The Modern Landscapes of the Baltic Macroregion and the Role of Socioeconomic Factors in Their Development

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Abstract

Human occupation, along with natural factors, is a major determinant of the modern landscape genesis on populated territories. In this article, I examine the modern landscapes of the Baltic macroregion. I use a unique method of landscapes zoning. This method consists in the calculation of a synthetic measure—the indicator of the effect of socioeconomic factors on the modern landscape genesis, i.e. of the degree of anthropogenic differentiation of landscapes. It is effective for any territorial unit (NUTS 2 and 3 for the EU countries and the level of a region for Russia). The indicator consists of five components: the average population density, the forest coverage and agricultural land use, the proportion of lands allocated to construction and roads, and the proportion of uncultivated land (bare rocks, sand, wetlands, glaciers, etc.). This study has practical relevance, since it offers a new method of landscape zoning that takes into account the current land use practices and settlement patterns. The zoning of the Baltic macroregion, conducted using the method proposed, shows that the effect of socioeconomic factors on the modern landscape development is heterogeneous. The regions in the north and northeast are affected to a lesser and those in the south and southwest to a greater degree. The latter regions' landscapes are strongly affected by the land use practices and the settlement patterns.

Keywords

Modern landscapes · Baltic macroregion · Landscape genesis · Effect of socioeconomic factors

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Introduction

The extent of human influence on the populated territories' landscapes is such that the understanding of the development of modern landscapes is impossible without taking into account the socioeconomic factors at play. Therefore, modern landscape zoning requires a multiscale approach and it must discriminate among the landscape components of different levels, on the basis of both natural and socioeconomic parameters. The Baltic macroregion is an interesting case for a study into the landscape genesis. Although it is difficult to give an unambiguous definition of the Baltic region or to determine accurately its boundaries due to its considerable diversity, this concept is well-established and traditional and it is widely used in politics, economics, and socioeconomic geography (Klemeshev et al. 2017). Despite the heterogeneity of this territory in both natural and socioeconomic terms, its connection to the Baltic Sea influences all the spheres of life of local and regional communities and thereby facilitates the formation of the Baltic macroregion as a single geographic and geopolitical entity (Fedorov et al. 2017). In a narrow sense, the Baltic region includes the territories of Sweden, Finland, Estonia, Latvia, Lithuania, Denmark, a number of Russian regions (Leningrad, Pskov, Novgorod and Kaliningrad), several Polish voivodeships (Warmian-Masurian, Pomeranian and Western Pomeranian), as well as Germany's lands of Mecklenburg-Western Pomerania and Schleswig-Holstein. Despite its relatively small area, the region boasts a great variety of geographical phenomena, related to both its nature and society. The territory is also rich in borders and barriers of different kinds—national, ethnic, linguistic, and cultural, all of which affect the modern landscape environment.

Theoretical Background

At present, there are two main paradigms in studying the modern landscapes: the physiographic and the cultural ones. Russian landscape studies traditionally opt for physical geography. Within this paradigm, the natural factors that influence landscape formation are thoroughly scrutinised and the problem of human occupation, which is viewed as a factor of landscape transformation, is approached from the perspectives of rational land use and landscape geoecology—both these areas being closely related to physical geography (Isachenko 2008).

The western approach to landscape analysis, on the contrary, has been developing within the cultural paradigm. Since the works of Carl Ortwin Sauer, the landscape has been largely equated with its appearance (Sauer 1925; Keough 2013). Another area of research in the Western geographic literature focuses on the reconstruction of historical (and even archaeological) landscapes, which are associated with the land use and settlement patterns of the past. This field of study is known as "settlement archaeology" (Karro 2010; Rippon 2012). Interestingly, the definition of the term "landscape", offered by the European Landscape Convention,

takes the human perception (i.e. the appearance) of landscapes into account and recognises the need for landscape assessment and the importance of landscape management (Jones 2007).

Different schools offer different views on landscape zoning. In Russia, landscape zoning has a long tradition with a focus on natural components. The most popular concept was developed by A. Isachenko. According to Isachenko (1991), the physiographical, or landscape, zoning includes zonal and azonal components. In the first case, the basic taxonomic unit is the landscape zone and, in the second, the 'physiographical' (or landscape) country (Isachenko 1991). At these levels, landscape zoning reflects the features of natural differentiation. At the regional level, especially in those areas where the natural environment is significantly affected by human activity, the "physiographical" approach to zoning is not effective. The structure and appearance of modern landscapes are affected by the socioeconomic factors and the main landscape-forming systems are the land use practices and settlement patterns.

The applied aspect of Russian landscape studies deals with landscape planning, which, however, has not been enshrined in law. Thus, in Russia, so landscape studies remain a theoretical discipline. Western landscape geography, on the contrary, is closely connected with spatial planning, which is a key tool for rational land use management and has a serious legislative framework. Land use management is closely associated with landscape zoning, since the landscape features (both natural and anthropogenic) determine the uses of territories and their significance for various aspects of environmental management. In Europe, spatial planning defines the land use patterns for each territory, including the rural and urban ones. In each country, spatial planning has its own specific features and depends on many factors. For example, in Bulgaria, agricultural lands are considered a national asset. Thus, changing the type of land use is allowed only in exceptional cases. Spatial zoning is mostly used to give a territory a protection status (Borisov 2015). The Nordic landscape management concept suggests a transition from the understanding of the term "landscape" in line with the definition from the European Landscape Convention ("an area, as perceived by people") to active landscape management (including relevant legislation and spatial management strategies) (Erikstad et al. 2015). The landscape management approach helps to draw up land-use guidelines for landowners and users (decision-makers). This approach requires concrete techniques for identifying and mapping "landscape zones". There are several distinct approaches to determining the main zoning criteria. According to one of them, landforms, ecosystems, and land use patterns can serve as the main zoning criteria. A different approach to mapping modern landscapes was suggested by the developers of the new European landscape classification, which uses digital data on climate, altitude, parent material and land use as determinant factors (Mücher et al. 2010).

Although landscape characteristics have been drawing the attention of both urban planners and landscape architects for a long time [at least since the emergence of the so-called "context theory" and the publication of I. McHarg's *Design with Nature* (McHarg 1969)], the problem of landscape zoning continues to arouse controversy among international researchers.

Methodology

This research aims at working out a model of integrated landscape zoning in the case of a single geographical region. In our opinion, traditional physiographical zoning, which is quite common for Russia, should serve as the basis for integrated landscape zoning, since natural factors prevail at the level of landscape zones and countries. At the same time, at the level of regions, it is vital to take into account the factors of anthropogenic differentiation, which depend entirely on the socioeconomic conditions.

Geographically, most of the countries of the Baltic macroregion have a humid continental climate. The only exceptions are the small areas in the north that belong to the subarctic zone. The Baltic macroregion is situated on the Baltic Shield and the Eastern European platform. The whole area belongs to the region of the last Quaternary glaciation—the Würmian. The region's landscape structure was shaped under the influence of the glacial and post-glacial natural processes. The topography of the Baltic macroregion is dominated by plains with a few relatively recent glacial forms—the terminal moraine uplands and ridges, kames, eskers and sandurs. There are the swampy ancient deltaic lowlands of the Vistula, Neman and Neva Rivers. The most elevated part of the region (the eastern slopes of the Scandinavian Mountains) lies in the north-west.

However, the appearance and structure of landscapes of the same natural genesis may vary because of the anthropogenic transformation of the natural environment. On the populated territories, the modern landscape environment depends directly on to what it has been transformed by human occupation, which in turn is affected by the socioeconomic factors. Landscape changes are thus a result of the land use and settlement patterns. Here, the Baltic macroregion is a good example. The anthropogenic impact on the soils and vegetation is not the same across the regions landscape zones because the territory of the Baltic macroregion is developed and populated rather unevenly. The natural factors of landscape formation prevail on the sparsely populated, almost intact territories. Such territories are typical for the northern part of the region. In other parts, particularly, in the South-West and the South, the densely populated territories betray the history of their anthropogenic transformation.

Thus, the process of landscape zoning on populated territories requires taking into account the factors of not only natural but also anthropogenic differentiation. To rank the territories depending on these factors, I used the indicator of the effect of socioeconomic factors on the landscape genesis (Romanova 2017). This synthetic measure shows the degree of anthropogenic differentiation of landscapes of any territorial unit. The indicator includes five components: the average density of the population, the forest and/or pasture coverage and agricultural use, the proportion of lands allocated to construction and roads, and the proportion of landscapes unaffected by human activity. Each component is measured on a scale from 1 to 5, thus the value of the indicator (the sum of the scores) ranges from 5 to 25. The higher the value of the indicator, the greater is the role of social factors in the landscape genesis.

This methodology does not contradict the existing methods of the landscape, historical-geographical, and cultural-landscape zoning, (Mil'kov and Gvozdetskii 1986; Andreev 2012; Isachenko 2013). On the contrary, it complements them by making it possible to identify the current and projected conditions of landscapes.

The calculation of the effect of the socioeconomic factors on landscape development in populated territories makes it possible to identify new landscape areas. This hierarchical level is confined to one landscape zone of one physiographical country or, in some cases, to one landscape. Therefore, the grid of the new landscape zoning is not used on its own but is superimposed on the existing grid of physiographical zoning. At this level, the patterns of land use and settlement acquire special significance for the landscape genesis and affect the appearance of the modern landscapes. These patterns may have a varying impact on landscape development—this explains why the territories characterised by the same natural features evolve into different landscape areas.

To establish the boundaries of the new landscape areas, one can use the gradient of the calculated synthetic indicator. The gradient of two contiguous administrative units scoring 6 and above suggests that the boundaries of the landscape area coincide with the administrative borders. The gradient of 2 and below suggests that the administrative units separated by administrative borders belong to a single landscape area.

The natural differentiation, which affects the genesis of modern landscapes, which are later exposed to either anthropogenic differentiation or natural evolution. While generally accepting the typological classification of landscapes proposed by A. Isachenko, I am convinced that there is a need for a new typological unit—the landscape subtype. This unit will reflect the degree of anthropogenic transformation of a landscape type. Having analysed the features of anthropogenic differentiation of the environment within each landscape type (for example, a glaciolacustrine plain), I identified the three main subtypes of landscapes. The first subtype comprises relatively natural landscapes. Their appearance is determined by the natural features (the topography, the quaternary deposits and bedrock, etc.). The structure of the composition stages is preserved. The other two subtypes are cultural and artificial landscapes. The former are changed and the latter created in the course of human occupation (Romanova 2017). In the landscape areas where the effect of the socioeconomic factors is insignificant, the relatively natural landscapes dominate. In the areas where the effect of these factors is strong, the prevalent landscapes are cultural and artificial.

Research Results and Discussion

To determine the key factors of landscape development on selected territories, I calculated the indicator of the effect of socioeconomic factors for the countries of the Baltic macroregion and their administrative units (NUTS 2 and 3 for the EU countries and regions for Russia). The areas associated with lower values of the

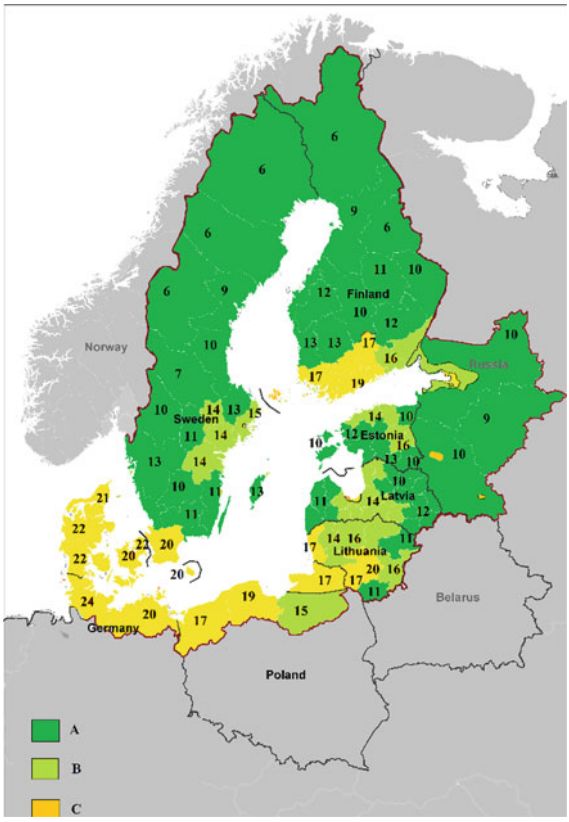

Fig. 1 The areas of the Baltic macroregion with the varying effect of the socioeconomic factors on the modern landscape genesis (A—natural factors prevail; B—the effect of the socioeconomic factors is middling; C—socioeconomic factors prevail; the figures indicate the values of the indicator)

indicator, i.e. where the environment is almost unaffected by human occupation, are located in the north of the Baltic macroregion, in Latvia, Estonia, as well as in the Leningrad, Novgorod, and Pskov regions of Russia. The areas where the effect of the socioeconomic factors is the strongest are found in Denmark, Germany, South Sweden and the South-East Baltic. The settlement and land use patterns are the main factors of landscape genesis on these territories.

Over half of the territory of the Baltic macroregion is occupied by the areas that are strongly affected by natural factors. In the south of the region, the effect of the socioeconomic factors ranges from middling to strong. This holds true for the Kaliningrad region (Fig. 1).

Conclusions

The appearance and structure of the modern landscape are the results of both natural and anthropogenic influences, with the main factor of environment differentiation at the regional level being human occupation. The latter is manifested in the patterns

of land use and settlement. The proposed synthetic indicator of the effect of socioeconomic factors on the modern landscape genesis can be used to differentiate among administrative and territorial units and to improve landscape zoning. To determine the boundaries between the modern landscape areas, the gradient of this indicator is of particular importance. The gradient shows whether the boundaries of a landscape area and the administrative borders coincide or not.

The values of the indicator of the effect of socioeconomic factors on the landscape genesis are represented vary across the Baltic macroregion. In the northern and northeastern parts, the effect is minimal, whereas the landscape genesis in the southern and southwestern areas is strongly affected by the socioeconomic factors. I suggest considering the settlement and land use patterns as the main factors of landscape genesis on these territories.

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