

<abstract> SATURN (System and sustainable Approach to virTuous interaction of Urban and Rural LaNdsapes) is a pan European EIT Climate-KIC project including three different pilot areas in the city-regions of Birmingham (UK), Trentino (IT), Göteborg (SWE). European urban areas are expanding, thus leading to controversial growth dynamics, and to unbalanced relations between urban and rural landscapes. Therefore, landscape becomes physically fragmented. For this reason, the European Landscape Convention (2000) urges parties to adopt more integrated approaches and to introduce holistic landscape-scale strategies within regional development policy-making processes in order to incorporate ecological and socio-cultural features and better adapt to climate change. SATURN aims to increase landscape multifunctionality and integration that are needed to better respond to climate emergency by addressing air quality, food and water security, and sustainable land uses. In the paper we will propose an analysis of the present European landscape and we will briefly describe the SATURN project, together with the context of the three hubs. The discussion then moves to the challenges contemporary landscape and territories are posing us, and how the three hubs are dealing with the topic of landscape fragmentation in relation with food security issues and through research into practice cooperation with local stakeholders.

Keywords: landscape design, territorial governance, urban and rural areas, fragmentation, adaptation

<title> The SATURN Pan European project: cross-border and cross-practice approaches for urban/rural linkages towards climate adaptation

<head1> Introduction

This contribution comes from the experience of the pan European EIT Climate-KIC joint project SATURN (System and sustainable Approach to virTuous interaction of Urban and Rural LaNdsapes). The project moves from the observation that climate strategies and management of cities and surrounding landscapes are fragmented and incomplete due to the controversial and separate dynamics of the built and natural growth. The aim is to find ways to reconnect urban and rural landscapes and develop new ways of managing peri-urban landscapes.

The project focuses on three pilot areas in different European city-regions named as ‘hubs’: Birmingham in the UK, Trentino in Italy and Göteborg in Sweden. The hubs participate through local institutions, universities and research institutions. Project partners share experiences, knowledge and develop new ways of working based on a number of local case studies.

At the heart of SATURN’s research is a conviction that innovative ideas to increase landscapes multifunctionality and integration will help us respond to the climate emergency. By increasing awareness of the multiple characters and qualities of the landscape, SATURN will also help local and regional administrations meet the 2030 UN Sustainable Development Goals (UN, 2015), and respond to the 2020 State and Outlook of the European Environment (EEA, 2019).

The SATURN project relies on the diversity of its three partners, located in southern, western and northern Europe. The hubs represent three cities of different sizes and their surrounding rural

landscapes: Trento in northern Italy, Birmingham in the central United Kingdom and Göteborg in western Sweden.

The Trentino hub is made up of three territories: the Municipality of Trento, a 117 thousand inhabitants city (capital of the namesake province), the Municipality of Pergine Valsugana and the Community of Piana Rotaliana-Königsberg. The territory is mainly mountainous and is crossed by two valleys: the Adige valley, where Trento and Rotaliana are located, and the Valsugana valley where Pergine Valsugana, the largest village in the valley, is situated. The two hubs of Birmingham and Göteborg are, in contrast, large industrial centres and the second most populous cities in their respective countries. Birmingham, in the UK West Midlands, has about 4 million inhabitants. Located on an uplifted sandstone plateau that contains the headwaters of one of the major river systems in the UK, it is characterized by complex geology, rich industrial heritage, post-industrial urban sprawl and rolling landscape. The Swedish city of Göteborg, with around 600,000 inhabitants, is located in the county of Västra Götaland, at the mouth of the river Göta älv and is surrounded by a vast area of countryside and forests.

What links the three hubs – as well as other European areas – is the fragmentation of the territory in terms of land use, ecological and social connectivity. SATURN focuses on health of the soil and water, the different needs of the stakeholders, social connectivity, local food growing, water cleansing policies, ecological connectivity, and landscape multi-functionality.

The diverse perspectives gained from SATURN's hubs, their respective characteristics and scales, are enabling us to explore problems and share possible solutions in a replicable way in different contexts. Among the challenges shared by the three territories, the most urgent is to address the climate crisis at the urban and territorial scales in terms of its impact on food production, urban adaptation and mitigation processes, biomass production and carbon sequestration and to reconnect the urban with the rural, as well as people to natural contexts.

<head2> **Background**

<head2.1> **Context**

The global population has been growing since the Agricultural Revolution with an exponential increase worldwide in the past sixty years; it is expected that by 2050 it will reach 9.8 billion people (Roser et al., 2020). The increase in population has important implications such as increased needs in food supply or to provide adequate housing. At European level, the answer to the housing shortage and population's growth after the Second World War resulted in the expansion of medium and small

urban centres across the continent (Piorr et al., 2011). The diffusion and expansion of intermediate urban regions across the continent, despite of not being comparable with other areas of the world, make Europe an 'urban continent' where the great majority of the population lives in urban or peri-urban areas.

Most of the European continental territory is covered by "middle landscapes" or "hybrid geographies", areas where urban and rural landscapes are intertwined in a complex territorial structure. This hybridization process is the result of a two-fold direction as urban areas expanded in the countryside while rural areas occupied the leftovers of fragmented urbanization (Ulrich et al., 2010). The process has been fostered by the multiplication of towns and urban nodes following the development of transport infrastructures on a continent that has a relatively high and distributed population density. The 'peri-urbanization' of these areas is the fastest land-use change at the European level (Piorr et al., 2011) and puts the urban-rural fringes under intense pressure.

<head2.2> Challenges

The problems associated with the territory surrounding a city are numerous and, to a certain extent, well known. It has a confused identity. To some it is a type of land use (such as intensive urbanization process, urban sprawl, fragmented landscape, loss of biodiversity). Urban fringe theory sees it as a 'divide' between city and countryside while the sprawl approach considers it as the dynamic and fast transformation of rural land into urban land. It is referred to as peri-urban or semi-urban areas. An important literature review from 2008 by Steven Meeus and Hubert Gulinck from the University of Leuven identified the lack of clear and precise definition of such areas and addressed how this lack of clarity also affects town and regional planning policy frameworks.ⁱⁱ (Meeus and Gulinck, 2008).

As cities expand, the surrounding landscape becomes physically fragmented, threatening natural systems and the loss of habitats. To counter this, the European Landscape Convention (2000) (article 9) urges parties to encourage a more integrated approach, declaring "The Parties shall encourage transfrontier co-operation on local and regional level and, wherever necessary, prepare and implement joint landscape programmes." (ELC, 2000)

The challenges, however, also relate to spatial and governance structures. The lack of an adequate vision, strategy, plan or integrated planning tools to deal with the interface between urban and rural areas creates the segregated landscape, fragmentation between ecosystems and conflicts between the diverse land-uses and stakeholders. The requirements of numerous functions such as agriculture, industrial or commercial zones and residential areas are difficult and complex to

combine without having an agreed overall ambition. Institutionally, by splitting planning responsibilities between municipalities or metropolitan areas, between different sectoral agencies and even between different professional departments, make it almost impossible to have any overview of the territory, its value and its potential.

Peri-urban settlements and landscapes are generally poorly planned. The constant threat and disruption of natural ecosystems remains, there are unmanaged commuting fluxes, an ever-increasing reduction in the soils capacity to deal with water replenishment and food production and increasingly difficult water management issues. Lack of holistic landscape policies often cause policymakers to adopt zoning and rigid functional separation as main drivers for territorial plans enhancing biodiversity reduction and social segregation in complex contexts such as peri-urban areas. The fragmentation of regions is partly based on specific economic interests of certain metropolitan areas which often leave rural and urban surroundings outside of the greater interest (Wandl and Magoni, 2017). In this sense, the Alpine areas of Europe are a paradigmatic example of these profound changes. With a complex topography, the effects of uncontrolled and scattered development of urban-rural areas have a great impact on an already fragile territory. We need to re-conceptualize the relations between urban and rural areas in order to recognize their full potential to face the challenges posed to us by climate change and to better include them in spatial planning measures.

<head2.3> **Aim of SATURN**

At a strategic level, lack of identity and fragmentation underpins the drive to integrate environmental strategies in landscape planning and management, as well as to encourage communities to become far more aware of the process of growing food, understanding its traditions and culture, where it comes from and its significance to the local economy.

It also underpins the drive to create, through the integration of existing relict areas, a continuous network of natural or semi-natural ecosystem units capable of performing the functional roles necessary for complex ecosystems.

As the crisis of climate change increases and a large part of the scientific community recognizes the fact that a city's surroundings have good potential for food growing, climate mitigation or carbon sequestration, we are becoming aware that there are in fact very limited mechanisms available to develop a strategic approach that could capitalise on this resource and build better relations between urban and rural areas, let alone challenge existing governance and institutional processes.

SATURN aims to address this complexity of interrelated issues. Investigating the potential of broader and more holistic visions to support the futureproofing of urban-rural regions across Europe. It is considering the potential of cross-scalar, and trans-disciplinary actions, strategies and decision-making processes to manage peri-urban hybrid landscapes, testing the development of strategic visions and innovative plans capable of accommodating a diversity of land uses and stakeholders, enhancing social and ecological connectivity and supporting multi-functional uses of the landscape. We are also examining the value of working across borders and practices particularly the lessons learned from and between the different hubs.

The following section focuses on initial findings based on food growing networks, the quantification of nature and the potential of these territories to address climate change.

<head3>**R-Urban Food Cycle potential**

In recent decades we seem to have forgotten many fundamental needs for our survival, such as operating food systems, with its multiple stakeholders, issues and interests. A food system is complex. It includes biological processes and agrobiodiversity as well as the physical infrastructure required to feed the population, growing, harvesting, processing, packaging, transporting, marketing, consumption as well as the disposal of food and food-related items. It includes the inputs needed and outputs generated by each of these steps. A food system operates within and is influenced by social, political, economic and environmental contexts and requires human resources to provide labour, research and education. Food production is related to human activities, is closely connected to the natural ecosystem and depends on biodiversity. For example, the pollination of fruit trees takes place thanks to insects but if the survival of insects is put at risk due to human actions, a fundamental component of the food supply chain is missing. For this and for many other reasons it is important that a connection occurs – and it is preserved – physically and conceptually, literally and as an idea, between rural and urban areas. The level of fragmentation of the territory needs to decrease so that ecological corridors useful for animals and plants for their survival are also enhanced. People need to become more aware of where food comes from.

In most European areas, farming and breeding do not take biodiversity and ecological connectivity aspects into account and the excessive quantities of chemicals become a serious threat for rural ecosystems. It is only relatively recently that we have recognised how seriously agriculture has negatively transformed the landscape and its eco-mosaics. And as the natural environment becomes increasingly distant from people, both spatially and mentally, interest in the health of natural ecosystems has waned; both factors exacerbate the disconnection between urban and rural areas.

Yet collective awareness of these issues is growing across Europe. In the Trentino region for example, in response to a popular initiative referendum, the authorities introduced incentives to encourage producers to switch from conventional cultivation to organic techniques. If adopted more widely, it could be part of the SATURN project's collection of best practices. The emergence of this and many other grassroots initiatives indicate a momentum to reverse planning trends and ensure that food production becomes a vehicle to reconnect urban and rural populations and territories, both physically and conceptually. It is a great example of the response to calls from UN-Habitat, ICLEI and others, for “a new ‘green mosaic’ connecting rural to urban areas through open spaces for recreation, biodiversity (including urban forests and horticulture) that provide many economic, social and environmental co-benefits” (FAO, 2011).

Different initiatives to develop urban and peri-urban agriculture are being investigated to evaluate and analyse their potential contribution to more holistic landscape strategies. As noted by FAO (2011) we are finding that food production can be utilised as a recognisable connection between citizens and ecological systems, where urban and rural landscapes and stakeholders interact as complementary parts of the food system (FAO, 2011) and recognise that it is important to take into account the socio-cultural connections are as important as ecological and physical connections. In all of the hubs, it is found that by enhancing the consciousness of citizens about environmental issues including food, ecology, natural capital, water and soil a new perception and vision of the landscape can be created.

The three SATURN hubs in Göteborg, Trentino, and Birmingham each focused on a particular element of the interaction between people and the landscape: Göteborg focused on sustainable approaches to farming; Trentino explored policy development; and Birmingham examined social farms, garden networks and the role of spatial visions. Research at the three hubs has common elements: for example, mapping the territory was among the first activities in Birmingham, Trento and Göteborg, to understand the materiality of the place and its potential, the quality of connections its shortfalls including measuring existing landscape fragmentation.

<head4>Facing climate challenges potential

To introduce a holistic landscape-scale approach which incorporates ecological and socio-cultural features is necessary in order to adapt to climate change. Neff et. al. have pointed out that most regional economic strategies tend to overlook the role and contribution of the landscape; a state he describes as a “blind spot” (Deltametropolis, 2016). However, the current procurement processes, policies and regulations concerning the climate strategies and the landscape, tend to follow

conventional frameworks instead of innovative methods that would allow for new project processes to arise and embed ideas and policy about climate adaptation and mitigation (Nikologianni, 2019). Thankfully, as Nefs notes, the “soft stakeholders”, like landscape, heritage and quality of life are gaining importance on the political agenda (Deltametropolis, 2016).

The latest literature highlights the importance of policy and legislation in large scale strategies calling for “a new, alternative framework able to fully embed the concepts of sustainability, environmental instability quality of space and economic - social benefits” (Nikologianni, 2017). Even though issues such as climate adaptation and mitigation are now starting to be recognized and widely discussed, the legislation in place is not as up to date as it should be considering the significance of the environmental problems we face (Clapp, 2015). It is recognised, however, that sustainable solutions such as the reuse of materials and spaces as well as the resource recovery will become necessary soon, even if there is currently little implementation on such aspects, especially in rural and peri-urban areas (Capodaglio, 2017).

<head4.1> Quantifying nature?

Over the last decades, human action has transformed the natural eco-mosaics almost completely, fragmenting them and leaving only a limited number of relict natural areas (Malcevski et al., 1996). To minimise the physical disconnection of ecological corridors, it has long been argued that it is important to extend natural areas from rural landscapes into cities. This helps species to migrate from one place to another in search for food or shelter helping to maintain and encourage biodiversity, support the environment and agricultural activities to be more resilient and adaptive to climate change.

It is increasingly being recognised that the economic prosperity of cities, regions and nations largely relies on natural capital to provide ecosystem services such as potable water, pollination, goods, etc. By threatening biodiversity conservation and ecosystem functionality, these are compromised and difficult to restore (Cantiani M. G. et al., 2016). Recognising the value of landscape is complicated, not only because it is a complex and misunderstood concept, but also because it is difficult to quantify, although in disciplines like ecology many different indices are used to measure it (Zatelli et al. 2019). The underestimation of the importance of ecosystem services, for the environment and humanity, derives partly from the inability to provide an economic evaluation. Many models exist and are being developed, including through the Naturally Birmingham component of this project with the intention of making it easier for administrations to consider ecosystem services in the creation of plans for the management of the territory.

<head5> **SATURN methodology and initial findings**

<head5.1> **Scalability**

The SATURN methodology is structured according to a process that moves into different steps. Underneath the conceptual framework and the aims above outlined, the investigation started from the direct observation of phenomena, to then formulate hypothesis and test experimental solutions (such as strategic visions, drafting urban policy, urban/rural devices). The aim is to formalize the approach and to outline a set of tools and procedures for the reconnection between rural and urban landscapes.

The diversity between the three hubs will allow for the development of an approach that can be used at several scales within the European territory. If the result is satisfactory, we proceed with the creation of a model, equipped with procedures and tools, which can be potentially replicated and adapted in other contexts. This approach has allowed the SATURN team to identify themes which are common to the three hubs, and thus has supported to outline common problems in very different contexts. An analysis made of the specific characteristics of the three contexts and subsequently, on the basis of what has been observed, provide initial solutions to be tested. This last step also provides for a comparison with territorial realities with similar characteristics: for example, in the Trentino case, a comparison began with the ROBUST project in Prato, in the Tuscany Region, where the reconnection between urban and rural has been tackled. From the comparison of the two projects it was noted that both start from the assumption that the instruments adopted for the distribution of the land, such as the case of the 'Banca della Terra' (literally: the Earth Bank), did not led to the expected results. Starting from this, the two projects were able to offer new solutions which were adopted: the Trentino hub intent is to review and improve existing tools, such as 'Banca della Terra', while the Prato case envisages the divestment of the 'Banca della Terra' experience and adopting new tools. The study of the two projects is ongoing, and once each has been completed the two experiences, and the results achieved, will be analysed.

<head5.2> **Public engagement**

The SATURN pilots aim to tackle cultural issues in raising interest and enhancing citizens' knowledge of the capacity of landscape and local production to mitigate climate change. The different scales through which the SATURN project is implemented range from the very specific farm-scale project developed by the Göteborg hub, to the enhancement of local food cycles and land reuse schemes which are the focus of the pilot of Trento, and finally to the scale of landscape re-significance policies built by the Birmingham hub. The three hubs, moreover, are tackling peri-urban issues through a

multi-sectoral approach covering the enhancement of agroecological techniques to improve urban farming, the support of stakeholders and policy-makers in setting favourable policies for a more balanced urban-rural development; and the implementation of holistic strategies for urban-rural landscapes. A common objective of the three hubs is to shorten the food supply chain accompanied by support for the creation of innovative business models. The shortening of supply chains is encouraged through local food production using cultivation methods which are attentive to sustainability in terms of local environmental, economic and social needs.

The creation of new business models fulfils another SATURN objective, namely the activation of local stakeholders, in particular stakeholders belonging to disadvantaged sections of the population, such as young people, women and at-risk categories including those with physical or mental disabilities. The starting point of this process is given by the identification of excellent business models that can be exported to other contexts. In Trentino, two examples relevant to cultivation techniques were identified: the CS4 Social Cooperative located in Pergine Valsugana and the Foradori business model. In the Swedish hub, researchers identified a 'food lab' which encouraged young people to launch and manage new food businesses. In this case, the model envisaged state-owned territories being made available to young agricultural entrepreneurs with a clause requiring them to participate in farm management and sustainable cultivation technique courses.

The formation of a network of territories and the creation of collaboration between research hubs allow SATURN to study solutions to issues with a common basis, and discover innovative solutions carried out by others that are adaptable and scalable to other contexts.

<head6>Final remarks

The experience conducted so far by the SATURN network suggests that working across borders and practice increases the value of each individual local project thanks to the establishment of a cooperative environment between project partners and the collaboration between different realities resulting in an enriching environment. The perspective of the overall problem is broadened through collaboration, and together helps us understand aspects that had never been considered before. It must also be noted that this work is sometimes very difficult, because of the complexity in putting together different subjects with completely different social, technical and scientific cultural background and approaches. To formulate an example that is limited to the academic environment, some technical concepts that define the meaning and the essence of landscape are apparently very different in the disciplines of ecology, engineering or architecture. Imagine what it happens when the concept is communicated to a broader public that include politicians and decision makers and

problem owners that bring with them a variety of different perceptions and experiences. Nevertheless, the project partners attest that the mutual exchange of experiences, learning by doing and learning from mistakes and from victories, both one's own and others, is fundamental to research at a landscape scale.

The three hubs will continue to undertake activities aimed at improving and enhancing the whole connectivity both among human and natural systems as well as among ecological dynamics - this is the basis of the research activity of SATURN. Starting from this purpose, we are working on mapping and connecting grassroots initiatives through participatory activities and through the creation of multi-stakeholder round tables and living workshops. Particular attention is being paid to the commitment and engagement of young people. Territorial mapping activities will continue and abandoned or unused or transition areas will be mapped and geolocalized. In terms of business development, a land lease model will be formulated to encourage the creation of new activities linked to the agricultural world and food production. To promote innovative and sustainable business models, both from an ecological, social and financial point of view, a guide for the development of skills for ecological entrepreneurs will be drawn up. Starting from a collection of best practices and in collaboration with local administrations, innovative governance models for urban-rural connections will be identified, including the role of regional spatial visions. As regards human connections, activities involving young people and tutoring for business development will continue through the pre-development of the business and technology transfer, with particular attention to landscape resources.

Bibliography

Bonari, E., Galli, M., Marracini, E., Lardon, S. and Al, E. (2010). *Agricultural management in peri-urban areas: the experience of an international workshop*. Ghezzano Pi: Felici Editore.

Cantiani M. G., Geitner C., Haida C., Maino F., Tattoni C., Vettorato D., Ciolli M. (2016) *Balancing economic development and environmental conservation for a new governance of Alpine areas*. Sustainability 8(8),802-820, <http://www.mdpi.com/2071-1050/8/8/802/pdf>, doi:10.3390/su8080802

Clapp, J. (2014). *Distant agricultural landscapes*. Sustainability Science, 10(2), pp.305–316.

Council of Europe and Cultural Heritage, Landscape and Spatial Planning Division Directorate of Culture and Cultural and Natural (2000). *European Landscape Convention and reference documents EUROPEAN LANDSCAPE CONVENTION*. [online] Available at: <https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=09000016802f80c6> [Accessed 19 Mar. 2020].

Curry, N., Reed, M., Keech, D., Maye, D. and Kirwan, J. (2014). *Urban agriculture and the policies of the European Union: the need for renewal*. Spanish Journal of Rural Development, pp.91–106.

European Environment Agency (2019). *The European environment - state and outlook 2020: Knowledge for transition to a sustainable Europe*. [pdf] DOI: 10.2800/96749, available at <https://www.eea.europa.eu/publications/soer-2020>. [Accessed 19 Mar. 2020]

FAO Food for the Cities (2011). *Food, Agriculture and Cities: Challenges of food and nutrition security, agriculture and ecosystem management in an urbanizing world*. [pdf] available at http://www.fao.org/fileadmin/templates/FCIT/PDF/FoodAgriCities_Oct2011.pdf. [Accessed 19 Mar. 2020]

Fondazione Edmund Mach (2020). - *SATURN - System and sustainable Approach to virTuous interaction of Urban and Rural LaNdsapes*. [online] Saturn-project.org. Available at: <http://www.saturn-project.org> [Accessed 19 Mar. 2020].

Forster, T. (2011). *Food, Agriculture and Cities Challenges of food and nutrition security, agriculture and ecosystem management in an urbanizing world* FAO Food for the Cities multi-disciplinary initiative position paper. [online] Available at: http://www.fao.org/fileadmin/templates/FCIT/PDF/FoodAgriCities_Oct2011.pdf [Accessed 19 Mar. 2020]

Malcevschi, S., Bisogni, L.G. and Gariboldi, A. (1996). *Reti ecologiche ed interventi di miglioramento ambientale. Ecological networks and habitat restoration: aspetti teorici e schede pratiche*. Milano: Il Verde Editoriale.

Meeus, S.J. and Gulinck, H. (2008). *Semi-Urban Areas in Landscape Research: A Review*. Living Reviews in Landscape Research, 2. Available at: <http://www.livingreviews.org/lrlr-2008-3>. [Accessed 19 Mar. 2020]

Nefs, M. (2016). *BOEK Blind Spot - metropolitan landscape in the global battle for talent* (4/2016, Deltametropolis). [online] Issuu. Available at: https://issuu.com/deltametropool/docs/blindspot_lr_los_3.

Piør A, Ravetz J, Tosics I (2011) *Peri-urbanisation in Europe: Towards a European Policy to sustain Urban-Rural Futures*. University of Copenhagen / Academic Books Life Sciences. 144 p. ISBN: 978- 87-7903-534-8

Ros-Tonen M.A.F., Pouw N.R.M., Bavinck M. (2015). *Governing Beyond Cities: The Urban-Rural Interface*. In book: *Geographies of Urban Governance Advanced Theories, Methods and Practices* (Gupta J., Pfeffer K., Verrest H., Ros-Tonen M. eds.), Springer International Publishers, DOI: 10.1007/978-3-319-21272-2_5

Roser, M. and Ortiz-Ospina, E. (2000). *World Population Growth*. [online] Our World in Data. Available at: <https://ourworldindata.org/world-population-growth>. [Accessed 19 Mar. 2020]

Ulied A., Biosca O., Rodrigo R., (2010). *Urban-rural narratives and spatial trends in Europe: the State of the Question*, URNTE project final report, Mcrit: Barcelona, Spain (for the Spanish ministry for Environment, and Rural and Marine Affairs). Available at: http://81.47.175.201/urban_rural/220710_URBANO_RURAL_ING.pdf

United Nations, General Assembly (21 October 2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. A/RES/70/1, available at <https://undocs.org/en/A/RES/70/1>. [Online Resource]

United Nations, D.o.E.a.S.A., Population Division (2019). *World Urbanization Prospects: The 2018 Revision* (ST/ESA/SER.A/420) New York.

Zatelli, P., Gobbi, S., Tattoni, C., Cantiani, M.G., la Porta, N., Rocchini, D., Zorzi, N., Ciolli, M. (2019). *Relevance of the cell neighborhood size in landscape metrics evaluation and free or open source software implementations. ISPRS International Journal of Geo-Information*, 8(12)586. DOI: 10.3390/ijgi8120586.

ⁱ As described in the ESPON report (Ulrich et al., 2010) at page 50: "Europe is an urbanized continent. It is largely made of "middle landscapes", or "hybrid geographies". "Urban" areas can be found in rather rural landscapes (urban sprawl in major metropolis, large food processing districts, and clusters...), while "rural" areas can be found within urban environments. Therefore, urban and rural areas should be analysed in an integrated manner. This is not to say that the traditional distinction between urban and rural is completely vanished, there are extreme cases: still predominantly rural regions can be clearly recognised (e.g. interior or remote sparsely populated zones in the Iberian or the Scandinavian Peninsula), as well as urban (e.g. small and medium size cities surrounded by countryside)".

ⁱⁱ Meeus, S.J. and Gulinck, H. (2008). Semi-Urban Areas in Landscape Research: A Review. *Living Reviews in Landscape Research*, 2. From the abstract: "Generally, there seems to be a lack of good definitions and frameworks. However, although it is studied often and in various scientific disciplines, the majority of concepts, theories and definitions proposed are underpinned by a resilient dichotomy between rural and urban. [...]"