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Are conservation and restoration of rivers real dilemmas of the contemporary world

Branka Aničić, Sonja Butula, Dušan Ogrin

ABSTRACT: Landscape and ecological peculiarities of certain Croatian rivers determine their specific position in the European watercourse network. The primary aim of this paper is to emphasise their comparative values in the international context and the importance of the current moment in which decisions are taking place on their further destiny in the context of protection – energy recovery. The paper also proposes acceptable relationship towards rivers, as a starting point of any national water management strategy.

In the attempts to maximise energy recovery from renewable energy sources, river exploitation pressures are getting increasingly stronger, which causes significant and irreversible changes in their morphology and spatial physiology. This is followed by social conflicts of short- and long-term interests, the confrontation of which should be based on an integrated approach, taking into account diverse horizontal (different social groupings) and vertical (long-term) interests, and on analysing the related material and immaterial values.

KEYWORDS: riparian landscape, nature, value, conservation, river landscape

Introduction

The main intention of this paper is to make a contribution to some principal issues in the societal policy of river management. This, naturally, concerns the fundamental dilemma: should rivers be subject to any exploitation at all, and if yes, what would that imply? The first part of this paper deals with general issues and will be followed by a presentation of case studies prepared on two interesting rivers in Croatia. Both may be considered as highly illustrative examples for our contemplations at this conference. So, this paper aims to cover the first of three parts of the conference's subtitle, which announced principles, processes and practices.

For a better understanding of the dilemma postulated above, it is necessary to first outline the meaning of river as a spatial system.

In terms of physiographical and ecological features, rivers are especially valuable in their lowland courses. In the flat land they run slowly and therefore meander, thus creating complex water and terrestrial systems. The diversity of biotopes is very high, reaching from deep or shallow water to marshes and other wetlands. Naturally, in these areas a rich flora develops, with many species forming extremely varied plant communities. In the same way, these habitats are home to numerous animal species, especially birds.

Finally, natural rivers belong to the most attractive areas for various kinds of recreation, especially those based on their experiential value.

Structurally, these riparian landscapes belong to some of the most complex land formations. Nowhere on earth can living conditions be found where such widely differing and numerous ecosystems appear as within the realm of rivers. On a relatively small area, actually in narrow land stripes, a large number of varied geographical and biotic configurations is concentrated. This altogether normally results in an outstanding land-scape that is constantly changing due to natural, spontaneous processes.

In this context mention should also be made of another aspect that refers to the impact of rivers on their surroundings. Due to their flooding activities, rivers deposit fertile silt that creates favourable conditions for agriculture. Therefore in many cases a number of interesting and unique patterns of cultural landscape can be seen.

However, the impact of the river can reach further, beyond its immediate surrounding. We often find a remarkable distribution of rural settlements and villages that consistently follow the same soil type, more or less parallel to the river flow.

Structural and ecological values embodied in river landscapes can briefly be summarised as following:

- unique physiography
- hydrographical dynamics of river systems
- multitude of typical biotopes
- unique plant communities
- a large number of plant and animal species, often rare ones
- speciation, origin of new species
- succession of biocenoses
- bird sanctuaries
- resting places for migrating birds
- exceptional patterns of cultural landscapes
- potentials for a variety of recreational activities
- carriers of identity

Identity. River landscapes are unique tracts of land with specific features. Hardly any other geographical component presents such a unique image as meandering rivers can do. In this capacity, rivers are able to create or largely contribute towards the geographical identity at the local or even regional level, regardless whether it is derived from natural or cultural features. In our increasingly globalised era this issue requires special attention.

As is well known nowadays, almost all artefacts in our environment are created in the spirit of globalisation. It is a notorious fact that globalisation covers almost all material and spiritual aspects of our life at an increased pace. All over the world, we drive the same cars, we use the same or very similar household appliances, clothing is no longer a matter of national, let alone regional distinction, all technical goods and construction works bear the mark of technical standards and are therefore largely uniform. Even architecture that always used to be a source of national or regional identity, ceased to do so and nowadays takes over models from wherever they may come. The outcome of that process is a far-reaching homogenisation of our physical world. In this situation, it is of greatest importance to safeguard those physical phenomena in our environments that are capable of maintaining their identity-making role.

The Mura River – A Great Natural Heritage

The landscape of the Mura River is going to be discussed within the framework of three mutually dependent value systems that encompass boarder social interests present in the riparian landscape today. The three considered value systems are of physiographic,

ecological and symbolic nature. The purpose of discussing them is not rooted in the idea of outright nature protection. To the contrary, the intention is to eulogise the concept that the Mura riparian landscape values worthy of protection extend beyond the boundaries of designated protected areas. In this regard, conservational planning efforts tend to focus and encompass the riparian landscape as a spatial whole. The reason for this boarder scope is due to the subject of conservational planning: to either conserve or enhance a specific quality of the landscape rather than its environmental component. Acknowledged as such, the dimension of profession explicitly renders the notion of values. In the current development practices, however, these value notions have either tended to be reduced to the notions of efficiency or ignored altogether (Tryzna, 1995). The ethical dimension of the development - protection relationship is usually hidden. Jacobs (1996, 57) pointed out the problem as a consequence of "a calculus that views values as either too messy, too controversial, or too subjective to be compatible with the quantitative measures that we use to evaluate the developmental sector". As the result of such practice, the cost-benefit principle is frequently used to deal with the costs of environmental and/or landscape degradation. Yet, the shortcomings of the polluter pays principle implementation are widely recognized. The emphasis in resolving development - protection relationship disputes are therefore directed towards strategies of anticipation and prevention rather than reaction and cure.

The physiographic value dimension of the riparian landscape is focused on the river course structure. In its entire length of approximately 72 km (of 3500 km long national network of rivers), the Mura river still shows elements of natural spatial structure. The exceptionality of the Mura river natural character is particularly obvious when compared with its antipode, the Drava river course (fig.1).

Another spatial value that originates from the natural structure of the river course is mirrored in a field pattern (Fig.2). The development and, more importantly, the preser-



Figure 1. The present river courses situation



Figure 2. Field pattern as an element of cultural landscape at the mouth of the Mura into the Drava river. Left: cadastral map of Legrad, 1859, source: Croatian State Archives. Right: aerial image of the mouth of the Mura into the Drava river, source: State Geodesy Institute .

vation of the field pattern is one of the most focused upon quality in the assessment of the cultural landscape. The lower river course and its valley determine the cultural landscape that is typical for the continental part of Croatia.

Value appropriation from the ecological point of view is a significant and broadly recognised claim. Wetlands in general, and riparian landscapes in particular, are considered as unique spatial arrangements that carry high level of biodiversity. The latter, i.e. biodiversity, could be perceived as an evaluation criteria of the sustainability concept¹. Another sort of criteria for assessing the sustainability of the riparian landscape could be characterized as intangibles. The intangibles are perceived as outcomes of the complex interaction between nature and affiliated culture. This type of appraisal exceeds economical system, which is short term orientated. Although lacking empirically derived data for the area concerned, the riparian landscape of the Mura river, as a living and experiential environment, is an influential part of its local communities' identity. Another immaterial quality considered is the visual quality. A comprehensive research of landscape perception and preferences has shown that quality evaluation is positively correlated with close to nature physical components of the riparian ecosystem.

Any human – environment relationship analysis should precede a planned landscape change. Polič et. al. (2002) argued that individual and collective understanding of the environment is a major force that shapes that same environment through human behaviour and choices. Such knowledge is indispensable for professionals involved in land use decision making. The case of "soft"² developmental concept for the Mura river could be perceived as the result of such interaction.

Value and significance of river landscape - to lose it or to preserve it?

The Drava River, along with the Mura, is among the best preserved lowland rivers in Europe. It flows through Croatia in the length of 317 km and encompasses a catchment area of 7.440 km², i.e. 28% of the river's total catchment area (Figure 3).



A) Upper course, upstream of Legrad to the Slovenian border, with regulation changes and remains of the natural riverbed

B) Lower downstream course from Botovo to Ferdinandovac, with still preseved natural-ecological, cultural and unaltered characteristics

Figure 3: Research area

In its middle course in Croatia, up to the Mura River mouth, the Drava flows through an alluvial valley filled with thick deposits of gravel and sand. In this area, prior to the construction of hydropower plants and reservoirs (12 in Austria, 9 in Slovenia and 3 in Croatia), it used to be a relatively fast river, with significant mechanical power. Bank erosion and accumulation of materials caused a permanent change in its riverbed. Due to the horizontal movement of the riverbed, numerous meanders, river islets, river arms, and finally oxbows as well, some of which remain today, have been created. Such behaviour points out to a watercourse of great space-shaping power. Consequently, it is a physically well developed and ecologically rich natural environment, in the state of constant change, both in relation to elements of animate and inanimate nature. Due to always new gravel deposits and changes in water relations in the river body, new biotopes keep appearing and disappearing, followed by adaptation and migration of vegetation and fauna and the creation of extraordinary dynamics in the entire river ecosystem. Described phenomena in the research area are adequately illustrated by two older maps, which give an overview of the changes in flow and river body through several time periods (Figure 4). A structurally marked branching of the river line is evident. In individual stretches it almost seems that the Drava has no main course, but instead flows through numerous river arms. This is particularly evident in the area where the Drava gradually changes into its lower stretch (the area downstream of Prelog). Due to gravel deposits the riverbed spreads, fan-shaped, into several waterways, which further divide and rejoin, and change their shapes according to changes in water levels. In places, the Drava also moved its riverbed by several kilometers, and left in its wake interesting hydrographic phenomena. River islets appeared and again disappeared. The space was criss-crossed by numerous linear, flat and spotty wetland habitats.

The first changes came as a result of the riverbed regulation (1930) for flood protection purposes, which simplified the Drava river line, and straightened its course. The largest changes in the observed Drava course occurred in the 1980's, when the construction of three successive reservoirs with accompanying lateral canals significantly simplified the physiognomy of the watercourse. The once undivided space, through which a structurally developed river line continuously flowed, is today perceived as several characteristic spatial units:

- reservoir zones, where the river completely disappeared under reservoir water mass;
- old riverbed zones, the areas with the remaining bioecological and landscape values;
- zones of denivelation of new structural elements of a more or less cultivated landscape

The old riverbed still remains only between the reservoirs, parallel to straight derivational canals. Due to the slowing down of the main river current, where for the most part only the biological minimum flows, intensive morphological dynamics has also disappeared. A consequence of the river flow stabilization are numerous dry river arms, and what remains of the once widely influential Drava area is only a shallow riverbed, about 10 m wide. Described changes have led to a slowing down of growth, drying out and destruction of trees in the floodplain marginal forests.

Drying out of river arms made numerous river sandbanks accessible, as well as gravel and sand deposits. In many places their excavation is under way, and the river is being reduced to a narrow strip, its banks cleared and devastated. Recently, for reasons of securing a free flow profile of the old Drava riverbed and small water quantities that flow through it, the riverbed is becoming unnaturally wide in some places. Up to 110 m wide lakes, the size of the former river profile, are formed, and successfully offer further quantities of construction materials.



Figure 4: A) The river course in four chronological sections between Slovenian border and Legrad



Figure 5: Conflicts between protection and development (dark areas are areas of very high sensitivity, in which degrading activites are taking place)

Due to obviously undefined society's position on the value of river landscape, for this river stretch a permanent process of space degradation has been determined (Figure 5). Therefore, the purpose of research was, by application of comparative analysis to these two areas, to suggest that, despite of all promised caution and protection measures, the construction of the HPP Novo Virje will permanently destroy numerous existing and proposed protected areas (Figure 3: A) upper course of the river, upstream of Legrad, with regulation changes and remains of the natural riverbed; and B) lower downstream course, with still preserved natural ecological, cultural and unaltered characteristics).

In the second observed area, from the Mura River mouth to Ferdinadovac, the Drava flows in a low-lying riverbed. Despite the changes and reduction of the riverbed width (Figure 6), there are still stretches with larger overflows and disputable velocities. In some places the river is slowed down and branches into several arms, thus exposing wide sandbanks in the riverbed and encompassing great flow width. Conversely, in some places flow velocity is high as a consequence of sharp river bends and narrow, deep riverbed. The natural width of the river can be observed only in stretches which are characterized by a stable flow, where flow energy creates a balance with riverbed resistance, thus preventing further changes.

Regardless of the changes in the upper stretch, the downstream course preserves the total morphology of water phenomena, numerous, diverse bioecological and cultural characteristics, which give the space its *identity*. Three space units have been observed in this area, each with its own unique characteristics:

- the river with its immediate surroundings. Rich composition of this part consists of: *physiographically divided water line of the river, variously shaped river banks and natural forest vegetation in the alluvial zone, where the range of different biotopes and the settlement of the catchment area by biotic species reaches its peak.*
- the transition between the aquatic part and cultivated surfaces. Due to limited use of poorer soils and unfavourable water phenomena, mostly small fields or grassed areas with abundant natural remains of forest trees. Main elements are: *forests or individual trees, groves, hedges, different water surfaces, gravel pits with surrounding growth.* Due to its complexity and ecological diversity, this is a world of great ecological, natural scientific and experiential value.



1886. - The river course was shaped by natural dynamics.

1930. - Forty three years later, remarkable changes have taken place due to regulation works

1982. - The character of river has radically changed in the direction of severe reduction of entire river system. This has transformed a once richly articulated river into a simplified hydrographic phenomen. Dispite regulation works, the area Botovo - Ferdinandovac stil boasts a number of preserved natural phenomena

Figure 6: B.) The river course in three chronological sections between Botovo and Ferdinadovac

- the cultural landscape created under the influence of agricultural production. Present in the areas of fertile soils, less saturated by water, outside the area of influence of periodically high water levels. Arable fields are of regular geometrical shapes, criss-crossed by river arms, hedges and plant strips along ditches and oxbows. Villages are situated on the margins of the cultivated land, along streams, forests and reed patches. The majority is of the grouped type, with only some dispersed settlements; both types have their origins in the surroundings, whose harmony and cultural value still remain undisturbed.

Downstream of the Drava River mouth into the Danube River, landscape complexity increases even more. Here the Drava's great water mass forms overdeveloped river bends, creates different water phenomena and causes high groundwater levels. All along the river the vegetation is abundant and thick. In the downstream stretch arable lands increase, as well as large Slavonian oak tree forests. The area of Baranja is characterized in particular by the Drava floodplain forests with numerous old oxbows and wetland meadows. Alluvial soils, especially in river indundation areas prone to filling up by flood deposits, give rise to plant specificity and authenticity in this area, i.e. the appearance of authentic fen-forest landscape of outstanding value.

All above points to the fact that still a large part of the Drava area remains in its natural, unaltered state. Its preservation is not only dependant on the processes set in motion by the natural systems, but must certainly on human awareness and activities aimed at protection of this area as well.

Conclusion

With general considerations and the two case studies in mind, we would like to conclude our contribution with the statement that rivers should no longer be transformed for any reason, regardless of its importance. This is a historical moment in European history where we must do everything possible to preserve those few remaining natural rivers. Along this line, there would be no more reason for contemplating river restoration in the future. Rivers should no longer be considered within the dialectical relationship development – conservation.

On the other hand, we certainly do support the idea of re-naturalisation of rivers that are in a deteriorated state today. However, such action should be carried out according to an integrated approach to river landscape.

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Authors:

- Branka Aničić, Landscape Architecture Institute, Faculty of Agronomy, Zagreb University, Svetošimunska 25, banicic@agr.hr
- Sonja Butula, Landscape Architecture Institute, Faculty of Agronomy, Zagreb University, Svetošimunska 25, butula@agr.hr
- Dušan Ogrin, Landscape Architecture Institute, Faculty of Biotechnology, Ljubljana University, Jamnikarjeva 101

¹ Sustainability concept is here understood as an alternate position to the premise that we can continue to exert infinite demands on finite resources (Jacobs, 1996). The landscape is perceived as a finite resource.

² The chain of hydropower plants, although anticipated in the Spatial Planning Strategy of the Republic of Croatia, is not planned at the regional level (County of Me^[]imurje Spatial Plan, 2001).