SZENT ISTVÁN UNIVERSITY
Doctoral School of Environmental Sciences

COENOLOGICAL STRUCTURE OF SECTION OF VÁC DANUBE BANK AND THE LANDSCAPE ECOLOGICAL CONTEXTS OF IT

Thesis of Ph.D. dissertation

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1. INTRODUCTION

1.1. Importance of the topic

In the Danube Bend – proximity of Budapest – city of Vác has a central position as in geographical-, economic- and cultural sense. The values of environmental in Vác, significantly affect the air quality in the city this increase is due to the industrial, commercial and economic life. In addition, groundwater and above the water surface, and the effect of soil contamination is highly damaging to the environmental value. Vác city has outstanding natural values. We can find natural curiosities, which has invaluable natural values. We can find the most representative of them in the southern border of the city, which is the grove of Vác.

In the dissertation of the Danube Bend narrower section area of the Danube bank of Vác I examined the following sections; the right bank of the Danube branch of Vác: Kőgeszter-island and Torda-island areas; the left bank of the Danube branch of Vác: from the Kismaros dead channel, via Morgó-stream estuary over Kompkötő-island till grove of Vác areas, which was separately studied also.

I find the ecological corridor with different territorial units of the Danube Bend important. I will base my research and scientific work on this research territory. The people who are living on the bank part and areas away from the Danube river basin related and defined for their drinking water management. Navigation and general transport services, environmental amenities and leisure culture in and around the Danube River. The topic timeline is not only important in the present tense, but also continues to be important to the lives of future generations.

There are several publications which affect the Vác section of the Danube area in hydrology (Horváth 1998, 1999, Dukay 2000), geology (Karcsú 1880-1886), soil science (Karcsú 1880-1886, Hologon 2006), botany (Szilágyi 1992, Bakó et al. 2002), meteorology (Bíró 2005) and nature conservation (Gánti 1983, Sápi 1983, Illyés 1997, 2000, 2005, Bíró 2000, Bánhidi 2001). In the dissertation about the topic I will present summaries and analysis of a wider study of a process-oriented approach in landscape ecology. Equally important is environmental relationship, phenomena and processes systematic and the functional interpretation. During the dissertation preparation was considered that in the landscape ecology geography, natural things (including featured in the human).

During my research I followed and analysed the topic of domestic and international literature (Grime et al. 1979, 1988, Forman 1983, 1986, Pickett and Cadenasso 1997, Tillman 1999, With et

al. 1997, Zobel 1997, Zobel et al. 1998, Anand and Kadmon 2000, Pfisterer 2002, Tilman et al. 2002), the current researches, which allows an open view about the previous activities and results. The dissertation contains the field recordings methods and results, and their computer processing also.

1.2. Aim of the work

In the analysed area I can show the importance of the area with the landscape ecological characterization research and them detailed evaluation. The research aim was to make about the researched area detailed assessment, detailed analysing and exploring the development opportunities.

1. Coenological mapping for the aim of relative indicators values making at the Danube Bend along the Danube section of Vác. After the received relative indicators, values can be inferred for the whole associated structure, spatial location, density and hemerobic level.

2. Survey of naturalness value categories in different located territorial parts in the Danube, right and left bank side which gives structure value of the natural and degradation association appearance. In the surveyed areas will be compared the degradation value calculation by Simon's naturalness value categories (TVK) and by Borhidi's social behaviour types (TVK).

3. In the area of Danube bank zone (first of all near Vác) after the research results I set up the relationship between bank vegetation and bank section changes.

4. During the field visits I will analyse what is the type of water and the water covering of the dead channels and follow their physiognomy I will suggest after the research results which kind of development opportunities could be indicated in their territories.

5. I will answer what is suitable management, protection, bank line recovery and the status of the settlement in the grove of Vác, which is located near the Danube band area.

6. Further objectives that explore the scientific result of grove of Vác how could it be exploited in the design practice and how could it be integrated in the Danube Bend regional development concept.

2. RESEARCH AND METHODS

2.1. The location of sampling and research process

The coenological recording was made in July 2008. I was conducted during the examination work by conductor of the research for dr. Károly Penksza department leader from SZIU Department of Nature Conservation and Landscape Ecology. The plant species research was in three physiology groups: A – woodies, B – shrubs (some trees was estimated in this group because of their shrub size spread), C – herbaceous.

The research was made in six areas. Because of the different ecological conditions one area – Kompkötő-island – was spited for three parts during the estimate. In these areas were 24 sampling locations where random sampling method was used for plant estimate. In all sampling location we recorded the plant species in a 20 x 20 m quadrate. Photo documentation was made and with hand-held GPS the coordinates was recorded in the appointed areas.

2.2. Used methods for the verification

On one part of data evaluation was after the observance value the naturalness of ecosystem, other side the occurring species relative value numbers. Evaluation of social behaviour types were made according to Borhidi (1993), species name follow the nomenclature by Simon (2000):

1. Social behaviour types (SBT or SZMT) and rarity categories
2. Thermo using relative indicator numbers (TB)
3. Relative groundwater and ground humidity indicator numbers (WB)
4. Soil reaction relative value numbers (RB)
5. Nitrogen demand values (NB)
6. Plants light using relative indicator numbers (LB)
7. Climatic effects, intemperate climate tolerance relative value numbers (CB)
8. Salt-tolerate relative numbers (SB)
9. Naturalness value categories (TVK)
10. Degradation value numbers after Simon naturalness value categories (TVK) and Borhidi social behaviour types (SBT)

The 24 sampling locations separately chart representation not gives easily measured and combined between the territorials that is why I made summary results in four chart lines. With this classification method possible to summarize the different located areas – within the territorial parts – the value of the territorial match or difference, duplication or distortion. During the assessment I also made eight summary charts of the results of the relative values difference and degradation, after it apparent the summary of the six territorial parts coenological structure. With series grouping the difference and match is assessed more quickly between the left and right side of the Danube branch of Vác.

Related to the examined area (according to different ages) I analysed maps and publications the changes of the positions of the bank section and islands, which I present with more copies of maps. In the maps there are military records, government works, academic-, mapping company works and the newest aerial photographies after Google program.

3. RESULTS

The figure 1 shows the summary of the degradation assessment. After figure 1 is evidence that evaluation method degradation results as well by Simon and Borhidi is the highest in the grove of Vác. Also high – after both evolution methods – near the Morgó-stream estuary the degradation value. Lower degradation value apparent in Kismaros dead channel, Kőgeszter-island, Kompkötő-island. The lowest degradation value is under Torda-island. The territory which located at the right bank of the Danube like Kőgeszter-island and Torda-island presented lower degradation values, than territorial which are located at the left side like Morgó-stream estuary and grove of Vác. Compared to the two authors evaluation except two territorial – Kőgeszter-island and Torda-island – different rates are generated. After examination by Borhidi the Morgó-stream estuary, Kismaros the dead channel and the grove of Vác values are higher, while by Simon the Kőgeszter-island value is higher.

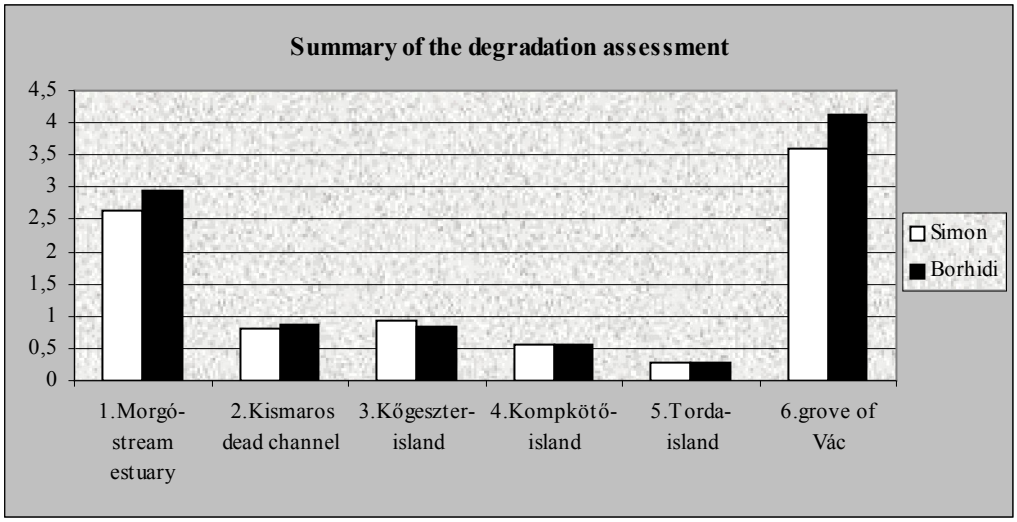

Figure 1. Summary of the degradation assessment in the examined territorial parts

3.1. New scientific results

1. I determined after my coenological research result of relative indicators values along the Danube Bend, that in the appointed 6 sample areas, and inside of them the 24 sampling locations (in some cases, similarity seen) but the vegetation mostly different in association structure, spatial location, density, hemerobic level.

2. Survey of naturalness value categories shows that in all examined areas can be found species which are indicative of degradation. Based on my research was lower degradation level in the analysed plants at the Danube bank right side, than at the left bank side. It is true that the degradation value calculation by Simon naturalness value categories (TVK) and by Borhidi

social behaviour types (TVK) presented more time identity, but after the values summarizing from all areas (by the two kinds of evaluation) dates results was in 70% different. I established that during similar coenological comparative research subservient to use together the two evaluation methods.

3. I drew the conclusion after analysing the maps and publications about the examined area that the bed and the water volume changing of the Danube bank is actuate to the vegetation appearance and species composition.

4. I analysed two kind of dead channel types along the Danube Bend during my field visit: 1. Kismaros dead channel, as a floodplain, which water volume mainly depends of the Danube water levels, 2. Kogeszter dead channel, as a saved side dead channel. This assessment result gives initiative dates for recovery program creating of different types of dead channel.

5. I found after the results which I got during the investigation that the grove of Vác bank and the associated Danube bank management, protection, care ordering status are inefficient, present use is only partially consistent with the ideal management aspects, and thus can't evolve the naturalness condition.

6. On the score of the prepared examinations of grove of Vác bank part the scientific results could be used by planning works, as well as by regional development conceptions for Danube Bend and Vác section with more science connections such as hydrology, geology, soil science, botany, meteorology, nature conservation.

4. CONCLUSION AND SUGGESTIONS

The researches show that on the places which are right side of the Danube (Kőgeszter-island and Torda-island) the analysed associations degradation result values was lower than on the left side. The most significant difference was in two dates such as Danube right side Torda-sziget and left side grove of Vác which are located very close to each other. Based on these results I can say that along rapid rate extinction of indigenous species there are more and more numbers appear of the adventive plant species and aggressive landscape alien invasion species. Like alien plants for landscape and flora, the aggressive landscape alien invasion species get into an ecosystem quickly can be dominant because of their fast proliferation. This effect can be seen in grove of Vác Danube bank parts where not the natural condition reference species are dominant. The natural weed species (in the frequent disturbed grove of Vác) with efficient proliferation strategy can be dominant occurrence also.

The analysed *Kismaros dead channel*, as floodplain dead channel, has minimal water volume and properties of it the heavy warp and excessive vegetation proliferation. The dead channel water volume mainly depends of the Danube water levels and volume changes. The *Kőgeszter dead channel*, saved side dead channel with bigger value of water, which during my time analysing had very bad quality dissolved oxygen and conductivity attributions water content. Because of the area has not got serious water moving that is why this result could be presented as a constant result. The Kőgeszter dead channel water circulation partly depends of the Danube water levels and volume changes, but on the other hand the meteorological factors, which are dominate. In evidence overall both dead channels in the present aspect of them is discredit the landscape view and present condition inappropriate for recovery (holidays, swimming, water sports). I propose to competent government to prepare a development program with contains research program, assessment, database and monitoring, which is traced development implementation method and for this conclusive aim could be the modern settlement and development of the area.

I can declare after my scientific research in maps and publications that in the last two thousand years the main bed of Danube hasn't changed but this contention is not veridical for the bank part. Well represented in the different ages of maps and publications the bank part changes. While in medieval and early 20th century maps show more islands completely separated from bank part, for example Torda-island, Buki-island, Égető-island, than present relief recording present some of these islands as only half island or nearly merged island with the bank part. This process primary created – cause of the Danube shipping – the works for the water bed deeper making,

which inflict the higher water depth as well as speed and than the bank part changed. During the assessment the composition of the species near the bank part (grove of Vác) the degradation shows more value, than in the analysed islands and dead waters (Kőgeszter-island, Kompkötő-island, Torda-island). The analysed islands, half islands importance of value and position in the ecosystem is presents on them territories by the appeared Natura 2000 conservation classification as well. The islands, half islands additional merged and disappearance is not only for the coenological combination of appears pieces dangerous but also it has serious part in the protected pieces occurrence with the ecological corridor function.

The protection of the ecosystem not only conservation serve habitats of the protected and endangered species (although undoubtedly this is a very important target also) but rather, the diversity of habitats conservation and through this improves relations between society and nature. The diversity of habitats in the landscape (both in ecological and visual sense) which enriched and particularly valuable for the ecosystems, also receive a greater chance for survival if the green network has sufficient conditioning surface. As a result, properly functioning ecological corridors can connect the different located territorial parts.

Based on the identified literature and studies research the Danube Bend and inside in the chosen sample area section of Vác Danube band the natural value protection can be achieved only with the natural condition maintaining, providing over and above together with the necessary landscape use changes. Ecologically important target is the ever shrinking and gradually destroyed natural values particularly the most endangered wetlands ecosystem protection. This is particularly relevant in areas along the rivers, which are still in an international context significantly preserved many elements of original landscape of imagine and ecosystem. Reflected well the vegetation and body of the water the changes around underway, so through monitoring can allow seen in a given ecosystem the natural condition or disturbance deciding, the natural or detection of anthropogenic effects changes.

I justified in some part of the topic researches continuing, adding of my represented research result after the specificity, development opportunity and as well as focusing to the presented scientific results recoverability (insertion opportunities view) in the design practice, and in the Danube Bend regional development concept.

5. SUMMARY

The aqueous and close to water ecosystems belong to decreased number of fast changing and endangered ecosystems. These ecosystem areas dimensions drastically reduced because of climate change and direct human interventions (pollution, water legislation, drainage, irrigation). In the examined Danube Bend area, the ecosystem operate condition is the sufficient quality and quantity water presence, as like for all water systems. However, we can say that plants near the Danube bank often need to live with varying volumes of water quantity, which rate is depend on more factors, and from these are the most important the weather evolution, as well changes of the forms of bank and water bed.

The earlier maps and studies show during the last centuries and decades, more islands and half island connected to the bank of Vác, until now most of them significantly reduced or almost completely disappeared, because of making the bed deeper for the shipping on the Danube. During the reconstituted research I experienced, that the influence of bank section changes it's impact on the density and composition of plant covering. Along the Danube bank appears vegetation composition of the most optimum attribution could be: being resistant to flood, to be low the biological invasive tendency and adapt for the planned reservation intensity. But in my results can be seen that is not happening in the plants what I examined in that territories parts and almost in all bank section start to be dominant the species presence indicating degradation. In the highly disturbed territories parts more significantly change the vegetation combination, density, with compared those areas, which has natural habitat condition. In the first place is the grove of Vác Danube bank section from the significant indicating degradation territories, where beside native species are rapid rate extinction there are appear in greater numbers adventive plant species and aggressive landscape alien invasion species. This suggests that in grove of Vác bank part is not the natural species predominant but because the effective dispersion the alien plants for landscape and flora are get in advance. As a result, grove of Vác mosaic pattern of landscape in time and space relatively quickly may be realigned, which may be inhibitory effects for the natural succession process, as well may be this the prevent of the natural ecosystem regeneration.

Danube Bend facade and landscape image depend of the vegetation type and covering of it. The landscape using method influence the whole vegetation rate, which is prevail across the borders also. The Danube Bend and inside of it the chosen research area grove of Vác natural values protection may work only with appropriate naturalness condition maintenance, cover and also together with necessary landscape using changes may be achieved. The landscape social (public)

and natural (ecological) changes factors in space and time may develop as a result of the interaction, which result could be the protected territories facade changes. Established, if the territorial parts operators don't take care of the required changes, in that case naturalness condition of the territory ecological system will not be realized.

The bank section changes make not only the vegetation shift to direction of degradation, but it mean the further absorption and disappearance of islands, half islands, dead waters, which has increased importance in the operation as ecological corridor and provide ecosystem for the protected species. The example of the two examined dead waters (Kismaros, Kőgeszter) reflect well that the dead channels recovery options, along the parameters of water balance are significantly affect the coenological parameters also. Beside the focus position of nature conservation of dead waters recovery and environment suitable converting could open contingency of some untapped economic opportunities implementation, such as tourism, foreign tourism and sports. Which primary working procedures would be research programs, evaluation and preparation of databases.

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