Landscape studies of ancient Russian cities on historic waterways

V A Nizovtsev\(^1\) and N M Erman\(^2\)

\(^1\)Lomonosov Moscow State University, Geographical faculty, Department of Physical Geography and Landscape Science, 1, Leninskie gory, Moscow, 119991, Russia
\(^2\)S.I. Vavilov Institute for the History of Science and Technology of the Russian Academy of Sciences, 14, Baltiyskaya str., Moscow, 125315, Russia

E-mail: nizov2118@mail.ru

Abstract. The aim of the study was to identify the role of the natural (landscape) factor in multifactor processes of structure formation, functioning and dynamics of urban landscapes. The practical tasks of this work were the reconstructions of the original landscape structure, identification of ecological properties and the resource base of host landscapes and cultural and historical landscapes of ancient Russian cities. Landscape studies of ancient Russian cities were carried out on the basis of the landscape and historical approach, where the entire territory of ancient Russian cities is viewed as a single, holistic entity, with inherent specific landscape organization which develops in space and time. A distinctive feature of the ancient Russian cities that formed on the historic waterways is that in the early stages of functioning of the water communications, cities were formed as the most important strongholds, whose vital activity was associated with subsistence farming and depended entirely on the local resource base and, accordingly, on the landscape structure of the territory. At different intervals, it differed sharply depending on the zonal-landscape conditions. The differences in the landscape features of the formation of ancient Russian cities on historic waterways in the IX-XI and XII-XIII centuries have been revealed.

1. Introduction
The formation and development of cultural and historical landscapes of ancient Russian cities is a natural result of the evolutionary processes of a particular territory. Studies of the basic patterns of formation and evolution of urban landscapes on the initial stages of their formation, as well as work on the study of the mutual influence of the city and landscape, are becoming increasingly important in historiography of both Russia and abroad.

The formation of urban landscapes is a spatial form of interaction between society and nature, man and landscape, and is a natural result of the evolution of the relationship between society and nature. The natural factor in the formation and development of cities is an integral part of the relationship between man and the surrounding landscape complexes. The natural component not only serves as a resource foundation for the formation of cities, but also creates its natural basis. The hierarchy of urban ancient Russian cultural landscapes is reflected in the fact that the city of the ancient Russian period exists partly independently in specific local geosystems, the city largely provides itself, within its natural-economic environment, it also provides its functioning through communication with subordinate
settlements, - together they form a system of settlements, inscribed in one landscape or a system of landscapes.

2. Historiographic review
Scientific studies in the urban landscapes are the most complete and diverse, they are especially well studied from a historical point of view. There is also an abundant reservoir of sources studying the issues of urban planning and planning aspects of cities.

Not less sources include the bibliography of geographical aspects of the study of ancient Russian cities, including encyclopedic publications [1].

Relationship problems of the modern city and landscapes are in the center of attention of scientists of different areas (for example, the work of Vladimirov V.V., Mikulina E.M. and Yargina Z.N. [2] has become classic). It is worth mentioning the works touching upon the historical-landscape aspect of the development of ancient Russian cities by E.Y. Kolbovsky [3], E.A. Sukmanova [4].

A number of issues related to the understanding of the factors that led to the formation of the functioning of ancient Russian cities and the changes that took place in them are controversial, often insufficiently substantiated. This primarily relates to the geography of ancient Russian cities, the elucidation of the influence of natural factors and, above all, the properties of the "enclosing" and surrounding landscapes, which are the resource base for their formation, existence and development. One can just recall the ongoing controversy in historical science about the "transfer" of ancient Russian cities, in which there are practically no arguments concerning the properties of landscape structure as a factor in their development.

3. Tasks and methods
The most important aim of the research was the development of conceptual and methodological foundations for studying the role of the natural (landscape) factor in multifactor processes forming the structure, functioning and dynamics of urban landscapes. The main practical tasks were the reconstruction of the original landscape structure, the identification of ecological properties and the resource base enclosing the landscapes and the formation of cultural and historical landscapes of ancient Russian cities.

In recent decades, the Chair of Physical Geography and Landscape Studies of the Geographical Faculty of Moscow State University named after M.V. Lomonosov has started to develop a landscape-historical approach in the study of the landscape conditions of formation and development of ancient Russian cities, the development of clear criteria for the identification and diagnosis of urban anthropogenically modified landscapes, including the study of their intra-landscape structure [5, 6].

The main distinctive feature of the landscape-historical approach is that the entire territory of the ancient Russian cities is viewed as a single holistic entity with only its inherent specific landscape organization, landscape structure. The natural and anthropogenic components of the evolution of urban landscapes are considered in a single specific space and time, and all research is performed at the regional and local levels (for the historical centers of cities). That is, the landscape differentiation of the territory is necessarily taken into account and the study of the territory is carried out according to certain parts of the landscape (morphological units), which served as the territorial basis for the formation of ancient Russian cities and for the formation of the structure of urban landscapes. The identification of patterns of formation of ancient Russian cities and their dynamics and evolution is based on a "cross-cutting" landscape-historical study of the territory with the associated study of the landscape and time, the landscape and the economic and cultural activities of man in it.

An important method of landscape research of ancient Russian cities is a retrospective reconstruction of the original landscape structure and the formation on its basis the cultural and historical landscapes of ancient Russian cities [6].

The cultural-historical landscape is understood as an integral historical-cultural and natural formation, formed on a specific territory with certain homogeneous natural (landscape) properties as a result of the long-term interaction of man and landscape. It can be said that the cultural-historical
landscape is to some extent optimized for a specific historical cross-section of time, the anthropogenic (cultural) landscape, which has a highly organized territory and optimal environmental management, reflects the specificity ("culture") of environmental management and spiritual life of an ethnos under specific landscape conditions. Along with the natural and anthropogenically transformed components and elements of the morphological structure, cultural and historical landscapes include heterogeneous elements inherited from various life cycles of the human being in the landscape: artifacts, social facts, mentifacts, the so-called "anthropogenic landscape layer". The characteristic features of cultural and historical landscapes are: originality, uniqueness (or typicality) of the natural environment and historicity of the landscape (preservation of historical appearance), richness of monuments of historical, architectural and spiritual heritage, integrity and unity of the natural and anthropogenic component, as well as ecological compatibility of the landscape (organic combination natural and anthropogenic component, ecological and aesthetic properties) [7].

The reconstruction of the landscape structure of territories into concrete chrono sections is based on the use of a landscape edaphic approach. The result of such reconstructions was the mapping of conditionally restored (indigenous) landscape complexes. Special attention is paid to the analysis of anthropogenic relief changes (artificial terracing, plantation, "anthropogenic" erosion forms, etc.), the power of accumulation and distribution of the cultural layer and the change in the hydrological regime in a given territory. Such a map shows the ideal (theoretical) distribution of landscape complexes [7].

An important method of research is landscape historical mapping with making a series of multi-time maps of key areas reflecting the development of urban landscapes at a certain historical stage in specific environmental conditions. All maps for each key area are created in electronic vector form for visualization in Mapinfo system in a single coordinate system. All information in the maps is presented in the form of specific coherent map layers with numbered selections with attribute tables containing selection numbers and textual characteristics of legends to them. All the layers are integrated into the corresponding thematic map and a single historical and geographical GIS. In turn, thematic maps are also integrated into a single geographic information system. This allows you to quickly isolate the necessary information layer or, conversely, to integrate them for subsequent analysis or synthesis. In addition, the existence of a working set saves author's design of maps, during the creation of which the methods generally accepted in landscape science were used, therefore, in this form, they will be better and faster read by experts.

The conjugated analysis of landscape, natural component and historical-geographical maps of the Great Volga Route region, the way "from the Varangians to the Greeks" and the Severo-Dvinsky, Mariinsky, Tikhvinsky and Vyshnevolotsky historical waterways combined with research on key areas allowed us to establish some features of environmental management, the formation of ancient Russian cities and the formation of settlement structure, depending on the specifics of the functioning of waterways and the landscape structure of the area. For the analysis, we used a sample of ancient Russian cities from the works of A.V. Kuza [8], the map of physical-geographical zoning of the USSR edited by N.A. Gvozdetsky (1983) and the Landscape Map of the USSR edited by A.G. Isachenko (1988).

4. Results

Historical waterways are unique in their significance for the whole Russia as namely along them a vast territory was settled and developed economically. In the second half of the eighth century waterways began to form the main trade routes. The formation and functioning of waterways happened due to the formation of a network of support points on them, whose vital activity was associated with subsistence farming and depended entirely on the local resource base and, accordingly, on the landscape structure of the territory. It differed greatly on different segments depending on the zonal-landscape conditions [7].

Management and economic functions, external and internal trade relations were realized along the waterways. Naturally, along these routes there appeared large and small cities, open trade and craft settlements, guard fortresses - "gradki", rural settlements with waterway control function, ordinary rural settlements involved in the life support of communication, i.e. a lot of strong points that provide them
with reliable protection and uninterrupted operation, because it was necessary to maintain dyes and port facilities in proper condition. The strongholds along the river way were unevenly distributed, but in general they provided control over almost every day transition, such as along the Volkov-Dnieper route (the famous way "from the Varangians to the Greeks") [9, 10]. The most ancient Russian cities arose on this route: Ladoga, Novgorod the Great, Velikiye Luki, Staraya Russia, Smolensk, Orsha, Lyubech, Vyshgorod, Kiev, Kanev, etc. In the future, these strongholds became the basis (skeleton) of the formation of the settlement structure that has existed until the present time.

The landscape analysis of the spatial distribution of historical cities in the Moscow glaciation area (Moscow, Vladimir, Murom, Starodub (Klyazminsky Gorodok), Yaropolets (Vyazniki), Gorokhovets Zvenigorod, Mozhaisk, Smolensk, Borovsk, etc.) showed that all these cities developed almost in the same way: fortresses were built on low or high valley sands with steep coastal slopes, on arrows with tributaries flowing into the main river or streams with girder valleys. That is, there were chosen landscapes with a spatial pattern, representing in defensive terms an almost ideal place in the whole area. All these cities occupy an ecotone position along the boundaries of two or three or more landscapes with a large set (over 40 species) of tracts with diverse natural properties. It allowed the local settlers to maintain flexible, integrated, diversified subsistence farming. In addition, these boundaries are the boundaries of physiographic regions and even provinces [6].

On the basis of a detailed landscape analysis with the compilation of the corresponding maps of the topography of Smolensk, Veliky Novgorod, Totma, Veliky Ustug and Solvychegodsk, there was an attempt to explain the problem of transfer of a number of ancient Russian cities from landscape point of view (the problem of "paired cities" in historiography). One of the main reasons for the transfer of the city to a new place is related to the fact that initially, when choosing a place, first of all, defensive-strategic goals were taken into account: control over the surrounding area and waterways, close proximity to the river (sections of high floodplain, first floodplain terrace or on the floodplain with areas limited by steep slopes). However, the possibilities for the territorial growth of these proto-cities were extremely limited, as well as the limited resource base of the surrounding "feeding" landscape.

Studies of the landscape location of the ancient Russian cities of the forest areas of the European Plain, carried out at the level of typological landscape groups, showed that the overwhelming majority of the ancient Russian cities also have an ecotonic position along the boundaries of areas and even provinces. Evaluating the conditions of the location of cities in landscape complexes of different types, 4 groups can be distinguished: 84 cities located in river valleys, 76 - in erosion zones (mostly in forest-steppe zone), 50- in moraine (about 60% of them are outside the Valdai glaciation zone) and 54 – in sandstone landscapes [6].

At the initial stage (IX-XI centuries) most of the cities (Rurikovo settlement - Veliky Novgorod, Gnezdovo-Smolensk, Beloozero, etc.) were located mainly on gently sloping surfaces of low floodplain or lake terraces, areas of low valley zandras, rarely on the near-valley slopes between the river plains, sometimes on high floodplains emerging from the flood regime.

From the 12th century, cities began to be formed mainly in the river valleys on steep banks on the relatively isolated sites of valley zandras (most often on low valley zandras, which corresponds to the third floodplain terrace), cut from the sides by valleys of small rivers or streams. Posads was located at lower levels: on the second and the first above floodplain terraces. Since almost all the cities were self-sufficient in terms of food or were formed as centers of the surrounding agricultural areas, when choosing the location for the city, preference was given to ecotone territories with a complex landscape structure and rich resource base that allowed the first settlers to conduct a flexible integrated economy. In general, the lands surrounding cities, as a rule, had optimal properties for the tillers of that time: leveled, well drained surfaces, loamy-sandy soils of relatively high trophicity with favorable water-air regime for farming, "warm" habitats with early field readiness for spring field work. The main limiting factor of nature management of that time is also revealed: poor drainage of land. It is also important that cities were developing according to a manor type: a house, outbuildings and an adjacent plot with gardens, gardens, etc. [6].
5. Conclusion
The landscape analysis of the spatial distribution of historical cities showed that, at an early stage in the Old Russian period, places for building cities (protocities) were usually chosen on the most important waterways taking into account their safety, with a relatively simple landscape structure, on low elements of the relief. Later, their expansion or even "transfer" to higher areas (high terraces, valley sandwiches, river moraine plains) with a more complex landscape structure and richer resource base occurs. Spatial differences in the location of cities are due to provincial-zonal conditions and their position in specific landscape conditions, which is often a decisive factor in the formation and development.

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