

Geocological importance of wetlands transformation into agricultural landscape: example of Pančevački Rit in Serbia

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Abstract: - Belgrade's suburban region of the Pančevački Rit (378.6 km²) is located in the southwestern part of Banat, between the Danube and Tamiš rivers. In the past, the Pančevački Rit was typical marsh region, often flooded by rivers Danube and Tamiš. Some areas of Pančevački Rit were poorly populated, and people lived in pile dwellings (stilt houses), and because of that, village Borča was called Serbian Venice. By the construction of a dam, with an irregular oval shape, around the Pančevački Rit, and melioration systems, in 1934th, this area has undergone landscape geography transformation, and from wetlands was converted to agricultural area, suitable for habitation. Thus, Pančevački Rit has grown in Belgrade's suburban agricultural region with the largest agricultural conglomerate in Serbia – PIK Belgrade, which supplies Belgrade and its catchment area with agricultural products. In this paper we analyze how new technologies can be used in creation of useful map of landscape geography transformation.

Key-Words: - landscape transformation, Belgrade's suburban region, informational technology.

1 Introduction

Pančevački Rit (378.6 km², 69.5-79 meters above sea level) is located in the south-western part of Banat in Serbia, between the Danube River in the

west and east, and Tamiš in the south, and its effluent Dunavac in the north. Until 1934, the Pančevački Rit was a typical wetland, which affected on the population lifestyle and dynamics of migration. Village Borča with its stilt houses, gave

an exotic impression, during 17th and 18th century, and was called Serbian Venice. Since 1929 to 1934 an embankment (length of 69.8 km and a width of 6 m), and a system of channels (320 km) were built and the riverbeds of the existing watercourses (73 km) were deepened. Thus, wetland landscape was altered [1].

Alluvial deposits dominate the surface layer. To a depth of 20 m, there are layers of yellow sandy clay, gray sand and gravel. The first compact layer lies at a depth of 20-40 m and is built of grey sand and gravel series. At a depth of 40-90 m occur waterproof and firm tertiary formations (marly limestone). To a depth of 90 m, there is the collector zone of free water that directly affect the groundwater and surface water regimes, which in the past influenced the *habitus* and determined the morphology and physiognomy of the terrain [2].

The aim of this paper is to show a transparent example of geographic transformation of wetland landscape in accordance with geo-ecological principles of evaluation and management, into a functionally quite different agricultural and urban environment.



Fig.1 Geographical location of Pančevački Rit

2 Phases of geographic transformation of wetland landscape

Geographic transformation of wetland landscape of Pančevački Rit area, can be analyzed in three phases. The first phase covers the period of unsuccessful fight of population against Danube's high water level. The second phase (period 1934-1945) is marked by hidromeliorative systems construction. During the third phase (period after World War II), functional transformation of geographical space in Belgrade's suburban agricultural region was made.

2.1 The first phase

Inhabitants of Pančevački Rit, have lived in the past, in accordance to the given natural conditions. Their main occupations were hunting and fishing cut the wood and reeds, and livestock farming. During the floods, they find shelter on the hillocks and ridges (Deheljan's hillock 79 m, Stojan's hillock 78 m, Iljan's hillock 78 m, Martin's ridge 76 m, Gavra's ridge 76 m, etc). Hillocks and ridges were dominant points, small hills, which were made of Danube's sand accumulation [3].

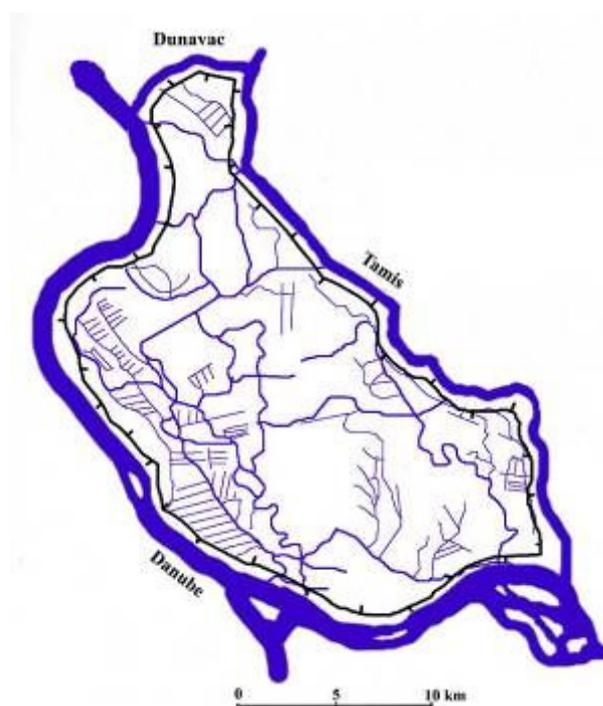


Fig.2 The system of channels at Pančevački Rit

However, the marshlands also represented natural protection from enemies. It bound together local residents, who used favourable geographical location of Pančevački Rit and lived close to Belgrade. The water dictated living conditions in the Pančevački Rit, until man succeed to curb it. In central and southern parts, where clay series lay in greater depth, settlements Borča, Ovča and Krnjača were created.

By imperial decree from 1867, Austro-Hungarian authorities gave marsh soil to border guards, and condoned them to built the dyke. The following year, some marsh soil was ceded to the settlers from Transylvania who built a dam and the villages, which were destroyed by the Danube in 1876 [2]. The only secure solution was to find shelter on the higher ground. During the highest water levels in 1888 and 1924, the water retained in the Pančevački Rit wetlands from June until September. Floods in 1888 crashed 180 houses [3]. At this phase, it was

independent and unsuccessful fight between inhabitants and water.

2.2 The second development phase

Collective efforts to address the problem of floods in Pančevački Rit gave the results in 1929 when construction of dykes began, and lasted until 1934. Along borders of the Pančevački Rit, embankment with dimensions - length of 69.8 km and width of 6 m was constructed. Its height was determined by the highest water level of the Danube, recorded in the late 19th century near Pančevo. Embankment was built 1.60 m above the measured maximum of 732 cm. However, in 1940, the Danube reached the level of 754 cm at the same measured place, and therefore endangered the safety of dam [1].



Fig.3 Danube embankment in Pančevački Rit [1]

For the purpose of water draining from the lower wetland terrains, a channel system length of 320 km was built, and 73 km of waterbeds were deepened [4]. Because of the small terrain downfall, gravity water discharge was slightly swollen, so that the drainage was only possible with the pumps and pumping stations that were set to the lowest point.

2.3 The third - final phase

This phase covers the period after World War II. Then, in Pančevački Rit the largest agricultural conglomerate in the former Yugoslavia – PIK Belgrade, which supplied Belgrade and its catchment area with agricultural products, was built. At this stage, another hydro-technical problem was solved – mobile pumps were built in order to prevent flooding during high waters of the Danube and Tamiš. Pumps were used, during the summer period for agricultural irrigation, and thus the lack of water during the growing season (rainfall 320 mm) was compensated [4]. Part of the drainage network is worn out and it must be environmentally

protected and maintained, in order not to become a collector of wastewater, due the process of constant filling and proliferation of hydrophilic vegetation.



Fig.4 Grand channel in Pančevački Rit [1]

The lowest points in Pančevački Rit, are being used for the accumulation of excess water and fishponds (Reva near Ovča i Veliko blato southeast of Borča).

3 Consequences of geographical transformation of space

Today, the region of Pančevački Rit includes various industrial and agricultural complexes, which supply Belgrade agglomeration of over 1.57 million people. After being almost uninhabited before 1945, today population density of Pančevački Rit is above average for Serbia as a whole, since some of the fastest growing suburbs of Belgrade are built there. The modern settlements – Borča, Ovča and Krnjača, spatially and functionally connected with the city center are being formed.

Borča is the largest settlement in the Pančevački Rit. Population of Borča, in various times: 1727 – 39 households, 1859 – 124 households, 1910 – 1.535 households, 1921 – 1.396 households... Since 1960s, Borča began its massive development with rapid population growth having an estimated population of 38.281 on 31 December 2007 (from 4.330 in 1961 to 35.150 in 2002 by the last official census). As one of the largest suburbs of Belgrade and a large settlement in its own right, Borča developed several sub-neighbourhoods of its own. Officially, Borča is divided into three local communities, sub-municipal administrative units: Stara Borča, Borča Greda and Nova Borča, which are grown on former swampland.

4 Conclusion

During agricultural domestication of this area, man could not win the fight against water until the

Republic of Serbia, with its hydro-technical and hydro-irrigation project took part. Interest of society was functional transformation of swampy region near Belgrade and Pančevo, into agriculturally suitable and settled region. During years of effort, man has mastered the adverse natural conditions. The outcome of the struggle against natural conditions is proof of how important human activity is, and to what extent it can modify the environment [5]. Trace of human work has deeply influenced changes of natural conditions in Pančevački Rit.

Pančevački Rit is no longer swamp landscape today, but very different visual and aesthetic, technogenic and functional form. It is instructive example of geo-ecological research and evaluation of wetlands as a form of natural (geosphere, ecosphere), its partial elements (water, morphology, climate, biosphere, soil) and the integrated evaluation of the entire natural ambient for unrestricted use of the transformed landscape.

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