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Water Spaces as Urban Activity Nodes*

Abstract

Objectives: In the contemporary cities there are two main development challenges. The first one is related to changes in residents' lifestyle (e.g. social and physical activity). The second one is associated with those aspects of climate change which have severe consequences for the city dwellers' safety and comfort. The conducted analysis determines the potential of particular forms of water areas and their development in creating local centres – nodes of activity.

Research Design & Methods: The subject of the conducted scientific research was the water areas of Cracow. Fragments of the Vistula waterfronts were selected as an example of a linear element, and water reservoirs were chosen as surface elements. The study is based on observations and interviews conducted during field visits.

Findings: The analysis of Cracow's water spaces has shown that not all of them can create activity nodes, which is mainly due to particular areas' high seasonality of use. The city's natural areas' development and use must be carried out with full respect for their natural values. The nodes of urban activity should not be identified only with the flagship public spaces of the city, such as the main squares and parks. These places should be created throughout the entire city, with access to all city residents, i.e. those living in more or less populated areas. Such spaces may be different in their spatial form, but should have a common denominator, namely social integration.

Implications / Recommendations: The article suggests that the potential of creating nodes is related to a specific place's multi-functionality, its influence range, and its ability to generate users' activity. The urban nodes' polycentric system needs to be considered during the development planning. The system's main aim should be to integrate all city areas by means of a communication network that would be of good quality and quantity.

Contribution / Value added: The presented approach opens up possibilities for analysing urban connections and functionality.

Keywords: urban nodes, blue-green infrastructure, public spaces, waterfronts

Article classification: research article

JEL classification: Y80

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Introduction

Water is the basis of the cities' ecosystem functioning, which co-creates the blue infrastructure system. Its multifunctional forms can also be diversified, i.e. either natural or shaped by humans. Water in the urban context is most often associated with greenery, creating a green-blue relationship that should always be considered[1]. This example of synergy creates a broad framework for urban planners, who, by urban design, create a healthy and friendly environment for city residents. They shape the inhabitants' daily existence and thus influence the quality of their life in various dimensions. That is why such spaces have become a crucial element in the process of contemporary, dense cities' development. Quoting Webe Kuiter, Januchta-Szostak issues a reminder that "water is a changeable friend and friendly enemy" (2010, p. 96). Therefore, both positive and negative effects can be associated with the presence of water in an urban area. As a natural factor of the city landscape, water is subjected to forces of nature, which must be respected in land management. Climate changes and the decreasing amount of water resources in Poland[2] meant that water could not be treated only as a "decorative" element of an urban space. The role of water in the strengthening of local centres can be very beneficial. Linear water forms can create a well-connected system of a city's public spaces that increase their accessibility. Such a system should include public spaces at both citywide and local level. The latter ones are significant in shaping the local identity and a sense of belonging to the area's community.

This article aims at showing the potential of the city and water in shaping the urban activity nodes throughout the city. The subject of the conducted scientific research included the water areas of Cracow. Fragments of the Vistula waterfronts were selected as an example of a linear element, and water reservoirs were chosen as surface elements. As a result of the analysis, it was possible to determine the potential of individual forms of water areas and their development in creating local centres, namely nodes of activity. The study is based on observations and interviews conducted during field visits.

City and water

Since water resources used to be one of the significant factors in deciding on a location of cities, the relationship between city and water has a long history. In the 19th and 20th centuries, that union was dominated by economic functions, since water was an essential element of transport and industry. For many years, the city was perceived as a composition of human-made elements. In this context, water had only practical dimension due to excessive pollution, which was an unattractive and sometimes even troublesome addition to the cityscape. According to De Meulder (1997, pp. 48–55), the era of "clean urbanism" was associated with the absence of water in urban design, often hidden in underground pipes or canals, reduced to an element of technical infrastructure. As De Meulder and Shannon (2008, pp. 5–6) note, it is not so much the reappearance of water in the centre of urbanist interest that is understandable. Still, the omission of this topic during the heyday of urbanism in the 19th and 20th centuries seems strange. Considering the over 2,000-year-old tradition of building cities, water – artificial or natural – was the keystone of the built urban system. Water as an element of urban spaces became popular and was repeatedly discussed in scientific publications, which affected the water

[1] The need to treat water and greenery together as a blue-green infrastructure was one of the conclusions of the discussion panel as part of the Mobile Session no. 5 during the 6th Congress of Polish Town Planning (20–22.06.2018, Gdynia).

[2] According to the expertise prepared on the initiative of the Living Earth Coalition – and in cooperation with the Heinrich Böll Foundation and the WWF Poland Foundation – it is in the group of countries threatened with water deficit, and national water resources are almost the smallest in Europe (Borek et al., 2020).

presence in urban projects[3]. Kazimierz Wejchert wrote about water as an urban composition element in the following way:

> water – whether as a permanent reservoir, lake, pond, swimming pool or as a river, is one of the fascinating and constantly changing elements of the urban spaces. Reflecting the colour of the sky and walls, giving the floor and ceiling a common tone increases their height. It binds the image together, in which there are real and reflected vertical lines in the water surface. The variability of the water surface depending on the lighting, wind, watercolour is rich material for the urban composition. (1997, p. 99)

As noted by Nyka (2013, pp. 118–119), in the 1980s, along with the recovery of abandoned industrial areas, the topic of integrating the built cities and the natural environment became more and more popular. This unifying view of nature and culture includes visual aspects related to cities' identity, history, spatial form, or architecture. The issues of natural revitalisation, i.e. restoring the balance of urban ecosystems, are also fundamental. This term means a set of activities aimed at creating a friendly urban environment. The critical element of such spaces is providing residents with carefully maintained cultural and natural heritage (Przesmycka, 2005, pp. 53–59).

Urban spaces

For many years, the words of Jane Jacobs that 'the city is people', or that of Jan Gehl that 'cities should be for people', have been repeated. Such statements expose that shaping urban space should take place with consideration of the needs and preferences of future users. Regardless of how different these needs are, it is necessary to point out those that seem universal. Therefore, there are two main leading design conditionings. The first one is related to changes in residents' lifestyle (e.g. social and physical activity), while the second one is associated with those aspects of climate change which have severe consequences for the city dwellers' safety and comfort.

Unexpected situations such as the COVID-19 pandemic became a reason for engaging in reflection on urban space. These unlikely circumstances emphasised what kind of spaces cities need most. Space is an essential factor in shaping optimal psychophysical living conditions, which gained an additional dimension during the pandemic. The events of 2020 confirmed that cities implementing residents-friendly space development could function much better in a difficult period. In this context, worth mentioning are programmes that ensure equal access to essential services, strengthening the functioning of local city centres, building social ties, and supporting various forms of social activity. The recapture of city space for people is also related to creating public spaces, pedestrian and bicycle citywide networks. and green areas accessibility within ten to twenty minutes for all residents. These activities positively impact the improvement of the quality of city life (places of physical activity, therapeutic gardens) as well as environmental issues (air pollution, heat islands). The effects of the pandemic are already noticeable in how urban space is perceived or designed, but all the consequences are long-term[4]. All the social distance requirements – especially those related to blue and green infrastructure – emphasised the importance of the public space. Apart from offering greater open space accessibility, they allow residents to interact with nature or engage in various sports and recreational activities. When domestic and foreign trips are limited, recreational spaces in cities take on

[3] Worth mentioning are, among other titles: Pluta, 2018; Haupt, 2011; Nyka, 2013; Januchta-Szostak, 2009; Kusińska, 2017; Zachariasz, 2014).

[4] These changes will certainly impact the shaping of space, including in the field of work (especially in the office) or trade. The obligation of social isolation accelerated the development of remote work systems or virtual purchasing by several years or more (depending on individual countries or cities).

a new dimension by means of shaping leisure time and holiday space[5].

There are different forms of water in urban spaces. In developing cities' water areas, their specificity should be taken into account – in particular their ecological values. The function equated with water areas is the recreational function, which includes various bathing areas with city beaches and sports infrastructure. They are associated with all forms of greenery arranged as parks, squares, or developed rivet waterfronts. Apart from these spaces, there are areas where humans act as observers with a minimum of their interference. They have the most outstanding natural values, which should be retained and protected.

Water space as a node of activity

Waterfronts generate the unique character of urban spaces. Anna Januchta-Szostak (2011, pp. 146–149) defines two basic spatial systems: linear and nodal. Additionally, she points to a particular type of nodal water public spaces, namely bridges. The uniqueness of these structures is that, on the one hand, they provide the possibility of

> efficient and collision-free communication (…) because bridges not only hold the banks together but also create gates along the waterway, which is also a public space. On the other hand, (…) bridges as viewpoints provide a unique opportunity to perceive river banks. Simultaneously, the bridge itself is usually a landscape dominant, exposed by the water foreground and reinforced by a reflection. (Januchta Szostak, 2011, pp. 146–149)

Therefore, rivers, formerly treated as physical barriers in the cities' spatial structure[6] are now more appreciated for their landscape values. They provided openings or vantage points, allowing one to perceive the city from a unique perspective. The definition of an urban node is often associated with the term of the centre as an area with a high concentration of buildings and functions, the intensity of social activity, and transport accessibility. The node can thus be defined spatially and functionally in the urban tissue, combining the diversity of urban functions and activities. Sometimes, one of the functions becomes dominant, as is the case with communication or commercial-service functions. However, the common denominator of a well-functioning node is always people and the intensity of social interactions. Usually, this intensity is related to the satisfaction of the residents' needs. Jan Gehl (2013) defined three types of social activities in space, namely: *necessary activities*, related to the fulfilment of people's duties (e.g. going to work), *optional activities*, resulting from people's choices regarding the area in which they want to stay (e.g. playing sports), and *social activities*, i.e. choosing a place that offers opportunities for social contacts. Guranowska-Gruszecka and Łaskarzewska (2018, pp. 10–11) indicate the difference between urban nodes and nodes of the city. They point out that the former are characterised by the concentration of functions, i.e. activities related to urbanity, while the latter are part of a multi-layered metropolitan structure. As examples of urban nodes, they list, among other things, city centres, district and neighbourhood centres, areas around public transport stops, university campuses, science parks, and technology parks[7]. In this study, the scope of analysis is limited

[5] The impact of the pandemic on urban space was the subject of the scientific seminar organised by the Sociology Section of the PTS on May 28–29, 2020, where the author as well as Professor Karwińska delivered a joint lecture entitled "Crown-city: In search of the concept of a "coping" city". This topic is also the subject of ongoing research and analyses on the ways of designing and using urban spaces in the pandemic-struck era; examples include 'Planning for post-COVID cities' (https://www.rtpi.org.uk/research/2020/december/planning-for-post-covid-cities/ – accessed on January 4, 2021) or 'Community ties' (https://knightfoundation.org/wp-content/uploads/2020/05/Community-Ties-Final-pg.pdf – accessed on May 20, 2020).

[6] These qualities had already been noticed by the aforementioned Kazimierz Wejchert (1974).

[7] The author had previously undertaken an attempt to define urban activity nodes (Jopek, 2018).

to urban nodes – here referred to as the nodes of urban activity – because their main attribute is the activity factor, i.e. social integration.

City users' needs regarding access to nature are related to the city's new development challenges. Hence, urban green spaces linked to recreation become key spaces with the most excellent activity and urban integration. Recently, the interest in cities' water areas has increased, as evidenced by the many revitalisation projects in these areas. In general, city waterfronts also gain an additional value, namely the possibility of creating attractive bicycle and pedestrian communication networks.

The city and the quality of life

Jacek Szołtysek (2018) points out that "the quality of life shaped by the city's surroundings has a significant impact on people's happiness" (p. 29). He also notes that due to "this issue interdisciplinary approach, (…) environmentalists will, for example, point to the cleanliness of the environment, logisticians on the issues of mobility and accessibility, economists on the issues of social security, and sociologists on social cohesion" (Szołtysek, 2018, p. 31).

Marcin Wnuk (2013) speaks in a similar vein:

> The historical determinants of research on the quality of life are rooted in ancient philosophy when representatives of two main philosophical currents dealt with the phenomenon of perceiving, understanding and explaining happiness. The quality of life was then equated with happiness, and the further development of this approach resulted in its transfer to the field of psychology and other social sciences. (p. 285)

Urban space is an active factor influencing and significantly shaping human behaviour[8]. To paraphrase Winston Churchill's thought – first, we shape space, and then space shapes us. The broader context of this original statement, including buildings and other urban elements of landscape – such as greenery or water – is a significant sign of change in city development planning. Currently, the quality of the urban landscape is buildings and natural but urbanised space elements. Also, in urban areas of increased density, the adverse effects of insufficient care for the natural layer of the urban space became noticeable. Greenery plays a fundamental role in creating a friendly and healthy urban space for people as well as in minimising the harmful effects of urban islands of heat, noise, air pollution, etc.

The spatial development method creates place identity and transforms a physical space into a meaningful place. The variability of the criteria for assessing the quality of life is related mainly to the variability of socio-economic conditions; their importance depends on many factors, including the size of the city[9]. At the same time, it is doubtful whether the tendency to create attractive urban spaces also entails specific threats. Bierwiaczonek (2018, pp. 43–44) points out that shaping public space is a kind of reflection of the era. The turn to the attractive functionality of public space for residents in contemporary cities is not surprising. The consumer's roles – and especially roles of the "consumer of impressions" (Bauman, 2000, p. 99) – have been mainly replaced by civic attitudes and a reflective view of individual identity and relations with the surrounding world. Thus, cities and their public spaces are constructed by consumption. A preventive measure for this consumerist attitude to urban spaces is social participation, i.e. dialogue with local communities and awakening social responsibility for space; this will offer a chance to create space and places which are important and identified as one's own.

[8] The influence of space on human behaviour is an interdisciplinary research issue. In the field of urban planning, one can recall research and theories e.g. by Wejchert (1974), Lynch (1960), or Bonenberg (2010).

[9] The quality of life in the city is the subject of many interdisciplinary research projects and scientific considerations, including Szołtysek (2018).

The blue node spaces of Cracow

Cracow's hydrological system is based on the Vistula and its tributaries, which conditioned the city's development for centuries. In addition to the river system, an essential element of Cracow's hydrographic system is stagnant water reservoirs, both natural and artificial, created through human activity. Apart from their natural values (including natural habitats), they have great landscape values and fulfil significant recreational functions. Water reservoirs located in the city of Cracow include: Zakrzówek, Zesławice, Zalew Nowohucki, Staw Dąbski, Przylasek Rusiecki, Zalew Bagry, Staw Płaszowski, and Stawy Bonarka.

In line with the spatial differentiation of water areas (Table 1), it was assumed that only linear and surface landscape components might show the potential for creating activity nodes[10].

Table 1. Type and form of water elements in space

Physiognomic components	Water forms
Spot components	small water forms with some surface features (e.g. small ponds), fountains, other decorative forms
Linear components	rivers, streams, creeks
Surface components	reservoirs, lakes, ponds, swamps, seas, oceans

Source: own elaboration.

For this study, the following two groups of criteria for water areas were adopted in order to define the potential of space within the blue-green infrastructure in the context of creating activity nodes[11]:

a) the main criteria:

- contain an element of generally accessible public space; – in the case of green areas, this can include, among others: landscape interiors within them, meadows, sports and recreational spaces around water reservoirs or along rivers, city gardens (including community gardens);
- are located in the vicinity of a residential development (500 metres from pedestrian access);
- have good transport connections with other parts of the city, especially in terms of pedestrian and bicycle connections;
- are multifunctional;

b) additional criteria:

- are connected with residential areas (they are located not far from places of residence, i.e. approx. 10–15 minutes within walking distance);
- are frequently visited by a large number of users from various age and social groups;
- they are arranged in an attractive and functional way, creating friendly and safe conditions for rest and recreation for all users.

The most critical factors in creating places for social activity include accessibility, location, transport facilities, and multi-functionality. *Accessibility* is related to unlimited space use; the fulfilment of this criterion covers areas managed by public entities as well as private areas that offer public access. *Location* concerns the spatial and functional situating within the city structure; it is related to the primarily residential vicinity, whose inhabitants become potential and permanent users of the place. In the case of water spaces, *transport facilities* to create local sites of activity mainly concern the accessibility of walking and cycling. In this context, the quality of communication connections is also essential, i.e. safety and the quality of communication routes. Places that can be accessed through wide and high-quality

[10] This analysis does not include point elements because of their size. It is assumed that they can be an element of an activity node, enriching its functional, compositional, or aesthetic values. However, this aspect requires a separate analysis.

[11] These criteria were defined in reference to the features that municipal local centres should meet (see: SARP, 2015, p. 8). However, due to the specificity of the development of water spaces in Cracow, it was found that the concept of a node of an urban activity is more reasonable for individual locations, which nonetheless remains in close relationship with the concept of a 'local centre'. Hence, the above-mentioned item was the source material for the formulation of one's own set of criteria.

pavements, and which offer recreational and green areas, will be visited more often. The adequately designed space should also be inclusive and accessible to the elderly, the disabled, or people with young children. In linear elements, mainly perpendicular connections that create links with the neighbouring areas and other parts of the city are considered. Last but not least, an area's *multi-functionality* is about the coexistence of various functions (the analysis assumed that there should be at least three of them); in the case of water areas, the most frequent activities are recreational (walking), sports (opportunities to play sports, including water sports), natural (valuable natural resources), cultural (cultural objects and sites presence), and commercial (catering, shopping, and service facilities).

Additionally, three additional criteria were formulated. The first is about the connections with residential areas, i.e. about a 10–15-minutes-long walking distance from the dwellings. This factor was considered necessary as one which generates a permanent group of users for whom a given space is an everyday living space, independent of tourist seasons. A second criterion is area popularity among users from different age and social groups. The intensity and diversity of forms of activity and social contacts shape the urban character of the analysed space. The third criterion is the area's attractiveness and functionality, which affects friendly and safe space creation for rest and recreation for all community members.

The last evaluation criterion is related to users' opinions expressed during field interviews or surveys[12] on the following features of individual spaces: friendliness, safety, activity offer, attractiveness, and functionality.

[12] It was assumed that the opinions expressed during the conversation/interview were of greater value when the established relationship helped to obtain more thoughtful answers.

The Vistula as an example of Cracow's linear component[13]

The linear form of watercourses creates the potential for creating continuity of urban areas, including public space systems and urban greenery. Different spatial and functional characteristics of waterfronts[14] largely determine their development. Therefore, there are many places along rivers that create nodes which generate various forms of social activity. One can also call them the keystones of urban space systems. Because of waterfront areas' unique character, public spaces and public buildings located there often constitute the spatial dominants of the city.

As a linear landscape component, the Vistula is the main element of Cracow, flowing from the west to the east over 41.2 km. The strategy of exploiting the values of the Vistula River in shaping the city's development was initiated after 1989 as a result of Poland's socio-economic changes[15]. Since then, the transformation of the Vistula embankments have included many investments, the implementation of which was in line with the idea of creating the "Cracow's living room" [Pol. "*Salon Krakowa*"][16]. It covers new museums

[13] The concept of river parks in Cracow based on the Vistula and its tributaries – implemented by the ZZM UMK – should be mentioned here. These activities increase the attractiveness of riverside areas and improve the accessibility of green areas, creating activity nodes. However, the purpose and object of the analysis undertaken in this study is only a designated section of the Vistula River.

[14] For example, the diversity of the nature and conditions of development based on the examples of the Vistula Boulevards in Cracow, the Thames riverfront in London, or Manzanares in Madrid was discussed in Jopek & Martyka, 2018.

[15] The concept of the river park system in Cracow has a long history, which has been revisited to a different extent – first in theoretical works, then in planning (see: Ptaszycka, 1957; Bogdanowski, 1974, 1996–97; planning documents 1994, 1999, 2014).

[16] This term was used, *inter alia*, in the document of the Local Development Plan entitled "Bulwary Wisły" [in:] Resolution no. LXXXI / 1240/13 of the Cracow City

and cultural centres (e.g. the Manggha Museum, Cricoteka), new connectors (e.g. the 'Bernatka' pedestrian and bicycle bridge) or the revitalisation of postindustrial areas (e.g. the Kazimierz shopping centre, Zabłocie[17]). The areas along the river have also been enriched with new parks. The Stacja Wisła park in Zabłocie as well as the Grzegórzecki[18] Park were created on the local communities' initiatives. Worth mentioning are also Cracow's Vistula Boulevards' unique landscape openness. It is related to the natural function of this area, namely the ecological corridor of the city, constituting, for instance, a vital element of the entire city ventilation system.

The urban form of the areas adjacent to the Vistula affects the waterfront development. The highest intensity development was the main reason for the scope of the conducted analysis, which is the section of the Vistula River from the Rudawa River estuary to the Ofiary Dąbia Bridge. The most important components along the chosen area have different characteristic due to their functions, spatial character, and infrastructure/related connection type. Two main parts are distinguished: cultural (Wawel, Cricoteka, the Manggha Museum of Japanese Art and Technology) and recreational (including Park Dębnicki, Planty F. Nowicki, Park Stacja Wisła). The spatial nature of the elements was determined by means of assigning them to a group of spot (e.g. buildings) or surface components (e.g. parks). The type of functional and infrastructure-related connection is associated with the quantity and quality of available links between the waterfront area and the facilities and spaces which are related indirectly. In terms of transport, due to the presence of a bicycle route along the waterfront, the analysis refers only to perpendicular connections (mainly access to pedestrians, bicycles, and public transport).

In the analysis of the Vistula Boulevards (Figure 1), the main goal was to determine the potential of creating urban nodes along their course.

Characteristic development sites were designated and grouped into four main analytical categories: 1) infrastructure-related connections enabling pedestrian and bicycle traffic (bridges, footbridges); 2) public facilities and spaces located directly along the waterfront (e.g. Wawel, Cricoteka, the Manggha Museum of Japanese Art and Technology); 3) facilities and areas functionally related to the waterfront in an indirect way, i.e. those located along its strip but not directly connected to the boulevards (e.g. Planty F. Nowacki, Dębnicki Park); 4) facilities and areas functionally related to the waterfront owing to good transport connections, but located at a greater distance from them (e.g. the Ghetto Heroes Square, the Dębnicki Square, the Wolnica Square).

The first category of analysis concerns communication links with regard to pedestrian and bicycle traffic. There are seven river-crossing possibilities of this kind in the selected scope of the analysis, i.e. six road bridges and one footbridge (two railway bridges that do not provide any pedestrians or bike connections have been excluded). They all create the main determinants of shaping urban activity nodes along the Vistula waterfronts. However, the most popular and integrating crossing is the Father Bernatek footbridge, located at the height of Kazimierz and Stare Podgórze. Since the bridge was open to the public in 2010, the areas located in its vicinity on both Vistula banks have become places of increased urban activity. It is related to, among other things, the gastronomic offer created in this area, but also to a convenient walking routes and cycling connection. An additional advantage of these spaces includes attractive viewpoints (e.g. a panoramic view of the Old Podgórze and Kazimierz, as well as Cricoteka). The second analytical category covers public facilities and spaces directly along the waterfront,

Council of September 11, 2013, on adopting the local spatial development plan for the Bulwary Wisły area. However, its genesis dates back to a much earlier time.

[17] This topic was discussed in detail by Agnieszka Matusik (2016).

[18] The symbolic opening of the park took place on September 1, 2018. The Zielone Grzegórzki Association representing the local community submitted a park development plan by BO 2020 (No. 180). It proposed to preserve the natural values of that former military area and create a municipal 'forest park'.

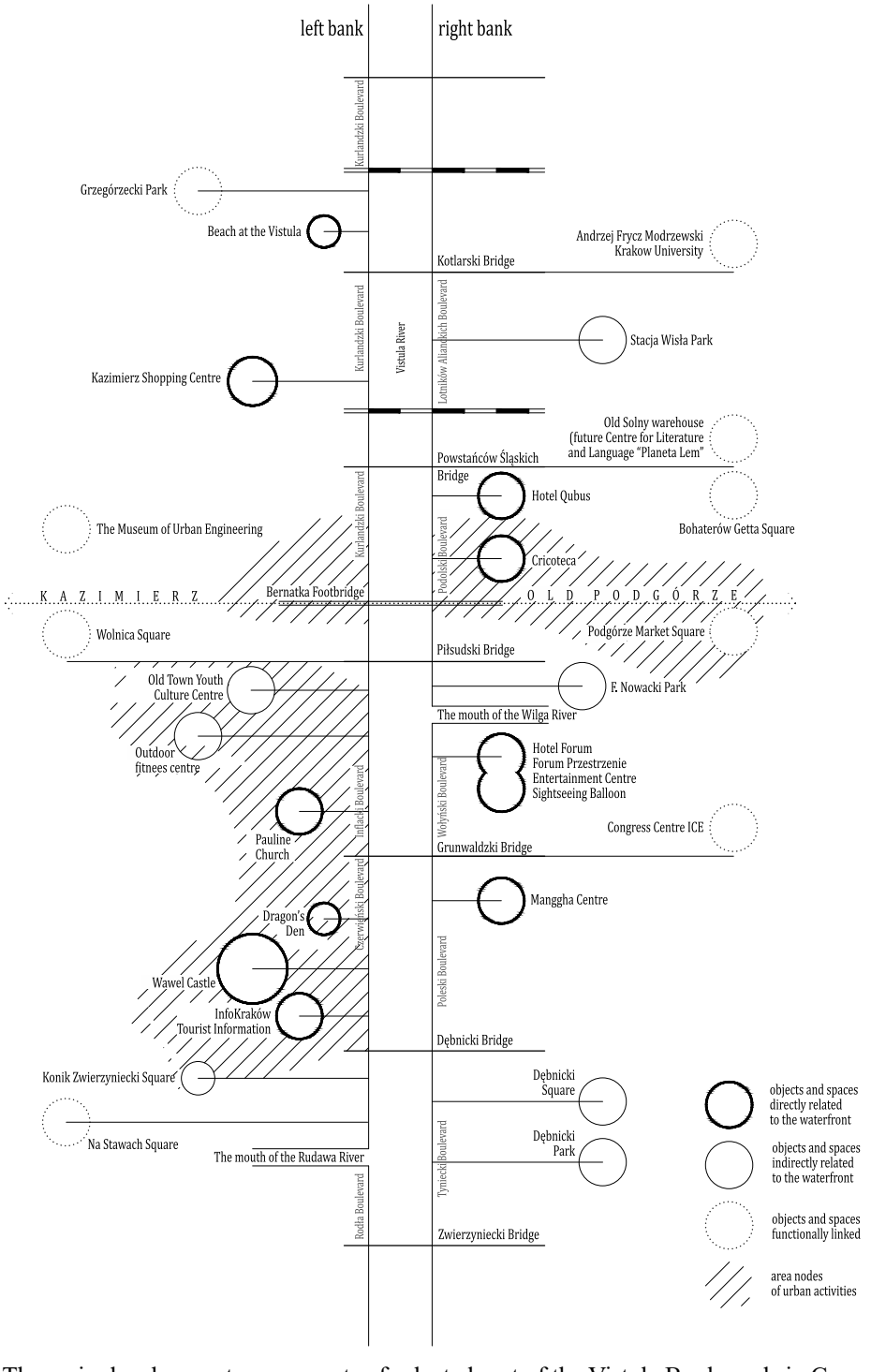

Figure 1. The main development components of selected part of the Vistula Boulevards in Cracow

Source: own elaboration.

which generates residents' and tourists' activity. They can constitute distinctive landmarks and Cracow's flagship attractions that significantly contribute to these spaces' popularity. However, it should be remembered that an activity node is usually shaped by more than one building. Hence, the form and functions of the surrounding areas and the quality of transport connections are essential elements of nodes' development.

The analysis shows that among all the spaces assigned to the second category, only in the Manggha Centre of Japanese Art and Technology there are not enough factors to shape the urban activity nodes, despite its high cultural and aesthetic values. Due to the Centre's location, the quality of connections with other parts of the city, and the elite cultural offer, it is not an urban activity node but, rather, an essential and distinctive element of the landscape of Cracow's boulevards. The third category consists of buildings and spaces located in the areas adjacent to the waterfront, but not having a direct visual or functional relationship with it. One example can be the Dębnicki Market Square or the F. Nowacki Planty, which can constitute functions enriching the adjacent area of the coastal area's activity node. The fourth analysed category involves objects and areas not located directly on the boulevards, but closely related to them due to their location and function. This group includes important public spaces creating functional and communication urban systems related to the coastal areas of the Vistula. Their role in shaping integrated systems of public spaces is particularly noticeable when connections with places are classified as belonging to the second analytical category and diagnosed as nodes of urban activity. One example is the sequence of spaces located on the right bank of the Vistula: Bulwar Podolski near Cricoteka – a square at the corners of Nadwiślańska Street and Józefińska treet as well as Brodzińskiego Street and Staromostowa Street – the Podgórze Market Square[19].

The analysis shows that along with the researched fragment of the Vistula riverbanks in Cracow, two areas (no. 1 and no. 2) have features characteristic of urban activity junctions. The extent of the indicated areas results from the specificity of the landscape of Cracow's boulevards. Areas of greenery along the Vistula's waterfronts create a unique natural character, which is in contrast with, for example, the built-up Thames' waterfronts in London. Therefore, a junction is a single object or urban interior, but a group of junctions comprises functionally- and communicatively-related elements. Areas no. 1 and no. 2 meet all the previously defined criteria of urban activity nodes. The advantage of these areas is their location, as it is connected with the oldest buildings in Cracow, which ensures good communication links as well as functionality and composition. Historical urban layouts create sequences of defined urban interiors with great spatial value, making them attractive places for users. However, this is not the case with area no. 3, where Konopnicka Street creates an unfavourable system of connections with the neighbouring areas. As previously mentioned, the Vistula's waterfronts in Cracow are seasonal in terms of the intensity of their use. Due to their natural character, the number of visitors is closely connected with the season or weather conditions. Therefore, the analysis focused on the number and the type of the functions. Area no. 3 was defined as the one most seasonality-dependent when it comes to the offer of activity and the number of users. Thus, this area did not meet the criteria related to these aspects.

[19] In the area of Stare Podgórze, the sequence of public spaces does not end at Rynek Podgórze and continues through successive urban interiors. However, as part of the analysis focusing on the quay areas, indicating the Podgórze Market Square as a space related to the Vistula River aimed at emphasising the role of an appropriate shaping of the connectors' functions. Activation of this area – both in terms of the presence of space users and the functions generating this activity (in this case mainly catering) – results, among other things, from creating an attractive pedestrian and bicycle connection with the left bank of the Vistula, namely the Father Bernatka Footbridge.

Table 2. Nodes of urban activity on a selected section of the Vistula Boulevards in Cracow

	Spaces and objects related to the given rea	Publicly available urban areas	Multi-functionality (min. 3 functions)	Good connectivity (mainly walking and cycling)	Links with residential areas	A large number of users	Area attractiveness
Area 1 Wawel (with the Dragon`s den), tourist service centre with the accompanying space, restaurants on barges	Plac na Groblach, Jubilat Shopping Centre, hotel and catering facilities along Powiśle Street and Zwierzyniecka Street	x	x	x	x	x	x
Area 2 Cricoteka, restaurants at Nadwiślańska Street, Józefińska Street, Brodzińskiego Street, and Staromostowa Street	the Podgórze Market Square, public facilities, but also an indirect area on the left bank of the Vistula River	x	x	x	x	x	x
Area 3 Hotel Forum, Forum Przestrzenie, an amusement park, a sightseeing balloon	ICE Congress Centre, the Manggha Centre	x			x		x

Source: own elaboration.

The conducted field interviews (106 in total) with the users of the particular spaces[20] revealed a high assessment of all the three defined areas. This assessment concerned the attractiveness of the development of the discussed regions, the activities offer for representatives of various age groups, a sense of security in them, and functionality.

Cracow's surface waters

The surface waters in the region include mainly artificial water reservoirs usually created in old mined quarries after finished exploitation. They include Bagry, Płaszowski Pond, Dąbie, the reservoir in Zakrzówek, and the reservoir in Przylasek Rusiecki. These reservoirs are popular places for water sports and recreation such as swimming, diving, and fishing. Additionally, most of these places are used for environmental education. As a result of improving a wide range of provided activities, reservoirs are becoming more and more popular among Cracovians as leisure places. The high demand for green and aquatic recreational places in the city is reflected in social projects submitted, among other things, as part of the civic budget (e.g. the development project for the Bagrów area). The growing popularity of these areas also carries the risk of a negative impact on their biodiversity. The constant development of these areas may pose a very high environmental risk. The most important and frequent one is the lack of local plans which would sufficiently protect these desirable areas (e.g. housing).

[20] One of the criteria for selecting the users was the place of residence, which ensured the possibility of a regular use of the space.

The surface-water areas of Cracow also include the areas of swamps, meadows, wild ponds, riparian forests, etc., which are precious natural areas of great educational value[21]. This group includes, among other things, a pond in the Liban Quarry or a wood stream in the Borkowski Forest. These places do not have the potential to create activity nodes in the classic sense, but are more and more appreciated by the inhabitants of Cracow. Mentioning them in the context of the creation of nodes as frequently visited places can even seem to be a kind of provocation; human activity in these areas would undoubtedly contribute to their degradation and would probably take away their unique 'value of wildness'. However, I strongly believe that the concept of an urban activity node can be understood in a broader context, i.e. it can also be a place connecting the local community and shaping the identity of a given site[22]. In the case of areas of wilderness, the natural values of these places are unique in the urbanised landscape of the city. Therefore, it is worth protecting them through educational activities. They cannot and should not officially become the nodes of activity, but when their value is acknowledged, they can get protection from improper exploitation. The rich awareness of the city's natural values and their significant role in shaping Cracow's ecosystem is slowly growing.

The study (Table 3) included six main water reservoirs in Cracow; they were analysed according to the previously formulated criteria. Due to the high seasonality of these spaces, only lakes located within walking distance from the residential areas can generate user activity outside the summer season. However, the level of this activity is not sufficient to create an activity node. Water reservoirs that gather the most significant activity of the inhabitants are those located in the vicinity of residential buildings, providing convenient access for pedestrians and cyclists, as well as offering bathing areas and opportunities for water sports. The fulfilment of the last criterion – i.e. the one concerning, among other things, the attractiveness of the development – was determined (similarly

Table 3. Features of Cracow's surface waters

Surface waters	Publicly accessible urban areas	Multi-functionality (min. 3 functions)	Good communication links (mainly walking and cycling)	Links with residential areas	A large number of users	Attractive development the terrain
Bagry	x	x	x	x	x	x
Zakrzówek	x	x	x	x		x
Staw Płaszowski	x			x		
Zalew Nowa Huta	x	x	x	x	x	x
Staw Dąbski	x		x	x		
Przylasek Rusiecki	x	x				x

Source: own elaboration.

[21] This topic is taken up by the 'Children in Nature' association, which deals with nature education with regard to nature protection, as well as with ways to include it in the spectrum of urban greenery to benefit the city and the community.

[22] The issue of urban activity nodes was also taken up, among other authors, by Jopek (2018) as well as within edited volumes (e.g. Guranowska-Gruszecka & Łaskarzewska, 2018).

to the analysis of the Vistula River) based on observations and field interviews (68 respondents). In this case, the majority (76%) of the opinions were positive.

Therefore, the most important conclusion of the analysis is that Cracow's surface waters have a minimal potential for creating nodal areas within the city structure due to their specific functionality.

Conclusion

Social and natural aspects are essential pillars of the development planning of modern cities' spatial and functional structure. Designing urban polycentric system of activity nodes and their connections favours social integration and organises the city structure. The positive impact of greenery on many aspects of people's lives is well-known. The development of the city's natural areas as well as their use must be carried out with full respect for their natural values. Nodes of urban activity should not be identified only in terms of the city's flagship public spaces such as main squares and parks. These places should be created throughout the city and accessible to all city residents, i.e. those living in both more and less populated areas. Such spaces can be different in their spatial form, but should have a common denominator, namely social integration.

Water spaces are an essential element of the urban space. Together with greenery, they form a close, blue-green, synergistic relationship. Waterfront areas related to the hydrological network offer the possibility of improving green areas' accessibility throughout the city, also in Cracow. Apart from sports and recreational functions, it is also essential to emphasise their educational role by means of revealing natural and cultural values. A sense of belonging to – and responsibility for – a heritage must be cherished and protected over the next generations.

The analysis of Cracow's water spaces has shown that not all of them can create activity nodes, which is mainly due to particular areas' high seasonality of use. The potential of creating nodes is related to the multi-functionality of a given place, its range of influence, and its ability to generate users activity. The urban nodes' polycentric system needs to be considered during the development planning. The system's main aim should be to integrate all city areas through a communication network of good quality and quantity.

There is no doubt that a river in the city plays a unique role. Therefore, a city's nodes created along waterfronts have a significant value in connecting the city structure to its parts. Other advantages of a well-designed city network can be about natural and cultural values, better protection, and opportunities for scenic explorations.

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