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AN INTEGRATED APPROACH TO RIVER VALLEY REVITALISATION

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Abstract. Rivers have always been a unique space in urban landscapes. Regrettably, the river-town relationship was disturbed in the 19th and at the beginning of the 20th century as industrial plants and districts were established at banks, which changed the urban structure. This resulted in degradation of riverscapes among other things. Today, attempts are made to revitalise the areas and use them for ecological, recreational, and other purposes. The paper presents an integrated approach to river valley revitalisation – demonstrated on the Skawinka river, flowing through Skawina, an industrial town in Poland. An integrated approach could indicate local development possibilities of river valley and thereby strengthen the competitiveness of the area. The study employed the Landscape and Hydromorphological Assessment of River Valleys Method, focusing on hydromorphological, landscape, and integrated factors. Proposing an integrated approach to the Skawinka river valley revitalisation presents a procedure that indicates possibilities for local development and thereby strengthening the competitiveness of this region. The guidelines for the revitalisation project for this river indicate that if the river was made generally accessible, it may become an important location for social and economic life. At the same time it might have a recreational and educational function.

Keywords: revitalisation, integrated method, landscape management, hydromorphology, river valley, Poland.

Introduction

The man has been living around rivers, which became a vital component of our life, for ages (Neruda, Tichonova, & Kramer, 2012). Rivers provided food and potable water necessary for every-day existence, were used for defence (water for moats around Medieval castle walls), and were used for water communication and transport (Neruda et al., 2012). They provided exceptional spaces in the urban landscape as well. They facilitated spectacular visual reception of architecture. It was near rivers that key buildings and urban complexes were situated in order to display them. This is the case for the Thames river in London, the Danube river in Budapest, and the Seine river in Paris (Mann, 1973; Torre, 1989). The industry also favoured the space near rivers where it could draw energy from flowing water (Haslam, 2008; Newson, 1997; Nowacka-Rejzner, 2009). It was already back then that the river was perceived as a component of the competitive advantage of a region, which provided natural benefits (Otto, Mccormick, & Leccese, 2004).

In the late 20th century, the recreational potential of river valleys and their significance for wildlife corridors and biodiversity were recognised (Godron, 1986). Despite anthropogenic transformations, river valleys remain a valuable element of the natural environment (Nowacka-Rejzner, 2009) enhance the urban life, and contribute to the stability, comfort, and balanced development of cities (Baschak & Brown, 1995; Cook, 1991).

The restoration of spatial and functional relations between the town and the river is an important issue of river valley development. These, often very complex, relations have evolved over the history of urban development from 'interweaving' to 'exclusion', to 'reconciliation' (Chasseriau & Peyon, 2004). The disruption of the harmony involving the industrial development of waterside areas resulted in a new search for solutions related to forming a balanced town-river relation. These activities conform to the principles specified during the Global Conference Urban 21 on such issues as treatment of waterside areas as an important element of the urban structure, providing public access to waterside areas,

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and recognising the continuous nature of waterside revitalisation (Pluta, 2014).

The first actions taken in industrial land in Western Europe (1990s) focused on the ecological revitalisation of the Emscher river in the Ruhr, Germany (Sommerhäuser & Stemplewski, 2015). The current design trends stem from this idea and are aimed at the naturalisation of rivers and restoration of their natural condition. An example for Europe is the Reuris project (Revitalisation of Urban Spaces), which included the central part of Europe (Bender et al., 2012; Neruda et al., 2012). In the USA, there were some great projects aimed to revitalise riverbanks in Buffalo (River Walk) or the current project, the Los Angeles River Revitalization Master Plan (2007). The latter is intended to restore the historical riverside and habitats in order to support wildlife proliferation, improve water quality, and offer passive leisure, economic development, and general access to the river.

The essence of functional transformations of river valleys is to preserve their multi-functional nature and varied use and take into consideration the town-river relation when introducing new functions (Hall, 1993; Breen & Rigby, 1994; Bruttomesso, 2001; Wlodarczyk & Dias Mascarenhas, 2016). Every river town and city has a unique relation with the river and common history. Being near a river, one should feel its special character and appearance related directly to the history of the town. The residents should be aware that the river in their town provides identity to their region, natural habitats, recreation, potable water, and jobs in their surroundings (Cengiz, 2013). Every river town and city has a unique relation with the river and common history. Being near a river, one should feel its special character and appearance related directly to the history of the town. The residents should be aware that the river in their town provides identity to their region, natural habitats, recreation, potable water, and jobs in their surroundings As regards the economic aspect of river valley revitalisation, important are the new impetus for economic growth, development of the existing or introduction of new businesses, stimulation of market mechanisms, and attraction of new investors.

Wide-spread revitalisation has been in place in Poland since 1990s, after the socio-political transformation (Jaszczak & Dreksler, 2011). Since 2015, there has been an Act in force, which regulates these processes and determines the principles for procedures and funding of the process (Ustawa, 2015). The starting point for revitalisation activities in a municipality or a town is to identify the crisis situation (social, economic, environmental, technical, spatial, and other issues) based on a diagnosis carried out by an administrative body (or a delegated interdisciplinary team) (Ambroziak & Kłosowski, 2004). A correct diagnosis facilitates the determination of the boundaries of the most problematic area in need of revitalisation. Regrettably, it happens remarkably often that revitalisation is still associated with 'repairs' and 'restoration' of urbanised areas (districts, neighbourhoods, city centres), which results in passing over neglected areas with great potentials such as industrial land, wasteland, or river valleys (Ziobrowski, 2010). This may result from the fact that modernisation and repair provide 'quick, visible final effects' while all changes to large areas usually take time and their results may be appreciated only after several years, among other things due to introduced vegetation. This is why the paper focuses on a river valley in an industrial town as the revitalised area also in the context of the development of the whole urban area (Bernat, 2014). Its revival may improve environmental quality, social and economic growth, and competitive capabilities of the region.

The aim of this paper is to present an integrated approach to river valley revitalisation. An integrated approach could indicate local development possibilities of a river valley and thereby strengthen the competitiveness of the area. Carrying out the revitalisation in an integrated way might additionally prevent further degradation of the river as well as its valley. The valley of the Skawinka river was assessed using the LandScape & HydroMorphological Assessment of River Valleys Method (LSHM Method) (Nawieśniak, Strutyński, & Hernik, 2016) focusing on hydromorphological, landscape, and integrated factors.

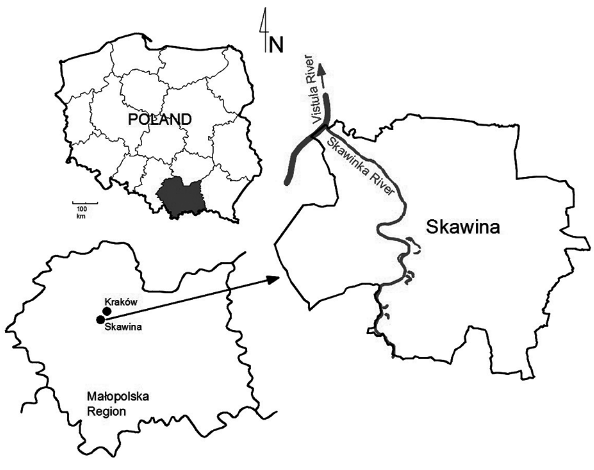

Figure 1. The study area against the contour of the country and the region (drawing from the author's private archives)

1. Material and method

The study area was the Skawinka river valley in the Małopolskie Voivodeship (Figure 1). Skawinka is a right-bank tributary of the Vistula river. Its confluence is located between the Skawa river and the Raba river, near Tyniec. The surface area of the drainage basin of the Skawinka is about 350 km^2. Its total length is 33 km. The source of Skawinka is in the Chełm, Beskid Makowski. The river flows through a heavily industrialised Town of Skawina (bordering at Kraków).

Skawina was located pursuant to the Magdeburg rights already in the 14th century. Since then, it has been growing a town of artisans, trade, and farming. In the 19th and 20th centuries, the town went through substantial economic changes related to the construction of factories and manufacturing companies. The changes were driven by the Kraków-Oświęcim railway line opened in 1884. This contributed to the establishment of a paraffin oil refinery, stoneware and chamotte products factory, coffee products factory, and a brewery (Krupa, 2013). After the Second World War, one of two Polish aluminium smelters, a power plant, and glass-works were opened there (Monografia Skawiny, 2014). Today, the industry continues to grow. In the place of the aluminium smelter, there are new factories that produce and process aluminium. A food manufacturer renowned in Europe, Bahlsen but also Valeo, Vesuvius and other are located in the town. Many of them are situated close to the river.

The Skawinka river valley was investigated in the central part of Skawina where the river runs through industrial parts of the town. The area was assessed and identified in six sections selected based on a preliminary assessment of the area. The sections were located in spots where changes in riverscape and its vicinity are clear (Figure 2). Section I is situated in a place where river bed was completely covered in concrete and the adjacent area is entirely unused. Subsequent sections (II, III, and IV) were located in places where access to the river is blocked; vegetation species variety is very limited; and there is virtually no cohesion between the park area, technical infrastructure, and natural landscape. Sections V and VI are areas where the river is partially covered with concrete and neglected.

The study employed the LandScape & HydroMorphological Assessment of River Valleys Method (LSHM Method) (Nawieśniak et al., 2016). This method is based on an investigation of a set of hydromorphological and landscape elements in the river valley. The main purpose of this investigation is to collect information regarding the surrounding landscape, its character, physiognomy and hydromorphology. Altogether these elements have impact on a river valley. During the field investigation three main groups of factors are assessed, and these are: hydromorphological (H), landscape (L), and integrated (I) factors. All the factors are assessed using a 10-point scale and assigned to one of five classes (0; 1–2; 3–5; 6–8; 9–10). The first group of elements, the hydromorphological factors (H), pertains solely to the river channel. This group includes the following parameters: the geometry of the watercourse (H-1), river bed material (H-2), vegetation assessment in the channel (H-3), and erosion/deposition (H-4). Table 1 shows extreme values for the assessed parameters according to the LSHM Method.

Parameters assessed in the second group, landscape elements are land cover and topography (L-1), open landscape (L-2), settlement areas (L-3), and historical features/structures (L-4). Extreme values for this group of elements as per the LSHM Method are shown in Table 2.

Elements in the third group are integrated elements (I), which could not be definitely assigned to either of the previous groups. These parameters integrate hydromorphological and landscape elements: flow characteristics (I-1), anthropogenic elements / modifications (I-2), use and vegetation in areas adjacent to the watercourse channel (I-3), and mobility and connection of the channel to a floodplain and/or adjacent open area (I-4). Table 3 contains extreme values for the parameters according to the LSHM Method.

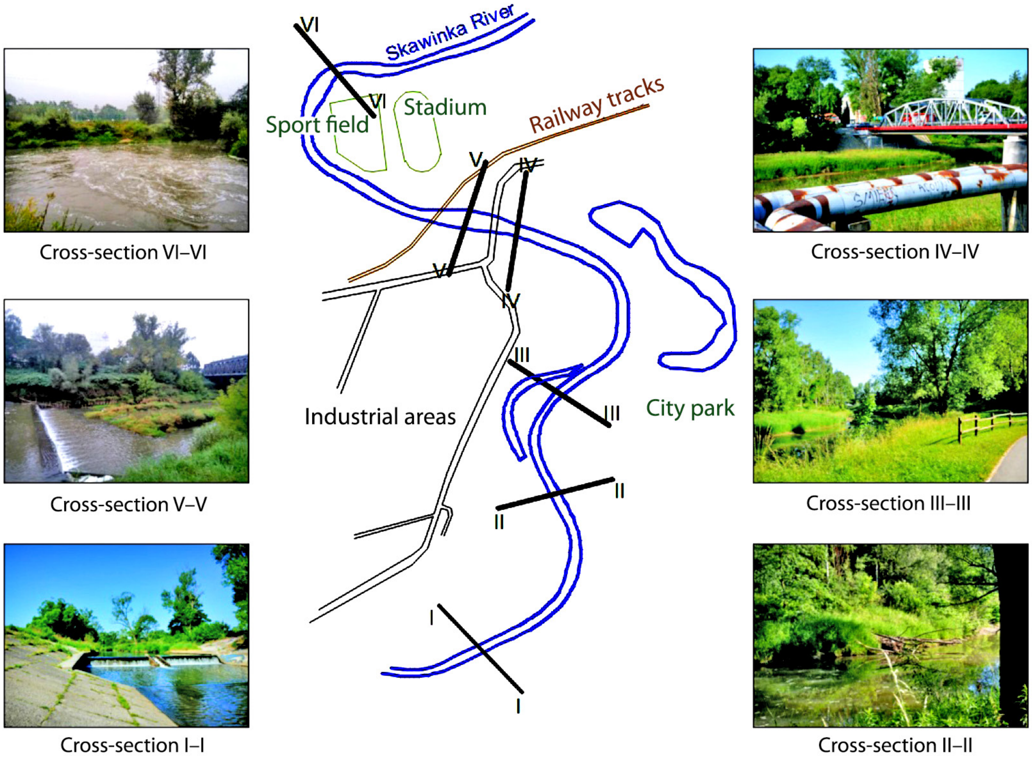

Figure 2. Sections in the study area (drawing and photos from the author's private archives)

Table 1. Extreme values of hydromorphological elements as per the LSHM Method (source: author's study)

Hydromorphological elements (H)	Scale	
	10–9	0
Watercourse geometry (H-1): assessed value of change in the channel section, change (or lack thereof) in the longitudinal profile and cross-sections of the watercourse	Up to 5% of the section of the watercourse channel changed, no human impact (or minimal interference) in the course of the river channel, no change in the longitudinal profile and cross sections of the river, any changes are slight, almost imperceptible	90 to 100% of the section of the watercourse channel changed, change in the entire geometry and course of the river channel (straightened), complete change in the longitudinal profile and cross-sections of the watercourse
Watercourse bed material (H-2): the value of the parameter is higher if the material is natural, diversified, and unaffected by the man. Lower values are assigned to artificial beds or beds improved using engineering materials (such as concrete channels or groynes)	Natural course bed, very large diversity of watercourse bed material, natural occurrence of rough elements	Course bed completely artificial, concrete
Plant life in the channel (H-3): assessed depending on the degree of channel improvement and plant potential, in particular on bars	Channel unregulated, presence of the various species of plant life on bars and banks of the watercourse, natural woody debris	Channel is completely regulated (concrete), absence of vegetation
Erosion/ deposition (H-4): assessed depending on the present forms of erosion and deposition, which is also related to watercourse bed improvements (or lack thereof).	Presence of erosion and deposition in watercourse channel, presence of many point bars and mid-channel bars, existence of natural riffle-pool sequences, occurring forms of erosion do not cause undue damage associated with lateral erosion	Watercourse channel completely regulated (concrete); absence of erosion or deposition forms

Table 2. Extreme values of landscape elements as per the LSHM Method (source: author's study)

Landscape elements (L)	Scale	
	10–9	0
Land cover and topography (L-1): assessed based on visible diversity (or homogeneity) of topography and land cover	Clearly varied topography and land cover, presence of hills and valleys, forests, meadows, cultivated fields; perfectly harmonised landscape: coexisting landmarks perfectly match each other, without causing eye strain	Not varied topography, absence of diversity in land cover
Open landscape (L-2): values assigned depending on the occurrence (or not) of spatial order and characteristic features and patterns related to agriculture and forestry	Spatial order, clear boundary between cultivated fields and forests, high feelings and associations, distinguishing agricultural and forestry features and patterns, preservation of traditional arrangement of farmland	Total absence of spatial order, absence of boundary between cultivated fields and forests, as well as distinguishing agricultural and forestry features and patterns, absence of traditional arrangement of farmland
Settlement areas (L-3): assessed depending on the occurrence (or not) of region-specific developments and building condition	Spatial order, preserved regional features of development, high feelings and associations, visible distinguishing features of houses and settlements, buildings in good condition	Total absence of spatial order, absence of regional features of development, buildings preserved in poor condition with no distinguishing features
Historic features/ structures (L-4): assessed based on the occurrence of historic structures, characteristic features, and patterns of cultural landscape	Presence of historic structures (castles, ruins of castles, walls, etc.), which clearly attract observer's attention	Absence of historic structures and distinguishing features and patterns of the cultural landscape

Table 3. Extreme values of integrated elements as per the LSHM Method (source: author's study)

Integrated elements (I)	Scale	
	10–9	0
Flow characteristics (I-1): assessed based on the occurrence (or not) of diversified hydromorphological units in watercourse channel and feelings related to the sound of flowing water (or lack thereof due to human activity)	Many different hydromorphological units in watercourse channel, sound of flowing water is unobstructed by any anthropogenic activities, a clear, unique sound landscape	Absence of hydromorphological units in watercourse channel, inaudible sound of flowing water (completely disturbed by human activities), no unique sound landscape
Anthropogenic elements/ modifications (I-2): assessed in watercourse channel and in river valley based on occurrence (or not) of bank and bed modifications and anthropogenic elements in river valley that disrupt landscape structure	*Watercourse channel*: completely natural river channel, no anthropogenic elements, *river valley*: few anthropogenic elements perfectly integrated into the landscape, harmonious landscape	*Watercourse channel*: presence of hydraulic and concrete structures across the channel, as well as bank and bed revetment made of artificial materials, *river valley*: presence of many unnatural, anthropogenic elements that disturb the spatial order and harmony of the landscape (e.g. motorways, dumps)
Use and vegetation in areas adjacent to watercourse channel (I-3): assessed depending on the surface area of the land adjacent to the channel and its use	Area directly adjacent to watercourse channel is a wide belt covered with natural vegetation and alluvial forests	Area directly adjacent to watercourse is very narrow and used for technical infrastructure or development
Mobility and connection of the bed to floodplain and/or adjacent open area (I-4): assessed based on the possibility (or not) of channel shifting in the adjacent area	The channel has an unlimited ability to shift (meandering, braiding), very good channel connection to floodplain and/or adjacent open area	The channel is completely regulated and unable to shift, absence of channel connection to floodplain and/or adjacent open area

Values assigned to individual elements (parameters) indicate the attractiveness (or unattractiveness) of the studied area. River valley landscape was divided into 3 economic and tourism attractiveness groups in order to apply the LSHM Method: a very attractive area (values for assessed elements as per the LSHM Method vary from 7 to 10), a moderately attractive area (values for assessed elements as per the LSHM Method vary from 3 to 7), and an unattractive area (values for assessed elements as per the LSHM Method vary from 0 to 3).

It should lastly be acknowledged that the LSHM Method should only be applied on river valleys with a low probability of flooding. Thus, flood protection activities are not covered by this method, which focus solely on the revitalisation of degraded areas in terms of social and landscape aspects.

2. Results and revitalisation proposal

The assessment of the Skawinka river valley area with the LSHM Method yielded numerical values for each group of the assessed parameters. These values for three groups of elements are presented in Figures 3, 4, and 5.

Values for hydromorphological elements (Figure 3) in the sections varied significantly from section to section. In sector I, it received the lowest values for each hydromorphological element, i.e. 0. This means that the watercourse geometry at this section has been altered completely; the river bed was completely covered in concrete, as were the banks, which resulted in a lack of any form of erosion or deposition. Section V, except element H-3, exhibited similar properties and vas evaluated at 1. The highest values were assigned to hydromorphological elements in sections II and III: from 5 to 9. Changes in channel geometry were visible; longitudinal profile and cross-sections were deformed. The river bed was regulated with natural materials; banks were unregulated, covered with diverse vegetation. The channel featured forms of depositions: pools and riffles.

Values for landscape elements (Figure 4) in the sections varied significantly. Topography varied only in sections II and III; land cover diversity was noticeable. In the remaining sections, topography diversity was very poor; land cover diversity was scarce. In sections I, II, and II, the spatial order was virtually non-existent, agricultural and forestry features and patterns present to a small degree, no traditional arrangement of farmland. In sections IV, V, and VI, the spatial order was absent, agricultural and forestry features and patterns imperceptible, no traditional arrangement of farmland. In sections I and IV, regional features of development and distinguishing features of houses and settlements were noticeable to a small degree, for the other sections they were virtually absent. There were no historical buildings in on the investigated sector of the Skawinka river valley, but in sections I, IV, and VI, characteristic features and patterns of the cultural landscape were noticeable. For sections II and III, features and patterns of the cultural landscape were almost imperceptible.

Values of integrated elements (Figure 5) were much diversified across all sections just like values of landscape elements. In section I, there were many different hydromorphological units in the watercourse channel; the sound of flowing water was unobstructed by any anthropogenic activities resulting in a clear, unique sound landscape. In sections II, III, V and VI, there were sporadic

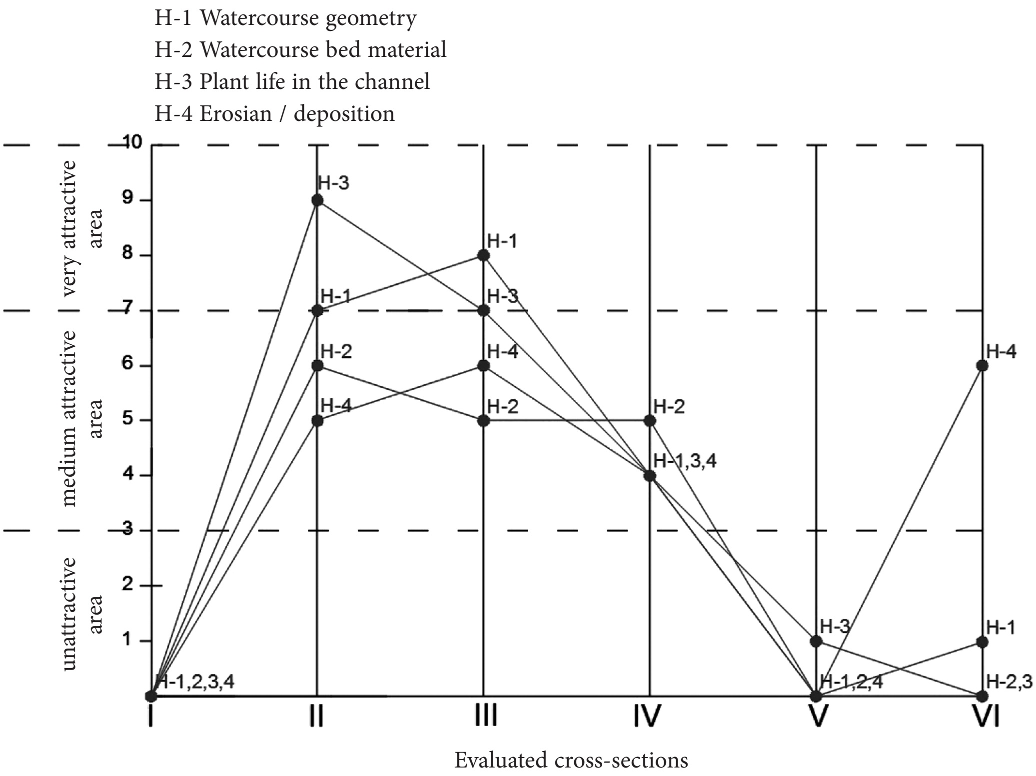

Figure 3. Values for hydromorphological elements (H) in the LSHM Method assessment of the Skawinka river valley (drawing from the author's private archives)

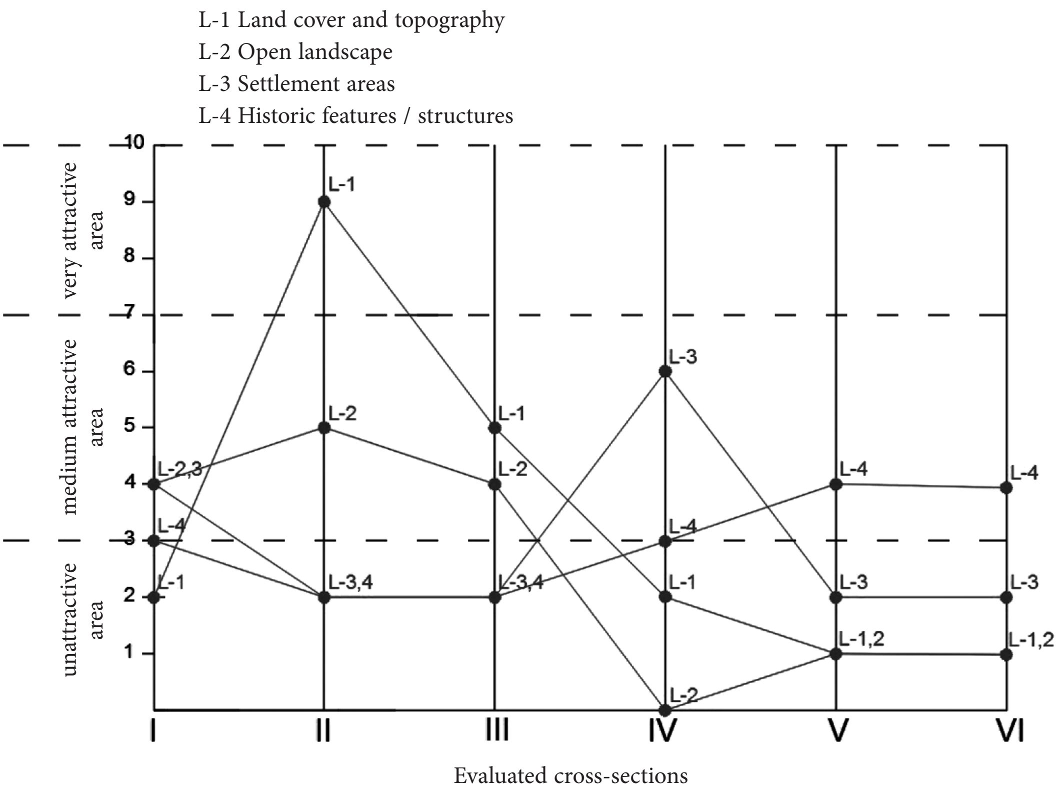

Figure 4. Values for landscape elements (L) in the LSHM Method assessment of the Skawinka river valley (drawing from the author's private archives)

hydromorphological units in the watercourse channel; the sound landscape was present but virtually imperceptible, obstructed by anthropogenic activities. The situation for section IV was even worse. No hydromorphological units in the watercourse channel; no sound landscape. Modification in the bed in sections I, V and VI were made from engineering materials (such as concrete). Extremely numerous anthropogenic elements were found in the river valley, which disturb landscape structure. Additionally, in sections V and VI, the spatial order and landscape harmony were disturbed by anthropogenic elements (a railway track). The situation was much better for sections II, III and IV. In section II, the watercourse bed was completely natural; there were scarce anthropogenic elements in the river valley, which were perfectly integrated with the landscape; the harmonious landscape was found. In sections II and IV, watercourse bed modifications were made of natural materials; some anthropogenic elements were noticeable in the river valley landscape. The area directly adjacent to the channel on sections I and II was a broad band, which was used for agricultural and/or forestry purposes. In section III, the band was still wide, but it was partially used for technical infrastructure. In sections IV, V and VI, the area directly adjacent to watercourse was narrow and partially used for technical infrastructure. In sections II and III, the channel had a slight ability to shift (meandering, braiding), noticeable channel connection to a floodplain and/or adjacent open area. In the other sections, the channel could not shift; no connection to a floodplain and open area. Vast areas with high flood risk.

The historical state could not be restored in the study area owing to new industrial developments. Therefore, it should be revitalised. The LSHM Method analysis suggests that the study area should be revitalised. For the area to be considered attractive, all elements that scored 0 to 3 should be improved.

The following hydromorphological elements should be improved in section I: the geometry of the watercourse (H-1), river bed material (H-2), vegetation in the channel (H-3), and erosion/ deposition (H-4). Land cover (L-1), anthropogenic elements/ modifications (I-2), and mobility and connection of the channel to an open area (I-4) should be corrected as well. In sections II and III, the improvement should include landscape elements: settlement areas (L-3) and cultural landscape (L-4). In section IV, the lowest-ranking elements are landscape parameters: land cover (L-1) and open landscape (L-2) and integrated elements: flow characteristics (I-1), use and vegetation in areas adjacent to the watercourse channel (I-3), and mobility and connection of the channel to an open area (I-4). In sections V and VI, the following need to be made better: hydromorphological elements: geometry of the watercourse (H-1), river bed material (H-2), vegetation in the channel (H-3), and erosion/deposition (H-4) (section VI without H-4); landscape elements: land cover (L-1), open landscape (L-2), and settlement areas (L-3); and integrated elements: anthropogenic elements/ modifications (I-2), use and vegetation in areas adjacent to the watercourse channel (I-3), and mobility and connection of the channel to an adjacent open area (I-4). Table 4 shows a proposal of

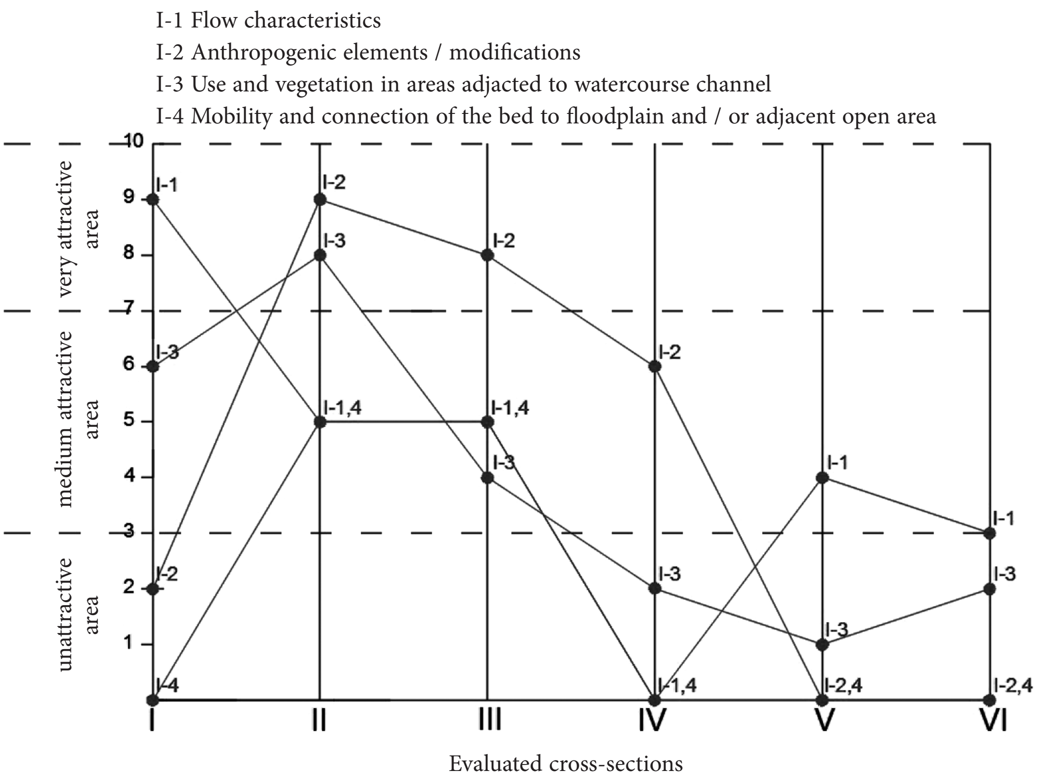

Figure 5. Values for integrated elements (I) in the LSHM Method assessment of the Skawinka river valley (drawing from the author's private archives)

Table 4. Guidelines for a Skawinka river valley revitalisation project according to the LSHM Method (source: author's study)

Section	Existing state, issue	Proposed solution (guidelines for the revitalisation project)	Direction of revitalisation
I–I	River bed covered in concrete, area neglected, unused for 20 years	Creation of recreational areas	RECREATION/ NATURALISATION
II–II	No access to the river, poor vegetation species differentiation	Protection of the riverside, permission for partial natural succession of vegetation, proposal of nature trails	PROTECTION/ NATURALISATION/ EDUCATION
III–III	No access to the river, river not exposed, river poorly integrated with the park area	Integration of the sector of the river with an arranged part of the municipal park, visual exposure	NATURALISATION/ INTEGRATION/ RECREATION
IV–IV	No cohesion between technical infrastructure and natural riverside landscape	Utilisation of the industrial and natural landscape to create a 'showpiece' of the town	INTEGRATION/ RECREATION
V–V	Sector of the river covered in concrete, neglected near industrial plants	Technology park integrated into the river valley	INTEGRATION/ RECREATION – SPORTS
VI–VI	Power station water outlet, neglected banks and fishing sites	Unrestricted access, car access to the river, new fishing sites	RECREATION

guidelines for a Skawinka river valley revitalisation project for each section, which include the improvement of poorly scored elements.

In section I, an important activity is an attempt to restore a 1990s bathing beach with modern infrastructure, redevelopment of banks and bed (natural materials), install fish passes to facilitate fish migration, adapt the riverside for recreation, and introduce park furniture. For sections II and III it is suggested to conserve and permit a natural vegetation succession, restore biodiversity, protect biotopes including habitats of river animals, and establish nature trails. Positive results may be achieved by integrating a sector of the river with an arranged part of the town park with additional park furniture drawing on local traditions. In section IV it is suggested to alter the riverscape by hiding the motorway from view and implementing sound insulation, to use the technical infrastructure (heat transfer pipeline, bridges) to highlight the industrial nature of this sector of the river and employ the riverscape as the 'showpiece' of the town. For section V it is suggested to merge the riverscape with the industrial landscape and to use this sector as an element of a technology park with a sports field complex. It is necessary to use natural finishing materials for the bed and banks of the river. Revitalisation of section VI should involve primarily an arrangement of river banks, providing pedestrian and car access, and creation of fishing sites. This sector is often used by anglers.

3. Discussion

Interesting, unique locations that can be put to creative use both for modern needs of their users and town promotion are a particular development factor for modern towns. Revitalisation of urban river valleys is a challenge today's world is facing. Such revitalisation improves the social, economic, and spatial situation. Economic benefits include the growth of services (including new business entities) and attraction of external capital. These activities improve the quality of social life in the region and its competitive advantage. Correctly designed embankments, bridges, and pedestrian bridges also enhance the attractiveness of riverside urban space (Gubańska, 2009; Pancewicz, 2003). Shaping public spaces in a way that facilitates direct contact with the river helps bind both banks and reduce communication barriers related to its presence. The perception of natural features in the surroundings affects aesthetic preferences of people significantly (Gobster & Westphal, 2004; Nassauer, 1992). Note that the perception is not limited solely to visual sensations but includes also sound or smell of water (Bernat, 2010).

Revitalisation projects must ensure adequate water quality through its improvement, appropriate functioning of the valleys, restoration or enhancement of their environmental functions, the capacity of a wildlife corridor, elimination of activities at variance with the ecological function of the valleys, and connection to existing green areas to create an urban environmental system. It is also important to take advantage of the integrating function of the river in terms of architecture, urban planning, economy, society, and culture and to strive to preserve the unique nature of the location shaped through age-old traditions while making it available to all stakeholders (Bernat, 2013). An important factor to moreover consider is the probability of flooding. In river valleys where the probability of flooding is high, it is necessary to first prioritize the infrastructure related to flood protection. Flood protection should preferably include solutions based on nature. It could be water retention by managing infiltration and overland flow and thereby the hydrological connectivity between system components and the conveyance of water through it, making space for water storage through, for example floodplains (WWAP, 2018). As mentioned before, the LSHM Method does not take flood protection into account. A project conception of a winding park in Skawina was published in 2010. The project was aimed to: 'Emphasize *genius loci*, express the identity of the Skawina area in the resulting cultural and social space through highlighting historical spatial arrangement and intangible cultural assets' (Wątor-Kmita, 2010). The project was not carried out. The project employed the JARK-WAK method, which involved mainly landscape integration. In order for this area to be revitalised correctly, not only the landscape but also hydromorphological elements related to the river should be taken into consideration. River valley revitalisation concepts may take various forms depending on the landscape context, spatial planning, social needs, and the identity of the location (Idajati, 2014), but the approach should be integrated. In this case, application of the LSHM Method to assess and identify the Skawinka river valley prior to the revitalisation is justified. This method combines hydromorphological and landscape elements, which were assessed separately so far. The LSHM Method offers 'holistic', integrated knowledge about the river valley and information about the improvement of individual elements in sections.

Competitiveness of regions means their ability to adapt to changing management environment in order to improve its market positioning. According to Markowski (2001) a competitive region is a region where the level of knowledge facilitates the creation of existing or new material assets, the building of a structural advantage, and the commercialisation of regional products. The natural environment, being a system of natural elements in the scope of interest of for example tourism, is an important domain of knowledge, which affects region's competitiveness (Dziekański, 2015). The natural environment and its touristic attractiveness affect the quality of life of the local community and attract business and capital from outside the area. Natural environment components, however, may be perceived in two ways because the surroundings include natural elements and artificial ones, created by the man. This way, on the one hand, there are environmental elements, which represent value in and of themselves (such as the climate, landscape, and rivers), on the other hand, they may be used for business purposes. As a result, varied spatial distribution of the resources may be an added benefit or disadvantage for businesses operating in the area. This results in significant disproportions in such domains as availability, quality, and cost of obtaining resources, use fees, or pollution limits in individual regions (Trojanek, 1996).

From this point of view, revitalisation of river valleys, such as Skawinka river valley, is a primary determining factor of region's competitiveness (Góralski & Lazarek, 2009; Winiarski, 1997; Piotrowska-Trybuł, 2004). On the one hand, Skawinka river valley is a vital element of the natural ecological system where energy and matter cycle. On the other hand, Skawinka river is to be considered a special four-dimensional landscape of permanent space, semi-permanent space (changing throughout the year), temporary space (episodic), and contact space (human relations and relations between environmental and non-environmental elements) (Bernat, 2007).

Revitalisation means 'restoration of life' and results from spatial, economic, and social transformations. It, therefore, increases the value of the area both in a material and spiritual sense. Revitalisation is increasingly more often included in strategic documents (for example strategies for municipality development), strategic development programmes. Development is a process of changes in time. Revitalisation stands for a change (revival) of what was destroyed. According to Kuźnik (1998) region's competitiveness may be analysed on three levels: spatial, including resources; economic and social, including the behaviour of resource users and their results; and organisational actions taken by local authorities and their effects on social life.

Skawinka river revitalisation affects the competitiveness of regions on all the above-mentioned levels. As mentioned above, revitalisation of a river valley in an industrial town affects the development of the town. Application of the LSHM Method to assess and identify river valleys in terms of hydromorphology and landscape can be used to integrate these two groups of elements, which used to be assessed separately. Next, a diagnosis and assessment of the Skawinka river valley can be a foundation for a proposal for a strategic programme of the Skawinka river valley revitalisation resulting eventually in an improved competitiveness of the region.

River valley revitalisation is a great challenge for those who implement balanced development in their regions. River valleys become the source of competitive advantage for regions in two dimensions. The first one is the creation of tourist products and the other, the growing inland waterway river transport. The river network in Poland is one of the best developed in Europe. Yet, over 3.6 thousand kilometres of waterways are unused. Note that inland waterway transport is environmentally friendly, cost-effective, and safe. Only about 0.2% of cargo is transported by water in Poland, while the average European result is about 7%. The Ministry of Maritime Affairs and Inland Shipping takes actions to change the transport situation of Polish rivers and considers river revitalisation a primary tool (Lewandowska, 2016).

Conclusions

The Skawinka river provides the urban landscape with an exceptional feature, but the area of its valley in the centre of the town is, following the utilized method, considered as medium or even unattractive area. Proposing an integrated approach to the Skawinka river valley revitalisation presents a procedure that indicates possibilities for local development and thereby strengthening the competitiveness of this region. The guidelines for the revitalisation project for this river, obtained with the LSHM Method, indicate that if the river was made generally accessible, it may become an important location for social and economic life. At the same time it might have a recreational and educational function. In the context of industrial cities, rivers may visually enhance industrial zones (Isabella, Britto, & Andrade, 2014), which was also stressed in the case of the study area.

A very important aspect for the development of aquatic areas is moreover to clarify spatial and functional aims. These aims are strategical instruments for achieving a high quality environment and, if fulfilled, a factor that make the urban space more attractive. In the case of the Skawinka river valley, focus should be put on recreational areas associated with the city park and natural greenery belts that enables an increased water fauna. The design of the greenery along the river should thereto act as a curtain, separating the riverside area from unattractive places such as abandoned post-industrial objects.

Based on the conducted research, it was found that an integrated approach to the revitalisation of river valleys should be part of a set of tools for experts who prepare architecture and landscape studies and a basis for drafting projects for shaping river valley landscapes. However, if there is high probability of flooding in the river valley, it is of importance to first manage flood protection and thereafter initiate the revitalisation process.

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