

URBAN PLANNING CRITERIA FOR RIVERFRONT CATEGORISATION

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Abstract

Riverfronts, as a transitional zone, have been recognised as a catalyst of urban regeneration. Their revitalisation has become a widespread global urban phenomenon and a frequently implemented strategy in urban planning. Despite numerous successful examples, riverfront transformation in some cities failed due to unsuitable interventions and a tendency to replicate globally popular models without contextual adaptation. To identify cities with the greatest potential for successful transformation and revitalisation, the research aims to determine the systematic framework for assessing the transformation potential of riverfronts. Derived from a literature review, the paper establishes a set of spatial criteria for the categorisation of riverfronts. These criteria are systematised and categorised according to four observation scales: (1) general spatial characteristics, (2) city, (3) riverfront, and (4) waterline. The result emphasises the importance of criteria defined at the city and riverfront level, which prove to be the most influential in determining transformation potential from the urban planning point of view. The established framework will guide further research on Croatian continental cities to evaluate their riverfront transformation potential and identify context-appropriate urban planning models.

Keywords: river-city relationship; blue urban space; riverfront transformation; urban regeneration

1. Introduction

Riverfronts, defined as the border area/transition zone between urban fabric and water [1], have been recognised as a “spark of urban regeneration” [2]. Their transformation can affect the economic, environmental, aesthetic, and social conditions of the entire city [1], [3]. Also, their revitalisation is one of the most widespread urban phenomena [4] and a major tool in urban planning since the 1970s, with the potential to create a new image of the city, attract investment, and prevent the deterioration of space [5]. The phenomenon of urban revitalisation, which began with the transformation of American post-industrial cities, has spread to all continents, affecting cities of various sizes and importance, cities by the sea and those inland [6]. In many cities, the transformation of riverbanks is a global phenomenon that has had a positive impact on the development of the entire city. The popularity of such projects and the desire to replicate their success have, in many cases, encouraged urban transformations that are not appropriate in terms of location, budget, programme, time, and type of transformation, resulting in unsuccessful developments [7]. This paper establishes the criteria for the categorisation of riverfronts based on a review of previous research.

The literature was selected by reviewing the Web of Science and Scopus scientific databases based on keywords ("waterfront" OR "riverfront" OR "urban blue space") AND ("classification" OR "typology" OR "categorisation") in the fields of urban science (WOS) and technical sciences, social sciences, and arts and humanities (Scopus). The review of databases was limited to works in English with open access, resulting in a total of 26 publications. From the mentioned 26 papers, ten papers that state the categorisation of riverfront areas were singled out, namely eight scientific papers, one article from the proceedings of a scientific conference and one book. The criteria defined in the mentioned literature are analysed, systematised, and categorised in order to highlight the urbanistically relevant ones for riverfront transformations. The established criteria serve as a foundation for further research - establishing a method of evaluating the urban transformation potential of riverfronts in Croatian cities.

2. Review of the research criteria for the categorisation of riverfronts

Previous research has dealt with the criteria for categorising riverfronts from different perspectives and at different scales. Petrtýlová and Jaššo, in their categorisation of riverfronts, highlight the specific characteristics of the city and rivers [8] (Table 1). They point to relevant aspects such as the size of cities (the status and area of the city, as well as the number of inhabitants) and the size of the river (the ratio of city area to river width, the hydrological significance of the watercourse, and the way the river is used) as an important indicator of the degree of urbanisation and the character of the space.

Criterion	Source	Categorisation
City status	[8]	Capital city; Federal state/municipality/regional capital; City; Town
City area	[8]	-
Number of inhabitants	[8]	-
The width of the river in the area closest to the city center	[8]	-
Ratio of river width to city size	[8]	<1; 1; >1
Size of the river in relation to the city	[8]	The river is not significant in size for the city; The relationship between the city and the river is in balance; The size of the river exceeds the importance of the city
Hydrological significance of water	[8]	Hydrologically significant watercourses, Small watercourses
River use	[8]	Electricity production and operation; Farming of freshwater fish and other aquatic organisms; Navigation, rafting, canoeing and other watercraft; Installation of floating or floating objects

Table 1. Criteria for categorisation of riverfronts according to general spatial characteristics of the city and the river

A number of criteria have been established to categorise the relationship between a city and a river (Table 2). Cities are categorised according to waterfront settlement type (city divided by a river, city on the edge of the river, city divided by several rivers and tributaries, swamp city, coastal city divided by a river, coastal city adjacent to a river, mountain town divided by a river, city on a lake divided by a river) [8], [9] and the significance of the city by the river (waterfront settlements, small to medium-sized waterfront towns, waterfront cities as lifestyle destinations, commuter waterfront settlements, waterfront regional cities) [9]. The location of the river within the city is categorised according to the location of the city in relation to the river, the location of the urbanised area in relation to the river, and the location of the river in relation to the historic centre [8].

Criterion	Source	Categorisation
City-river layout	[8], [9], [19]	City divided by a river; City on the edge of the river; City divided by several rivers and tributaries; Swamp city; Coastal city divided by a river; Coastal city adjacent to a river; Mountain town divided by a river; City on a lake divided by a river
The importance of the city by the river	[9]	Waterfront settlements; Small to medium-sized waterfront towns; Waterfront cities as lifestyle destinations; Commuter waterfront settlements; Waterfront regional cities
The position of the city in relation to the river	[8]	Right bank; Left bank; Both banks
Location of the riverfront in relation to the urbanized area	[8]	Riverfront outside of the urbanised area; Riverfront within the urbanised area
The position of the historic center in relation to the river	[8]	Historical city centre divided by several rivers and tributaries; Historical city centre divided by river; Historical city centre on the edge of the river; Historical city centre is not located near the river

Table 2. Criteria for categorisation of riverfronts on a city scale

At the riverfront scale (Table 3), research has focused on the categorisation of riverfronts by planned land use [8], [9], [10], [11], [12], character and morphology [13], the categorisation of public open spaces – parks, promenades and recreation [1], [14] and brownfield areas [15]. Breen and Rigby categorised riverfronts by land uses (commercial, cultural, educational, environmental, entertainment, industrial, business, residential and historic ports) [16], while Vallega adds categories that more closely describe their existing uses, such as enjoyment of the ecosystem, fishing, congresses, media, transport and navigation, research and education and training [10]. In the categorisation, Breś and Krośnicka place more emphasis on the river area, dividing the land use into the natural environment, urban environment for housing (traffic, infrastructure, housing, culture, education, commercial and recreational space) and urban environment for industry and infrastructure (defence, port, industry, transport, infrastructure, energy production and waste disposal) [17]. In addition to land use, the coast is characterised by its morphological shape, which Aouissi et al. divide into convex, concave and linear [13], and the character of the coastal area defined by human influence (natural, regulated, and built) [1], [8]. Lyu et al. categorise urban coastal parks according to landscape character - meadows with a type of forest area, squares, recreational areas, and promenades along the coast [14]. Duran Vian, Pons Izquierdo and Serrano Martinez establish criteria for the categorisation of public open spaces along the coast based on accessibility and position in relation to the river. According to accessibility, they distinguish between physical and visual accessibility, which may be total, partial, occasional, or completely absent. They establish that the location and accessibility of public spaces are greatly influenced by the morphology of the river valley and coast (vertical bluff and floodplain, large and broad floodplain, terraced floodplain, broad and braided river, or gently-sloping V-shaped valley) and position of public open spaces relative to the river (near the river, in the river or on the river) [1]. Brownfield areas, often located near rivers, in areas that are both attractive and valuable within the context of the entire city, represent an important element in the categorisation of the riverfronts. Rey, Laprise, and Lufkin cite brownfield categorisations according to location, use, ownership, size, level of contamination, and primary use [15].

Criterion	Source	Categorisation
Planned land use of the riverfront	[8]	Commercial; Cultural; Educational; Environmental; Recreational; Residential; Working; Transportation
Existing use of the riverfront	[10]	Ecosystem enjoyment; Fishing; Tourism; Recreation; Entertainment; Congress; Media; Transport and navigation; Trade and finance; Research areas; Education and training; Cultural heritage
Morphological shape of the riverfront	[13]	Convex; Concave; Linear
Morphological shape of the river valley	[1]	Vertical bluff and floodplain; Large, broad floodplain; Terraced floodplain; Broad, braided river; Gently sloping V-shaped valley
Position of public spaces in relation to the river	[1]	Near the river (at the edge, In a setback position, Multileveled open space); In the river; On the river
Physical and visual accessibility	[1]	(Almost) Total; Partial, Occasional; No
Brownfield type by location	[15]	Urban; Suburban; Rural
Brownfield type according to use	[15]	Under-utilised; Vacant; Derelict; Dangerous
Brownfield type by ownership	[15]	Private ownership; public ownership; mixed ownership; unsettled ownership rights
Size of the brownfield area	[15]	Small (<1ha); Middle-sized (1-10ha); Large (10-100ha); Extensive (>100ha)
Contamination level	[15]	Without ecological burden; with ecological burden; unknown degree of ecological burden; Without contamination; Contaminated, Unknown degree of contamination
Primary use of brownfield areas	[15]	Primary sector (agricultural, mining, and extractive); Secondary sector (industrial and construction, transport, and infrastructure); Tertiary sector (logistic, commercial, and administrative facilities, former public facilities, residential and housing facilities, others); Others (religious buildings, military, former chateaus)

Table 3. Criteria for categorisation of riverfronts in the scale of the riverfront

At the waterline scale (Table 4), Breś and Krośnicka propose criteria for the categorisation of urban blue space - an area that includes water and at least one edge between water and land. As an important element of urban blue space, they emphasise its edge, i.e. the waterline, which they categorise according to the quantity (one, two, more, complex edge) and type (fixed - vertical, over water; flexible – sloping, slanted, terraced, floating). They further categorise the relationship between land and waterline using the criteria of connectivity (not connected to water, connected with waterline, connected with more than one waterline) [17] and permeability (near the water, on the water, in the water) [18].

The edge element is also observed through the criteria of flood protection, where the categories of hard and soft edges are recognised [1].

Criterion	Source	Categorisation
Number of waterlines	[17]	Single edge; Double edge; Multiple edge; Complex edge
Type of waterlines	[17]	Fixed (Vertical, Over water); Flexible (Sloping, Slanted, Terraced, Floating)
The relationship between land and waterline	[17]	Not connected with waterline, Connected with waterline (longitudinal, perpendicular, independent from waterline), Connected with more than one waterline
Waterline in terms of permeability	[1],[18]	Near the water, In the water, On the water
Waterline in terms of flood protection	[1]	Hard edge (Flood wall, Hardened bank, Filled bank, Embankment wall); Soft edge (Natural, Floodplain, Fluvial park, Vertical bluff, Terraced plains, Levee)

Table 4. Criteria for categorisation of riverfronts at the scale of the waterline

From the conducted analysis and systematisation of previous research, it can be concluded that the criteria for the urban riverfront categorisation can be divided into four basic groups according to observation scale:

1. General spatial characteristics of the city and the river – quantitative characteristics that may have an impact on the categorisation of riverfronts - globally observed
2. The relationship between the position of the city and the river observed on a city scale
3. Accessibility and land use characteristics observed at the scale of the riverfront
4. Characteristics of the immediate city/water contact edge – observed at the waterline scale.

The first category is focused on descriptive and analytical data related to cities and their rivers. While this information is important to consider, it is not directly relevant when researching spatial data from an urban planning point of view. Moreover, the criteria used for categorisation at the waterline scale are entering the domain of architecture and urban design. On the other hand, the second and third groups of criteria are expected to have a greater influence on the urban perspective, as they most directly capture the relationship between the riverfront area and the surrounding urban fabric. Therefore, the next phase of the research will primarily focus on the city and riverfront scales.

3. Starting points for exploring the riverfronts of cities in Croatia

In all Croatian continental cities, it is possible to find watercourses of different types, significance, and character. Examples of successful urban transformation based on the riverfront revitalisation suggest that the same approach could be used in the context of Croatian cities. In order to select cities with the greatest potential for transformation and to use transformation methods that best suit each city, it is necessary to conduct a systematic study of the interrelationship between the city and the river from an urban planning perspective. For such research, a criteria systematised on the basis of previous research at the scales of the city, and the riverfront area will be used. By applying these criteria, it is necessary to examine whether the established categorisation encompasses all Croatian continental cities and, possibly, supplement the categorisation based on the observed shortcomings. In addition, it is necessary to implement criteria related to the level of preservation of natural and cultural heritage [18], navigability of rivers and port activity, which are not considered in the reviewed literature but can have a great impact on the potential for urban transformation.

4. Conclusion

With the primary aim to determine the systematic framework for assessing the transformation potential of riverfronts, the conducted research provided the first step - a synthesis of existing categorisation of riverfronts and identifying key criteria that influence their differentiation. The criteria were analysed and categorised into four basic groups according to observation scale: (1) general spatial characteristics of the city and the river, (2) the spatial relationship between the city and the river, (3) riverfront scale, and (4) the characteristics of the immediate city–water interface at the waterline scale. The scale of the city and the scale of the riverfront are recognised by this research as the most relevant, from the urban planning perspective, for determining the potential of the transformation of the city based on the transformation of its riverfront. In further research, a comparative analysis of riverfront transformation in European cities will be conducted. Criteria established in this research will be supplemented by additional factors that can influence the transformation potential of the riverfront but were not addressed in the reviewed literature, such as natural and cultural heritage, as well as port activities. Through this approach, a holistic methodology for evaluating transformation potential and identifying site-specific urban planning models will be developed, which can also be applied in Croatian cities.

5. References

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