along the Hungarian-Slovakian border including

settlements of Ipolyvece, Patak, Nagyoroszi, Horpács, Hont, Drégelypalánk. The settlements are villages with less than 1000 inhabitants with the exception of Nagyoroszi (2000 inhabitant) and Drégelypalánk (1400). The region lies along an important transit corridor, road Nr. 2 causing several environmental problems in the settlements. To ease the environmental pressure a motorway is planned (M2) connecting Budapest with the border. Considering landscape character types, largest part of the area is forested, homogeneous mid-mountain landscape, and foothills of the Börzsöny. Arable, mosaic like, hilly landscape with watercourses and forest patches is found in the area in Patak, Horpács and Nagyoroszi. Characteristic and ecologically valuable part of the area is dominated by waters, located in the valley of the Ipoly river running along the border.



**Figure 1. Location of the study area along the Hungarian-Slovakian border**

Net domestic income per capita in the region is well below the national average. The region is losing population since 1990, the outmigration is high compared to the national average (HSO).

The region is rich in civil organizations, several local programs, events are organized. Considering regional development the Local Leader Action Group (Ipolymenti Palócok) diversify local economy through EU co-funded small scale projects, Western-Nógrád Regional Development Association help farmers, fruit producers to use innovative production methods. The Ipoly-Landscape Association tries to build partnership between Slovakian and Hungarian settlements. In spite of the fact that the region is located along the Slovakian-Hungarian border, the municipalities do not have strong relations with the neighboring country's settlements. Sugárkankalin Tourist Association is one of the most active organization in the region diversifying tourism services, forming regional identity. The "Heritage Trail" greenway connects the most important cultural and natural values of the region. The future cross-border cooperation hopefully will be boosted by the growing number of bridges connecting the countries over the Ipoly river.

The analysis of landscape heritage was based on historical maps (military maps 1782, 1842, 1941) and maps from 1990 and present state (Google Earth) and GIS databases, as well as on surveys and data collection from the study area. In the frames of a student workshop we had field trips mapping conflicts and valuable natural and cultural elements and we interviewed the stakeholders of the local population.

To define the landscape-changing tendencies, we analyzed with GIS methods the military maps.

We paid special attention to the “lost” land use forms such as water surfaces, wetlands and to the analysis of green infrastructure change. Based on desktop study (website TÉKA - [Inventory of Landscape Values] websites of the settlements, historical maps) and on field survey we defined and collected the natural and cultural heritage elements of the study area. After using the available databases on the spot we looked for the heritage elements, mapped them, made photos and described the state of them. The landscape heritage inventory was assessed by GIS methods (density analysis). Using wide range of indicators we analyzed ecological value, production, tourism, aesthetics, accessibility and economic value (Table 1.). First we aggregated the spatial data on settlement level. The values of our indicators varied between rather different scales, so we harmonized them into a common dimension.

<b>Landscape function</b>	<b>Indicators</b>	<b>Database</b>
Accessibility	Number of bus lines, distance in kilometers to the railway station, length of cycle paths and distance from Budapest	TEIR
Economic value	Number of enterprises per 1000 inhabitants Business tax Net income per inhabitant Share of taxpayers	TEIR
Ecological value	Share of nature reserves (Danube-Ipoly National Park) Share of Natura 2000 sites Share of National Ecological Network Share of Ramsar sites	TIR TEIR
Production value (agriculture)	Share of entrepreneurs registered in agriculture Share of agricultural land Land users and land used by type of farming	AMÖ, 2010
Aesthetic value	Share of different landscape character types (natural land cover, varied land surface higher scores)	National Landscape Character Map
Tourism and recreation	Presence and density of hiking trails, presence of greenways, number of accommodation facilities, number and importance of values, landscape heritage, number of overnight stays	Tourist maps TÉKA TEIR

**Table 1. Applied indicators reflecting different landscape functions**

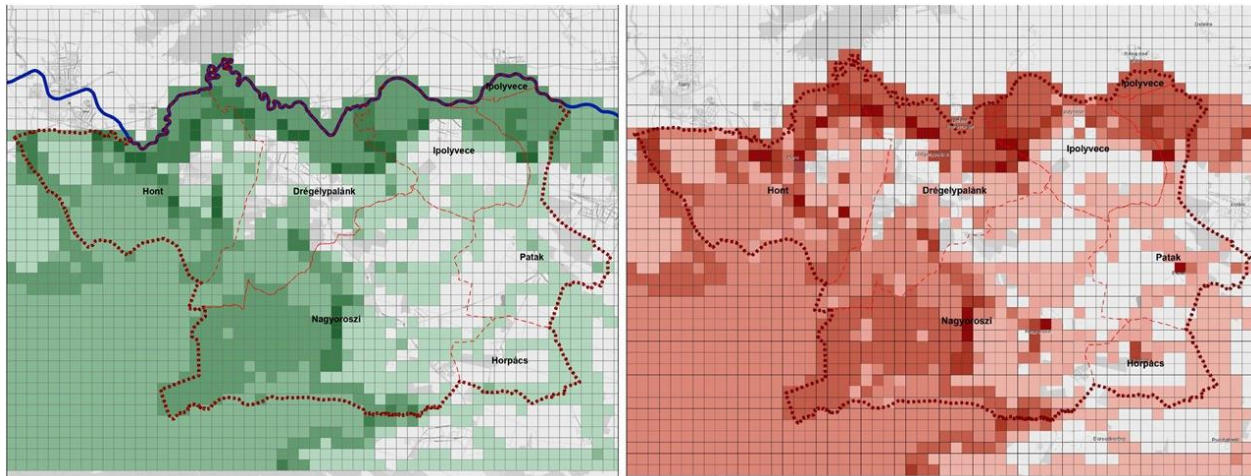
#### 4. Results

The results of landscape function analysis draw specific spatial structure of the landscape. The analysis reflect the landscape conditions: especially the ecological, aesthetical focused analysis follow the characteristics of the landscape. The functions which reflect mostly economic focus, such as tourism, economy often do not overlap with the results of ecological and aesthetical functions.

##### 4.1.Landscape heritage

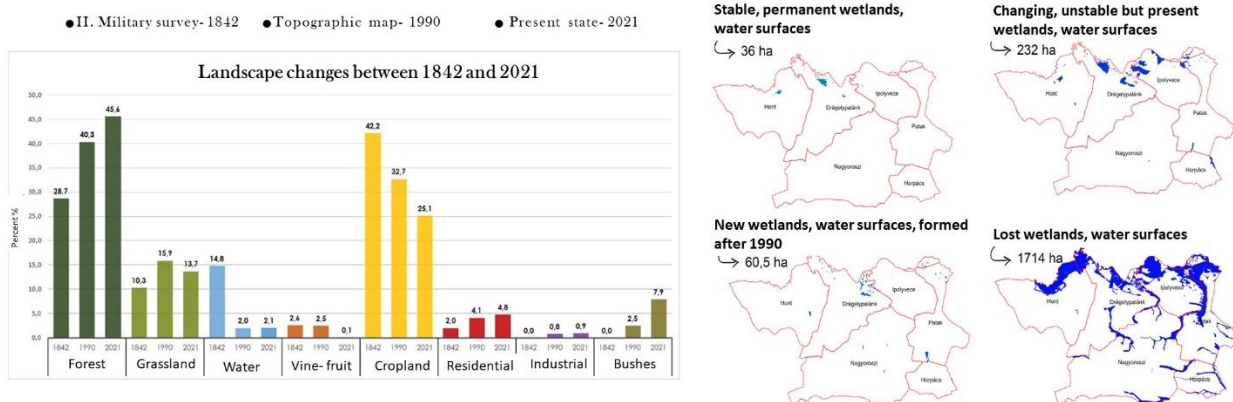
We mapped the spatial distribution of landscape heritage assets (natural assets, built heritage and unique landscape assets), revealing the spatial differences (Figure 2 a-b). The values are mainly concentrated in the centres of the settlements and on the edges of the foothills, mainly due to the high number of built heritage. Natural, ecological values mostly are concentrated Börzsöny (forested area) and along river Ipoly with ecologically valuable grasslands. Among the municipalities surveyed, Hont has the highest number of cultural and historical values, while the

highest number of individual landscape values is found in Nagyoroszi.



**Figure 2. a, Spatial distribution and density of natural values; b, Spatial distribution and density of all kind of landscape heritage (The darker colours show the number of heritage elements in a grid between 1-11**

Considering landscape changes for forest, grassland, residential, industrial/agricultural and scrubland, there was a remarkable increase from 1842 to 2021, for water, orchard-vineyard and arable land, there was a drastic decrease. (Figure 3a) In spite of the changes, the proportion of land uses that have been constant and stable for 180 years compared to the national average is high, 52%, and these historical land uses also represent a value to be preserved.

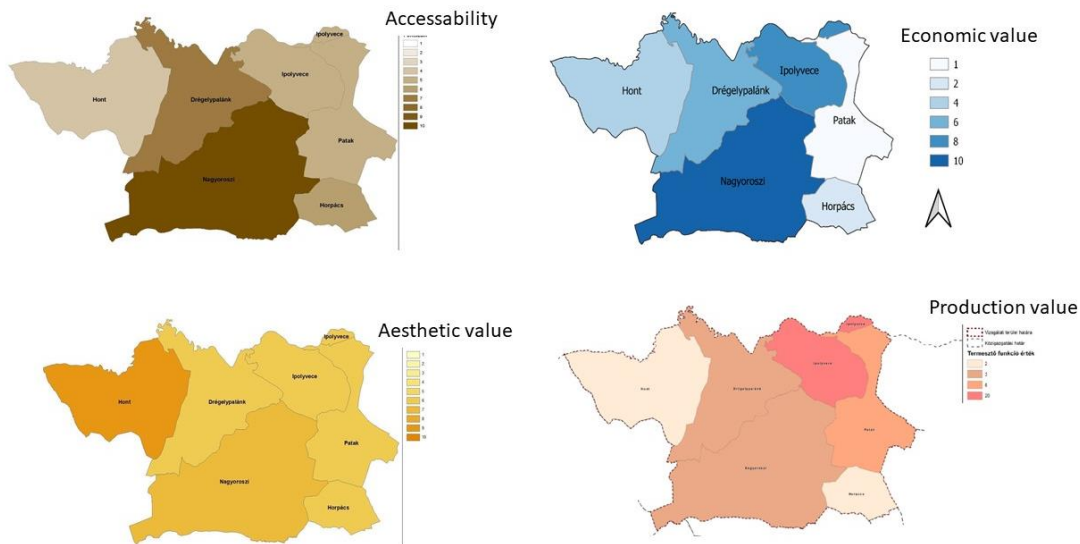


**Figure 3. a Trends of land use changes in the region, b, Stable, new and lost wetlands, water surfaces**

Wetlands represent an important ecological asset of the region, unfortunately negative trends affected wetlands in the basin area where croplands characteristic (Figure 3, b).

The landscape function analysis revealed spatial differences from different point of view. In terms of accessibility, Nagyoroszi is in the most favorable position. Drégelypalánk had high scores, but the other municipalities are not in such a good position. In terms of economic landscape function Nagyoroszi is economically the strongest, followed by Ipolyvece in second place, Drégelypalánk in third. Considering ecological landscape function Hont had the highest value, followed by Drégelypalánk and Ipolyvece. The retreating wetlands affected those basin areas next to Ipoly where more intensive cultivation is dominant. We analysed production function based on registered agricultural enterprises and the proportion of cultivated land, and on the number of livestock.

Reflecting the landscape conditions Ipolyvece and Patak had the highest values (Figure 4).



**Figure 4. Landscape functions in the region**

The aesthetic perception of landscapes can be subjective, in our evaluation we rated those landscape types higher where more natural land cover and varied topography dominate. We looked at the percentage of each landscape character type within a settlement. The highest scores were obtained for Nagyoroszi and Hont.

Analysing the tourist attractiveness of the municipalities, the lowest scores were given to Patak, and Ipolyvece, higher values were given to Hont, Nagyoroszi, Horpács, and Drégelypalánk. There is a large difference in the level of tourist attractiveness of the municipalities. The assessment shows that all the municipalities need to be developed, but that they have a lot of development potential.

## 5. Discussion and Conclusion

The landscape function analysis revealed the differences, limits of landscape resources and where certain landscape functions can be considered lower than the appropriate level. Natural and cultural assets are unevenly distributed in the area, tourism and the traditional but shrinking high added value fruit production can contribute to increase the income level of the population which is crucial for maintain the population retention capacity of the region. There are strong relations between landscape functions, accessibility and income level of the population. The subregion which economy is based on agriculture had lower income level. The low rates of intensive horticulture furthermore the low level of processing of agricultural products and a limited scale of complementary activities and income reduces the profitability of agriculture. Horticulture has long traditions here, but recently the volume is shrinking and due to climate changes the old vplant varieties do not work anymore, so innovative technologies, new varieties should be used, developed, offering higher added value and offering job opportunities in the region.

Strong correlation between accessibility and economic value, so accessibility especially in the peripheric parts, furthermore cross-border cooperation should be developed. The development of the M2 motorway is expected to improve accessibility and economic potential significantly, but its presence and cumulative effects may cause a deterioration of landscape/natural potential and environmental status.

The attraction of the natural environment and tourism can be an important base of the economy of the micro-region, but due to the lack of tourism infrastructure, tourism do not provide appropriate income level. Businesses built around the exploitation of the landscape resources (e.g., tourism services using local agricultural products and accommodation) can lead to the development of the region and create new jobs. However, values mean not just potential but limits as well, soft, small scale development is necessary to protect the traditional landscape character. That's why the establishment and development of small-scale industries in Nagyoroszi, or in other municipalities with lower vulnerability of landscape resources is important. Especially the development of effectiveness and added value of agriculture would improve the economic situation of municipalities. Furthermore the micro-region does not really utilize its strategic location along the Slovakian border, so promoting cross-border cooperation with neighboring Slovakian municipalities (Kukovič, 2018) and take advantage of easier trade with the neighboring country.

It is obvious that in many cases high environmental-natural potential does not result in economic development. Our results repeat the conclusion of former studies e.g. the sustainability analysis of Slovenian Karst landscape (Ribeiro, 2021), that this is due to poorly targeted regional and rural development policies. For the better use of landscape potential we call for more professional foundation of these policy documents by detailed landscape management guidelines based on landscape function analysis. Based on the different landscape function levels in our study area focused, diversified rural development would be necessary, harmonizing the ecologic, social and economic aspects considering also the landscape conditions. This needs rural development policy responding to the spatial development trends and differences following the landscape conditions using synergies and regional or systematic initiatives in spite of isolated projects. The problem is that rural development is too fragmented in the study region, the Leader which is a more complex program covers much wider region, the other local organizations mostly focus on specific topics, or settlement and mostly they lack financial resources.

Rural development can be effective based on the strong, active, cooperative local communities because they are assumed to have an increased capacity to respond to external challenges (Flora and Flora, 2003; Murphy, 2007). Capable local communities can mobilize and reach full utilization of endogenous resources. Enhancing the inner and outer cooperation is important to overcome the peripheric situation. In the case of our study area, stronger regional relations and cross-border international relations will be necessary to enhance the local economy based on tourism (Börzsöny, Ipoly valley), agriculture (Patak, Ipolyvece, Horpács) and other economic sectors with the center of Nagyoroszi.

## **7. References**

- Bastian, O. (1997): Gedanken zur Bewertung von Landschaftsfunktionen – unter besonderer Berücksichtigung der Habitatfunktion, Schnevedingen, Germany: Alfred Toepfer Akademie für Naturschutz.
- Bastian, O., Krönert, R., Lipský, Z. (2006): Landscape Diagnosis on Different Space and Time Scales – A Challenge for Landscape Planning, Landscape Ecology April, Volume 21, Issue 3.
- Costanza, R., Arge d', R., Groot de, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P., Belt van den, M. (1997): "The Value of the

- World's Ecosystem Services and Natural Capital,". *Nature*, 387: 253–260.
- de Groot, R. (2006): Function-analysis and valuation as a tool to assess land use conflicts in planning for sustainable, multi-functional landscapes. *Landscape and Urban Planning* 75
- de Groot, R., Hein, L. (2007): "Concept and Valuation of Landscape Functions at Different Scales". In Mander, Ü., Wiggering, H. and Helming, K. (eds): *Multifunctional Land Use*. Berlin Heidelberg New York: Springer, pp. 15–36.
- de Groot, R.S. (1992): *Functions of Nature: Evaluation of Nature in Environmental Planning, Management and Decision Making*. Wolters-Noordhoff, Groningen, pp. 315 .
- de Groot, R.S., Wilson, M., Boumans, R. (2002): A typology for the description, classification and valuation of Ecosystem Functions. *Goods Services Econ*. Volume 41 Issue 3 pp. 393–408.
- Ehrlich, P.R., Ehrlich, A. H. (1981): *Interaction Among Landscape Elements: A Core of Landscape Ecology*. New York: Random House.
- Gómez-Sal A., Belmontes J.-A., Nicolau J.-M. (2003): Assessing landscape values: a proposal for a multidimensional conceptual model In: *Ecological modelling* 168 (2003) 319-341
- Flora C., Flora J. (2003): D. Brown, L. Swanson (Eds.), *Challenges for Rural America in the Twenty First Century*, Penn. State University Press, University Park, PA, pp. 214-227
- Hubayné Horváth Nóra, Zsolt Szilvácsku, Edina Dancsokné Fóris, László Kollányi, Krisztina Filepné Kovács, Ildikó Módosné Bugyi, Dalma Varga and Ágnes Sallay (eds.), *A tervezett M2 autópálya határmenti térségének tájvédelmi és tájfejlesztési tanulmányterve / Landscape protection and development plan of the border region of the planned M2 motorway made on student workshop*, Hungarian University of Agriculture and Life Sciences, Institute of Landscape Architecture and Urbanism and Garden Art Budapest, 2021.
- HSO. Hungarian Statistical Office, [www.ksh.hu](http://www.ksh.hu)
- Kukovič, S.; Haček, M. Cross-Border Cooperation as a Tool of Escaping Crisis Conditions in Slovenia. *Transylv. Rev. Adm. Sci.* 2018, 53, 54–66
- Murphy, B.L. (2007): Locating social capital in resilient community-level emergency management In: *Nat. Hazards*, 41 (2007), pp. 297-315
- OECD (2006) : *The New Rural Paradigm: Policies and Governance*, OECD Publications, Paris
- Randelli, F. Martellozzo F. (2019): Is rural tourism-induced built-up growth a threat for the sustainability of rural areas? The case study of Tuscany In: *Land Use Policy*, 86, pp. 387-398
- Ribeiro, D.; Zorn, M. (2021): Sustainability and Slovenian Karst Landscapes: Evaluation of a Low Karst Plain. *Sustainability* 2021, 13, 1655.
- TEIR–National Regional Development and Spatial Planning Information System, <https://teir.vati.hu/>
- Willemen, L., Hein, L., van Mensvoort, M.E.F., Verburg, P.H. (2010): Space for people, plants, and livestock? Quantifying interactions among multiple landscape functions in a Dutch rural region. *Ecological Indicators* Volume 10 pp. 62-73.
- Y. Li, H. Westlund, Y. Liu (2019): Why some rural areas decline while some others not: An overview of rural evolution in the world In : *J. Rural Stud.*, 68, pp. 135-143,