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Bridging the rural-urban dichotomy in land use science

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ABSTRACT

Rural and urban areas are often conceptualized as two separate entities and studied accordingly. However, in reality, they are related in multiple ways. Here we explore this relation between rural and urban areas from a land use perspective. We argue that land should be characterized along a gradient from rural to urban. Further, we argue that land use along this gradient typically combines both rural and urban functions. Finally, we point at the complex patterns of migration and mobility between different types of settlements, which is a multidirectional process that further blurs the distinction between rural and urban areas. These propositions are supported by examples from recent research and suggest the need for a more inclusive approach towards the analysis of rural and urban land use systems, as well as plans and policies that target these systems.

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1. Introduction

The vast majority of the Earth's land surface can be considered rural, including both agricultural areas and natural areas. These rural areas are the main source for our food, and the key employment and income strategy for many people, especially in the Global South. At the same time, agriculture is directly related to the global decline of biodiversity, as well as a range of other environmental impacts (Clark & Tilman, 2017). Urban areas, in contrast, occupy only a small part of the land surface: Van Vliet et al. (2017) estimated that about 2% of the terrestrial land can be characterized as urban, including both built-up and non-built-up land in urban areas. Yet, these urban areas contain more than half of the global population and this share is expected to increase in the near future (UN-Habitat, 2019). In addition, the vast majority of all economic activities takes place in cities, and cities are responsible for more than 60% of the use of natural resources (UN-Habitat, 2019). Therefore, understanding both rural and urban areas is pivotal towards sustainable land use development.

Our understanding of both rural and urban land systems has increased greatly in recent decades. However, this understanding is typically based on analyses of rural or urban systems in isolation, where one is at best a boundary condition to the other. In this traditional conceptualization, rural areas and urban areas are distinct entities, and their main connections in terms of land use are via flows of agricultural products from rural areas to urban areas (Seto et al., 2012).

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In this paper, we argue that this distinction does not reflect reality, and that rural and urban land use systems need to be studied in conjunction to understand land use change processes as well as to support sustainable development. Specifically, we argue that 1) rural and urban land are two extremes of a gradient with many landscapes being mosaics that combine rural land urban land, 2) locations at different points along the rural-urban gradient provide a range of different land-use functions, and 3) rural and urban areas are inextricably linked through complex migration patterns between different types of settlements and in ways that further blur the distinction between both systems (See Figure 1).

2. The not-so-clear differences between rural and urban land use systems

2.1. A gradient from rural to urban land

Land change analyses often characterize rural and urban areas as mutually exclusive, despite many acknowledgements that in reality there is a gradient between both (e.g., Kroll et al., 2012; Radford & James, 2013). An important contributor to this persistent dichotomy are the land cover maps derived from remote sensing imagery that are underlying a large number of analyses. Remote sensing image classification typically assigns all pixels that are predominantly covered with impervious surface to the class of built-up land, and all other pixels to one or more classes of non-built-up land. Using the increasing availability of remote sensing imagery, a growing body of literature has documented urban development processes based on the conversion of non-built-up areas to built-up areas (e.g., Grădinaru et al., 2015).

On scales that are meaningful for the analysis of land use systems, many locations can be placed somewhere in between both extremes of the conceptual rural-urban gradient. These mosaic landscapes have been referred to, among others, as territories-in-between and as peri-urban areas (Wandl et al., 2014). Peri-urban areas are increasingly important in terms of ongoing land-use change processes. Greater Cairo is a prime example of this process. For example, Salem et al. (2020, this issue) analyze land use change since the 2011 revolution and find that the largest increase in built-up land was observed in the peri-urban areas surrounding Cairo, even though the largest increase in population was observed within the city itself. This process was at least partly driven by high land and house prices in the city, leading to inhabitants looking for residency elsewhere. Another way to look at the mix of rural and urban land is by considering the interface between both, as this will be large in mosaic peri-urban landscapes. An analysis of this interface in the Netherlands shows that a

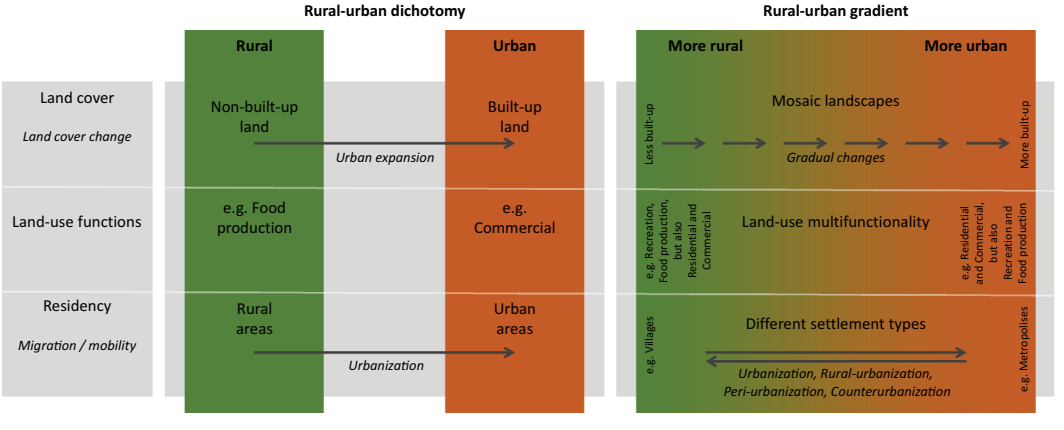

Figure 1. Conceptual differences between the rural-urban dichotomy and the more nuanced representation as a rural-urban land-use gradient. Arrows represent the relations between (more) rural and (more) urban parts of the landscape, while the respective changes are indicated in italic.

very large part of the population lives near this interface (Broitman, 2020, this issue), indicating that the direct environment of this part of the population exists in both rural and urban land.

Peri-urban areas are often in the hinterland of larger cities (Fertner et al., 2016; Vermeiren et al., 2012). Yet, it is increasingly acknowledged that smaller cities and towns, located in otherwise rural areas, play an important role in urban land use development. For example, in China, the development of new built-up land in village landscapes exceeds the development of built-up land in large urban centers between 1990 and 2010 (Li et al., 2019). Consistently, Conrad et al. (2015) found that building area in rural settlements in Uzbekistan increased with about 20% between 2006 and 2011 indicating the importance of urban development outside large city centers. Also in Europe, the majority of the built-up land is found in areas that are predominantly rural, i.e. with more than half of the area categorized as non-built-up areas (Van Vliet et al., 2019). Based on these observations, we argue that pixels with one homogenous land cover type are not the right unit of analysis for these processes and that landscapes should be characterized as heterogeneous units along the rural-urban gradient (see e.g., Schug et al., 2020). These observations thus call for mapping land use systems based on fractional cover as well as with land use intensities, in order to represent and analyze change processes along the rural-urban gradient. An example of this is presented in Wang et al. (2019), who present different classes along the rural-urban gradient. Scenario results thus show a land sparing effect as a result of urban intensification, while urban expansion leads to much larger rural land losses.

2.2. Land use multifunctionality

Land use at a given location is often characterized as monofunctional and associated with the predominant land cover. This focus confirms or even reinforces the perceived separation between rural and urban land, as it suggests different and clearly separable functions. For example, crop production is a land use associated with cropland and thus typical for rural areas. Conversely, commercial land use is associated with built-up land and typical for urban areas. This distinction is reflected in analyses of land use change drivers, as rural land use changes, for example, related to the demand for agricultural products, while urban change is for example, related to economic development. However, in reality, land use multifunctionality is often the rule, rather than the exception (Willemen et al., 2008), and this multifunctionality blurs the line between urban and rural functions.

An important example in which urban functions are provided in otherwise rural landscapes is in recreation, as urban dwellers increasingly visit nearby rural areas for leisure and thus use recreation functions of these landscapes (Zasada et al., 2013). A recent review of peri-urban change processes in Europe even found that changes in land use functions preceded change in land cover about as often as the other way around (Shaw et al., 2020). This suggests not only that rural areas provide essential functions for urban areas but also that change processes along the rural-urban gradient are affected by these functions. The agent-based model adopted by Beckers et al. (2020, this issue) demonstrates the role of especially recreation services on rural land use changes for Belgium. In their scenarios, urban expansion initially leads to a conversion of agricultural parcels. Yet, remaining agricultural land, especially when fragmented and enclosed by urban land, is also increasingly used for hobby farming and other recreational purposes. This effect thus adds to the decline in food production, despite the parcels remaining agricultural in use.

Off-farm employment is another example that illustrates this point, as many off-farm jobs are not related to agricultural production (Barrett et al., 2018). Conversely, agricultural production in urban areas has gained attention recently. Even though the total production is small as compared to predominantly rural areas, it can make important contributions locally (Badami & Ramankutty, 2015). These examples illustrate that multifunctionality often include traditional urban functions in otherwise rural areas and vice-versa. Hence, understanding multiple different land-use functions is required to identify social, economic and ecological drivers that together shape both rural and urban areas.

2.3. Migration as a rural-urban connection

Urbanization, the demographic process by which an increasing share of the population lives in urban areas, is based on a sharp distinction between rural and urban areas by its very definition. In the context of urbanization, migration is typically depicted from rural to urban only, fueled by the availability of employment opportunities as well as other advantages associated with urban areas such as education facilities and health-care services (Sabates-Wheeler et al., 2008). This discourse fits the predominant land use activities in both rural and urban areas: rural areas are mainly agricultural while urban land is used for commercial and industrial purposes, in addition to its residential function.

The complex reality is that migration is not confined to people moving from rural to urban areas, but also includes rural-to-rural, urban-to-urban, and urban-to-rural migration, and that it involves a wider range of drivers than strictly economic ones (Milbourne, 2007). On top of the arbitrary threshold between rural and urban areas, these processes present an intricacy to their traditional distinction based on the principal difference in terms of their land use and associated livelihoods. Migration within rural areas and from urban to rural areas is also often caused by perceived socio-economic advantages of the destination area (Zulu et al., 2011). Moreover, many migrants residing in urban areas retain strong links with their rural origin and transfer remittances. These remittances are often used beyond household subsistence and support investments in, for example, small business enterprises (De Haas, 2006). Conversely, while economic incentives are still the predominant driver for rural-to-urban migration in the Global South, opposite movements have been reported in many regions in the US and Europe, for example, in France (Détang-Dessendre et al., 2008) and Germany (Bernt, 2018). This process of rural urbanization represents a transformation of rural spaces to communities with urban values and lifestyles, often made possible by commuting. In the Global South context, the emergence of small urban service centers often leads to increased number of multi-local households making benefit of both the rural and urban sphere through circular mobility (Ørtenblad et al., 2019). The resultant spatial and socio-economic transformations impact the rural ways of life and influence changes in the rural landscapes. This process contributes to consolidation or abandonment of the agricultural land in pursuit of urban lifestyles, and thus further mixing land use and land use functions.

3. Implications and conclusion

We discussed the relation between rural and urban areas from a land use perspective, and argue that both are strongly related, while this relation is only rarely reflected in land use science. Instead, land use science has traditionally focused on rural areas, while urban areas have mostly been treated as exogenous entities affecting land use directly or indirectly via rural-urban teleconnections (Verburg et al., 2015). Yet, the examples presented in the previous section demonstrate that rural and urban are only two extremes of a rural-urban continuum, and that many regions fall somewhere in between, with mixed land uses, land-use functionalities, livelihoods, and lifestyles. As a result, there is a need for a more inclusive approach to studying land use change processes, where urban land is included as an integral part of the land use matrix.

Consistently, the interconnected nature of rural and urban areas is also relevant for land use planning and policymaking. Although there are large variations between places, urban expansion is usually addressed at the municipal level, and to a lesser degree at the regional and national level (Hersperger et al., 2019). Conversely, agricultural changes are mainly affected by agricultural policies, while agricultural trade is typically included in economic policies, both of which are normally addressed at the national level. Migration is often directly targeted by regional development policies and can be indirectly affected by economic and spatial policies, but also by agricultural policies and related subsidy schemes (Byerlee et al., 2005). These generalizations illustrate that planning and policymaking mostly addresses rural and urban areas separately, under the responsibility of different

administrative levels, and also sometimes by different departments within the same level (e.g., see Ariti et al., 2019 for an elaboration of this phenomena for Ethiopia). This set-up thus ignores the intrinsic relatedness of rural and urban areas. In a Global South context, where small and intermediate urban centers are rapidly emerging in otherwise rural area, this is often reported as a hindrance for fully exploiting the development potentials of rural-urban linkages (Lazaro et al., 2019). We argue that in order to better plan for the complex rural-urban continuum, a comprehensive approach towards planning is required, which would allow addressing the rural–urban relations explicitly. However, while planning is frequently suggested as a tool to control urban development, its effectiveness is not clear (Gallardo & Martínez-Vega, 2016), and neither are potential side-effects of proposed plans (Hersperger et al., 2020, this issue). Moreover, economic strength differs greatly between urban activities and rural ones, hampering such integrated approach. Comprehensive planning – on a level playing field – is only possible in circumstances where institutions are strong and where the value of rural land agricultural activities is acknowledged by and shared among all stakeholders.

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