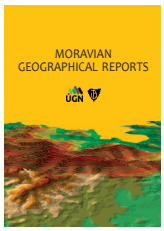

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Assessing the cultural heritage of historical ferries: A case study from the Czech Republic

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Abstract

The aim of the article was to evaluate the importance of historical ferries and ferry ports from the point of view of cultural heritage. The research took place in two model areas in the lands of Bohemia and Moravia in the Czech Republic. The registered transfer points supplemented by supporting database from historical topographical maps can be an appropriate basis for assessing the importance of cultural heritage. A follow-up archival and field research made it possible to objectively assess the potential of river ferries for cultural heritage. The knowledge and information about historical river ferries can be objectively used to make places more attractive for tourists. An ideal form of preservation of the cultural heritage is represented by preserved objects connected with the operation of the ferry, and the remains of anthropogenic landforms and landscaping. The construction or restoration of some objects associated with ferry operations contributes to the preservation of cultural heritage in this specific area of transport. The article attempted to verify whether the proposed methodology for assessing the cultural and historical values of river ferries is a suitable tool for assessing the importance of individual river ferries as a cultural heritage.

Keywords: River ferry, cultural heritage, archival research, Czech Republic, tourism

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1. Introduction

Large watercourses embody a landscape feature that often defines the natural administrative boundary between different regions (Popelka & Smith, 2020; Haselsberger, 2014). Similarly, major rivers also form a physical obstacle, being a significant barrier to transport corridors. Finding suitable means to move across such watercourses is therefore a principal challenge in the designing of transport routes. The past road network systems are frequently targeted by specialized history and microhistory researchers, who utilize preserved written and graphical sources, maps in particular (Tomeček, 2000; Ortiz, 2021; Vletter & Spek, 2021). River ferries, a broadly preferred crossing option, were popular especially in the middle and lower reaches, where establishing a permanent fixed link between the banks embodied an excessively difficult or even unfeasible task (Junxiang, 2020; Doswald, 2019).

From the Middle Ages into the modern times, the ferries allowed, above all, transporting cargo and goods along longer trade routes, in sectors unfavorable for fording (Martínek et al., 2014), and – using water-powered structures, too – facilitated supplying diverse products to those segments of the population that worked in the dynamic domains of food processing and craft manufacturing (Lucas, 2005). Stone bridges existed only in larger settlements before the mid-19th century; more common were wooden bridging structures, but these exhibited a limited material life cycle (Kromoser et al., 2023; Singh & Page, 2018). Further, bridges in general were highly vulnerable to natural hazards such as floods and earthquakes (Argyroudis & Mitoulis, 2021). When under reconstruction and renewal, bridges were regularly substituted with ferries (Parry, 2021). In the Middle Ages, the paid operation of ferries was originally a part of the privileges enjoyed by the superior authorities. The privileges also included collecting tolls to maintain the road, bridge, or ferry grounds (Ivanič & Husár, 2019); in reality, however, only a portion of the toll was employed for this purpose, most of the money being transferred to the king or used to satisfy the needs of the superior collectors (Vangel & Decký, 2010; Ivanič, 2019). In 1870, the Water Law for the Kingdom of Bohemia was passed, rendering the ferry business a licensed commercial activity (Čížek, 1886).

In what now is the Czech Republic, a total of 514 river ferry sites were identified on the basis of systematic registration, using old topographic maps from four time periods between 1763 and 2020; this amount gradually increased to 542 after other archival sources had been studied (Dostál et al., 2021). The ferries reached a peak during the 19th century, their overall quantity and distribution reflecting the dramatically increased demands on the transport system; this trend had arisen from the denser and faster flow of goods and people, an effect accompanying the Industrial Revolution (Derry & Williams, 1993; Bogart, 2013). The continuously increasing volumes of traffic, together with requirements for its broad acceleration, resulted in the ferries being progressively replaced in the 20th century with robust bridges made of iron, steel, concrete, reinforced concrete, and stone.

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Small river ferries are a rediscovered mode of travel in several countries, enhancing and bringing new dimensions to tourist landscape traveling experiences. The river crossing provides an experience of being on water, and the material structure of the ferry grounds significantly shapes on-board interactions whilst providing new perspectives of place (McGrath et al., 2020). Currently, ferries in the Czech Republic are operated mainly in areas with a recreational function, and they usually involve motor boats, often on new water reservoirs. The classic transport purposes have been preserved in a few ferries on the Labe and the Berounka rivers and the Lipno reservoir. In multiple cities worldwide (Prague, for example), ferries have become an integral part of public transport (Bignon & Pojani, 2018; Cheemakurthy et al., 2017), thus not only preserving a certain tradition in the transport system but also conveniently reducing the daily commuting time, in addition to being a tourist attraction. Tourist demand, by extension, embodies a driving force that can lead to the preservation of this form of transport (Tarkowski et al., 2021; McGrath et al., 2020).

Transport-related technical attractions, monuments, and sites of cultural heritage are not only a focus of interest for industrial heritage experts (Gagliardi et al., 2022; Molina-Castaño et al., 2023) but also form popular, charming destinations for tourists and transport enthusiasts (Rovelli et al., 2020). At the same time, traditional, historical modes of transport deserve protection and cautious use (Smrčka, 2021). The cultural and historical potential for tourism is nevertheless not restricted to urban settlements or major regional places of historical interest, as rural locations often feature unique architectures too (Pascu & Pătru-Stupariu, 2021). Historically, river ferries were operated mainly in smaller villages; in large cities, by contrast, high-quality stone or brick bridges prevailed, having been built by the nobility or townspeople.

Cultural heritage plays a prominent role in reshaping cities' current morphologies, reinforcing public sense of belonging, cultural identity, and place authenticity (Fouad & Sharaf Eldin, 2021). The most important parameters characterizing cultural heritage are historical space and historical time (Lauzikas, 2005). The exact spots and continuity of the river ferries can be derived partly from old topographic maps (Timár et al., 2006; Janata & Cajthaml, 2021) and, in the same manner, from archival data (Dostál et al., 2021). Simultaneously, however, from the perspective of cultural heritage, it is essential to investigate the traces of defunct ferries, especially as regards the surviving supplementary buildings (the ferryman's house, traveller's inns, boarding areas), typical river bank topographies and shapes, remnants of adjacent roads, and local names (Havlíček & Dostál, 2020). In addition to the cultural and historical values, the tourism potential of such defunct sites should be examined too (Dostál & Havlíček, 2021).

The aim of the paper is to evaluate the importance of historical ferries and ferry ports in terms of the cultural heritage in the Czech Republic. The relevant research questions have been defined as follows:

- Are the registered ferry sites, completed with a supporting database from old topographic maps, a suitable basis for assessing the importance of cultural heritage?
- Is the proposed methodology for assessing the significance of cultural and historical values of river ferries a suitable tool for assessing the significance of individual river ferries?
- Is the historical and functional aspect of individual ferry sites the key to the degree of preservation and authenticity to the present day?
- Is the knowledge and information about historic river ferries, in whole or in part, applicable in making the sites more attractive for tourism?

2. Theoretical background

2.1 Historical importance of river ferries for transport system

Ferry, a place where passengers, freight, or vehicles are carried by boat across a river, lake, arm of the sea, or other body of water. The term applies both to the place where the crossing is made and to the boat used for the purpose (Britannica, 2024). Perhaps the most prominent early use of the term appears in Greek mythology, where Charon the ferryman carried the souls of the dead across the River Styx. Ferries were of great importance in ancient and medieval history, and their importance has persisted into the modern era (Britannica, 2024). River ferries have been used for transport across waterways since the regular transport of goods and people, while the first systematic mentions of ferry operations are linked to old trade routes (Martínek et al., 2014). Direct evidence of the operation of ferries on large rivers is documented in the first historical documents and deeds from around 1100 AD and 1200 AD, for example from monasteries, manors, towns, villages and around castles (Redwood, 1994; Kröger, 2018; Kröger, 2023).

2.2 Options of mapping ferries

Until the 18th century, the existence and localization of ferries in the area of Central Europe was mainly linked to verbal descriptions from archival documents (Kröger, 2018). In the case of localization near settlements, it was possible to interpolate the location of the ferry in relation to the structure of the settlement, e.g. city gates, important historical buildings, in the open countryside outside the settlements, the localization of river ferries is more difficult. The use of topographic maps, which were created in Europe in the 18th century, is essential for more accurate localization of ferries (Timár et al., 2006). From these mostly military maps, it is possible to obtain a more comprehensive picture of the number and distribution of river ferries in the landscape (Dostál et al., 2021). However, even these maps from the 18th century do not yet reach the accuracy that can be used for the unambiguous localization of objects today (Janata & Cajthaml, 2021). Since the middle of the 19th century, positionally accurate maps, which are based on geodetic foundations, have gradually become available in Central Europe (Ostafin et al., 2021). Complex mapping of ferries is possible with the use of several sets of old topographical maps, while their applicability in Central Europe is suitable for the period from the middle of the 18th century to the middle of the 20th century (Dostál et al., 2021).

2.3 Cultural-historical and transport research on ferries

Compared to the research of historical bridges, road routes and other transport objects, the research of historical river ferries is a relatively marginal matter. It is research at the border of several scientific disciplines, where the interests of historians, archaeologists, geographers, and transport experts meet (Redwood, 1994; Junxiang, 2020; Doswald, 2019; Dostál et al., 2021; Kröger, 2023). From the point of view of the development of transport and trade, historically, river ferries played a similarly significant role, as the first emerging bridges (Kromoser et al., 2023; Singh & Page, 2018). Transport-related cultural heritage sites are the focus of industrial heritage experts (Gagliardi et al., 2022; Molina-Castaño et al., 2023). Remains of river ferry operations, preserved technical objects on the banks of rivers, buildings of ferry operators, specific information published in the location of the ferry can also be included among important cultural heritage, at the same time they have potential for the development of tourism (Dostál & Havlíček, 2021). In several cities in the world, ferries have become part of public transport, thus continuing the tradition of historical ferries on large and medium-sized rivers (Bignon & Pojani, 2018; Cheemakurthy et al., 2017). Tourist demand embodies the driving force that can lead to the preservation of this form of transport (Tarkowski et al., 2021).

3. Methods and data

3.1 Evaluating the cultural and historical importance

The methodological approach to the evaluation of the cultural and historical aspects of river ferry grounds arises partially from the methodological procedures for evaluating and protecting the Czech Republic's industrial heritage (Ryšková et al., 2022; Matěj & Ryšková, 2018) and, also to a certain extent, exploits the techniques that allow the classification and evaluation of industrial heritage from the perspective of heritage conservation centered on water management facilities. Technological monuments and industrial heritage are evaluated via traditionally conceived art historical, architectural, and urban planning criteria, taking on specific degrees of authenticity or historical context. The criteria include the typology value, integrity of the technical equipment, and traces of operation. To evaluate the industrial heritage in relation to water management, the methodology applied in the Czech Republic comprised the following value types: typology, technical flow, system link, authenticity, architectural, art historical, landscape/urban, and age. Besides specific items (such as, in ferry sites, the actual means of cross-river transport, being a raft or a boat), entire functional units are assessable too: the guide ropes, piers, boarding point stairs or steps, road sectors leading down to the river, anchoring elements on the banks, information signs, maps of the area, system to call in the ferryman, passenger facilities, ferryman's house, traveller's inn or restaurant, and other associated objects.

For the purposes of assessing the cultural and historical importance of ferries, we propose a methodology to assess/calculate the below specified criteria.

A) Typology value

Applying this criterion requires knowing the typological development of the relevant objects, including major milestones, typical representatives, and uniqueness of the object. The exclusivity of a building in a local, regional, or international context rests on one or more of the following preconditions: the first, oldest surviving, or only preserved of its type; exceptional structural and technological parameters; and exclusive structural design. A typical representative (relating to a class of buildings) carries the characteristics of the type, is in a well-maintained state, and the technology has remained functional. This criterion applies to both the functional unit (such as an operative ferry for transporting vehicles) and a part of that unit (for instance, a surviving ferryman's house). When evaluating the typological values of ferries, it was taken into account how representative it was within its category (large ferries, ferries, boats), or what was the uniqueness of the technical solution of the ferry itself, the boarding place for passengers and cargo, the surroundings, or the synergistic connection with subsequent functions (for example the use of ferries at water mills). Values 0 to 3.

B) Technological flow value

Technological flow is related to the functionality of the whole. The object under assessment may already be integrated in a larger functional unit that involves the flow of energy or material in a general sense; in the case of ferries, the central process is embodied in the specific transport of people, goods, and materials. An interesting issue may therefore lie in the actual demand and supply for the realization of a transport route or trip, which may have changed markedly throughout history (for instance, some of the ferries to haul materials to industrial plants were possibly later used to transport people). The technological flow value is assessed in the vicinity of the object of transport, at a distance measured in kilometers. The importance of the technological flow was taken into account according to the potential of transported people and cargo in the past, based on available statistics, historical data, photographs, the potential of the number of inhabitants in the hinterland of the ferries, local spatial connections were also taken into account, in particular the connection of agricultural farms and yards in history, including manor houses. The value of the technological flow can be increased based on proven involvement in production chains. Values 0 to 3.

C) System links value

A technological unit in a broader context, with an overlap to other sectors of industry, transport, and energy; in ferry grounds, the value is applicable to the importance of the ferry within the entire set of transport links, involving ferries on major regional or international roads, the connection of a ferry to a significant railroad route, and other similar factors. Primarily, the link to functional inclusion in the road network is evaluated here (Values: 3 = imperial road; 2 = other roads; 1 = local road; 0 = local transport link), connection to railway stations and stops in the immediate vicinity. Furthermore, knowledge about the connection of important industrial enterprises in the region, the connection of important administrative and cultural centers of the region is also important for system links. Values 0 to 3.

D) Authenticity value

This criterion is an expression of the degree of originality in several aspects and includes various subcategories. The authenticity of function: determines whether the ferry and accompanying buildings serve their initial purpose and are operational. The authenticity of technical installations: based on an assessment of the survival of the original installation or of certain functional elements of the buildings. The authenticity of form: compares the current and the original states of the building or its parts, considering the form of the buildings within the initial architectural or technical design. The authenticity of matter: determines the stage of preservation in some of the original materials employed to construct the ferry site, such as those on the surface of the river access road or in the structure of the ferryman's house. By extension, we may include also the degree of conservation that characterizes some of the geomorphological formations modelled to suit the ferry site; these formations comprised, above all, the river bays where the water flow was moderate enough to allow embarkation and disembarkation. The value of authenticity was evaluated on a scale of 0 to 3, i.e. 0 = none, very weak, 1 = low, 2 = medium, 3 = high. Any form of authenticity (function, form, technology) was taken into account. For this evaluation, the current state of the objects in the location of the ferry or in the immediate vicinity is crucial, in the absence of any trace of the existence of the ferry, a value of 0 was assigned. Values 0 to 3.

E) Architectural value

A traditional principle for the assessment of the heritage impact. The aspects taken into account involve whether the building represents a particular style, movement, or period, and whether a well-known architect participated in the construction. Regarding ferry sites, the criterion is mostly applied to complementary buildings (including, but not limited to, inns and ferryman's houses). The architectural value was evaluated on a scale of 0 to 3, i.e. 0 = none, very weak, 1 = low, 2 = medium, 3 = high. The value 0 was applied in locations where no trace of the existence of the ferry has been preserved to date and no buildings associated with the operation of the ferry can be found in the vicinity. The architectural value was evaluated for preserved buildings connected to the operation of the ferry: ferryman's house, inn, mill, warehouses or technical buildings, etc.). Values 0 to 3.

F) Art historical value

The subcategory covers the arts and crafts-related elements (ironwork and ironmongery, fittings, artistically crafted railings, and other similar components) and artistic details (for instance,

special plaster, tiles, or mosaics) or products. In the case of ferry sites, relevant items, such as monuments and plaques, are usually found on the complementary buildings or in the vicinity of the premises. The art historical value was evaluated on a scale of 0 to 3, i.e. 0 = none, very weak, 1 = low, 2 = medium, 3 = high. A value of 0 was given in locations where no trace of the ferry's existence has been preserved to this day. Lower art-historical values were assigned in locations where monuments, information signs or other reminders of the ferry are preserved. Higher values were assigned in locations with preserved buildings or accompanying technical elements. Values 0 to 3.

G) Landscape value

This value includes the impact of the building on the landscape or settlement, establishing whether the building fits in and how it affects the landscape. The factors of focus are the visual dominance, place identity, and role of a landscape-forming element and its stage of integration into the environment. The visual landscape value of the place and locality was perceived as the influence of the locality on the landscape character during the evaluation of the ferries. This value was scored on a scale of 1 to 3, i.e. 1 = low, 2 = medium, 3 = high. The value 0 corresponded to the absence of landscape value, it was primarily a case of localities where there is no longer any continuity with the original occurrence of the ferry at the watercourse, because this watercourse was moved elsewhere after regulation. Locations near regulated watercourses, locks, and densely built-up areas showed very low landscape values. Higher landscape values were recorded for locations with bays, with preserved entrances to the water, accompanying buildings, historic trees, avenues, historic buildings and naturally valuable surroundings. Values 0 to 3.

H) Historical value

The subset covers a wide range of parameters, depending on the context; the relevant factors then comprise local history, the evolution of a particular industry or craft, and links to cultural, literary, and art histories (as exemplified by landscape painting or photography). Some ferries and their surroundings could in the past have been the subject of works by painters, writers, or other artists. When evaluating the historical importance of the ferry, its importance for local industry or the development of some parts of cities and towns was also taken into account (e.g. the link to the development of recreation in the form of tramp settlements). The historical value was evaluated on a scale of 0 to 3, i.e. 0 = none, very weak, 1 = low, 2 = medium, 3 = high. A value of 0 was given to ferries that were operated in the recent past and thus have no major historical significance. Values 0 to 3.

I) Age value

This value was derived from the time the ferry was in service with an emphasis on older periods and long-lasting continuity. Ferries operated for only a few units or decades in the 20th or 21st century have lower or zero value. Ferries with historical use since the Middle Ages or from the 18th and 19th centuries have higher values. The highest values of continuity are achieved by continuously used ferries with operation until the present day, or with long-term operation until the second half of the 20th century. Values 0 to 3.

For the overall evaluation of the importance of a specific ferry in the historical context, the strongest connection to the surroundings, the greatest importance in terms of the connection of roads, villages, settlements, industry, and the greatest importance regarding the type of transport object were always evaluated. Therefore, the highest value was always taken into account during the entire evaluated period. As an example of the dynamics of the development of the ferry and the reduction of its significance, the following can be cited: a historically significant connection of traffic with the use of a large ferry with a regional overlap, later a decrease in significance due to the construction of a bridge in the nearby area, in another period the use of a small boat to connect the village with a holiday cottage settlement. In this case, the highest importance in the historical development of the site was taken into account. For each location of the ferry, a value of 0 to 3 for all nine criteria of cultural and historical significance was added expertly by the research team. The total value of the cultural-historical significance of the ferry could thus potentially range from a minimum of 0 to a maximum of 27. Comparison of the significance of the ferries in the two model territories was made possible by comparing the average values and other statistic values both for the overall point assessment and for individual types of cultural-historical values.

3.2 Methodology for mapping ferry sites using historical topographic maps

The mapping of historical ferry sites exploited, above all, historical topographic maps produced through the following surveys:

i. 1st Austrian Military Survey (1:28,800) of 1763–1768,
ii. 2nd Austrian Military Survey (1:28,800) of 1836–1852,
iii. 3rd Austrian Military Survey (1:25,000) of 1874–1880,
iv. Czechoslovak military mapping (1:25,000) of 1952–1956.

All the topographic maps of the Czech Republic were available in an electronic version of the original scans, in a georeferenced form usable for operating with geographical information systems. In addition to the georeferenced maps, the authors also employed maps published on the website Arcanum Maps – The Historical Map Portal (Timár et al., 2006) which ensures good readability of the materials.

The coordinate system S-JTSK Krovak East North (EPSG: 5514), commonly available for current mapping in the Czech Republic, was used at this stage of the research. First, map keys from all of the mapping cycles were analyzed to allow designing the structure of the ferry database. The mapping itself was carried out using the on-screen method in the ESRI ArcGIS software (Dostál et al., 2021).

Besides the classic map marks in the river courses, toponyms – mostly with German names – were observed on the maps; the more recent mappings already exposed names in Czech. In each of the periods studied, individual objects were located, and their positions were assumed to be identical within the observed continuity of objects, at a distance tolerance of 50 m. Regarding inter-object distances greater than 50 m in each period, separate, independent ferry sites were identified.

Based on the above process, a database of river ferry grounds in the Czech Republic was prepared, containing all localities in the present-day Czech Republic where cross-river ferries were shown in the topographic maps (Dostál et al., 2021). When creating the database, we also used some auxiliary archival sources, possibly toponyms listed on old maps (Panecki, 2023).

3.3 Model areas

The cultural and historical values of the ferry sites were investigated within two model areas in the Czech Republic, namely, the rivers Morava and Dyje in Moravia and on the section of the Labe River that runs between the Bohemian towns of Mělník and Kolín (Fig. 1). These regions or subregions were traditionally markedly industrial and agricultural, involving intensive transportation of goods, materials, and people. Simultaneously, it has to be noted that the relevant geographical segments embody parts of the most significant watercourses in the historical lands of Bohemia and Moravia. On the Morava and Dyje rivers, 17 sites were examined,

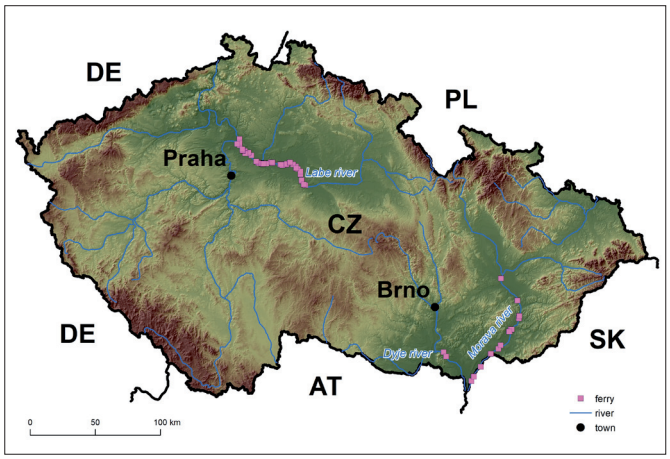

Fig. 1: The ferry locations along the Labe, Morava and Dyje rivers
Source: Authors' own elaboration

and the selected portion of the Labe river covered 48 sites. Such numbers then reflect a major density difference between the lands, with the actual choice of localities being an influence on some specific values following the applied methodology.

The three rivers under review are among the main watercourses draining the territory of the present-day Czech Republic. Since time immemorial, they have been arteries of life and trade, and therefore there have historically been interests in implementing their water management modifications, motivated by economic development, improving transport conditions and protecting the surrounding area from floods. These efforts can be traced back to the High Middle Ages on the Labe River, and to the mid-17th century on the Morava and Dyje. However, a systematic approach to the modifications of these rivers was not taken until 1896 on the Labe (and Vltava) River and until 1870 on the Morava and Dyje. The main focus of regulatory work, including full navigability, including the construction of navigation steps and the remodeling of the bed of the middle course of the Labe River under study, took place from 1911 to 1954, with the period between the world wars being key (Fošumpaur et al., 2020). The main regulatory works on the Morava river were primarily aimed at flood protection and were launched after 1905. Most of the river modifications were implemented by the beginning of World War I (1914), although in some sections the works were extended until 1941 (Brázdil et al., 2011). The important industrial company Baťa sought to make the Morava River navigable, which had a shipping channel built on part of the river between 1934 and 1938. It was primarily intended to facilitate the transport of lignite from the Ratíškovice coal field (downstream of the Strážnice area) to the Baťa factories in Otrokovice and Zlín (upstream). It was also to serve as a source of water for irrigation. Cargo transport ceased after only a few decades of operation as soon as early 1960s but nowadays the channel found further employment for water management purposes and as a tourist attraction (Machar, 2013; Havlíček & Svoboda, 2022).

4. Results

In the Moravian part of the research, we focused on a total of 17 ferry sites (Fig. 2), the average value of cultural-historical significance was 8.24 (out of a potential maximum of 27 points). Some ferries achieved very low overall cultural-historical values (total value 1 and 2). These were mainly ferries that had little historical significance for the transport of people or cargo, were not connected to any significant roads and currently no remains of them have been preserved. On the Morava and Dyje rivers, the Moravská Nová Ves – Kopčany ferry achieved the highest rating with a value of 17. This ferry had a long continuity of operation extending into the 18th century, originally connected two historical countries (Moravia and Hungary) across the Morava River, some landscaping is still visible in the terrain, a road is preserved on both sides of the river, as well as the ferryman's house, which is still inhabited today. The Nové Mlýny ferry site also achieved very high overall values, which received a higher rating also due to the historical significance of the tragic event in which elementary school children died in 1936. At the same time, it was a ferry of solid importance for the transport of materials and people, and it also achieved a longer continuity of operation. A high value was also recorded for the Lanžhot - Brodské ferry, which served for a long time as one of the possible connections between municipalities in two different countries (Moravia, Hungary). The gamekeeper's lodge, which originally also served the ferryman's needs, has been preserved here to this day. Five ferries achieved a total of 13 points in the overall assessment of cultural and historical significance. However, their point ratings are based on different cultural and historical values (Fig. 2).

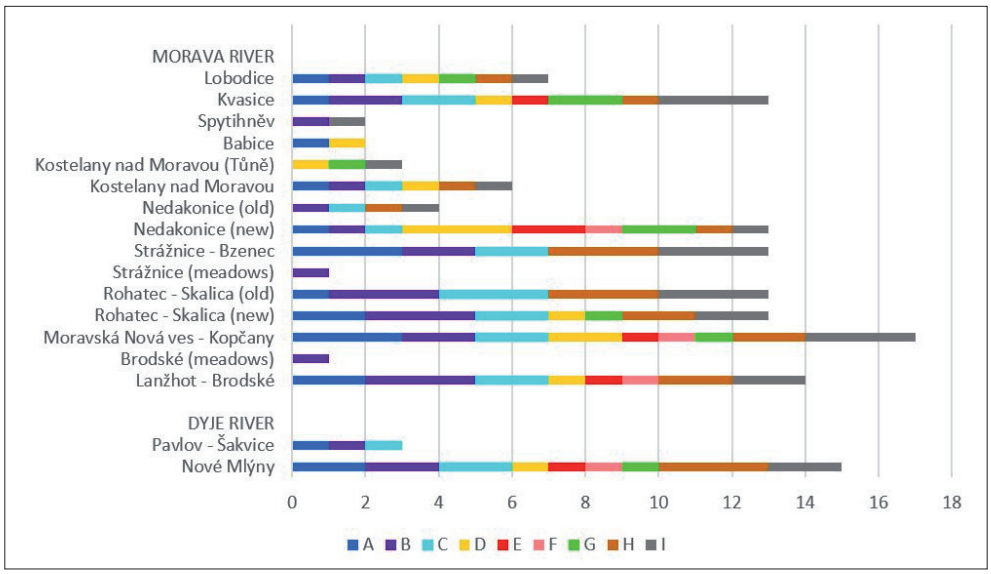

Fig. 2: The ferry grounds on the Morava and Dyje rivers, with both the cultural-historical values relating to the individual types and the overall cultural-historical value – sorted by river flow (Notes: A – typology value; B – technological flow value; C – system links value; D – authenticity value; E – architectural value; F – art historical value; G – landscape value; H – historical value; I – age value; total – complete art historical value of the area)
Source: Authors' elaboration

The Strážnice–Bzenec ferry was historically one of the most important and frequented ferries, connecting two important cities in the region, Strážnice and Bzenec, and was also typologically valuable, it was a large barge with a capacity of around 30 to 40 people, also for freight transport and using a guide rope. Historically and in terms of continuity, it was a crucial ferry in the region. Unfortunately, nothing has been preserved from this ferry at present. The Rohatec–Skalica old ferry has a similar characteristic. The Nedakonice new ferry was operated only in the 20th century, so it has lower continuity and also historical significance. However, it has a high value of authenticity and architectural value, the ferryman's house is still preserved here, as well as a typical geomorphological shape in the form of a bay (Fig. 3). In terms of the types of cultural-historical values of ferries, type B – technological flow value (average 1.47 out of 3) reaches the highest values on the Morava and Dyje rivers. The connection of some municipalities was very frequent, in addition to the transport of people for work, education or church activities, there was also a lot of transport of goods, earlier on horse-drawn carriages, later also by cars. Very high values were achieved for continuity values (average 1.41 out of 3), several ferries were operated for two or more centuries, and for several ferries the tradition of ferry operation is documented since the Middle Ages. High values were also achieved for C – system links value (average 1.18 out of 3), long-distance trade routes were connected by the Rohatec–Skalica ferries, in certain cases access to the railway was also crucial (e.g. Strážnice–Bzenec ferry). The same average was recorded for H – historical value (average 1.18 out of 3), while historical importance was high both for traditional important ferries at larger settlements (Strážnice–Bzenec ferry, both Rohatec–Skalica ferries), and for locations with a significant historical event (Nové Mlýny). Typologically, large ferries with a high capacity for transporting both people and cargo were particularly appreciated (Fig. 2). D – authenticity value for ferries on the Morava and Dyje rivers reached lower average values, and preserved objects in the form of ferryman's objects or geomorphological shapes are rather rare. An architectural value can be presently sought only in the gamekeeper's lodge at the Morava River-based Lanžhot–Brodské ferry grounds: the lodge has been a historical segment, and its past roles also included that of a traveller's inn. Some of the current building's components and details, such as the window shutters and portions of the plaster, have an art-historical value, a property that is even more comprehensively embedded in the memorial to the victims of a 1930s ferry accident at Nové Mlýny. Landscape values have been assigned to 7 sites, especially as regards the view layout, visual quality, or geomorphological shape.

From the perspective of character and exceptionality, the most notable of the ferry sites is that in Nové Mlýny, which incorporates a memorial to the victims of a 1936 tragic attempt to cross the flooding river (Figs. 4 and 5); the event claimed the lives of 32 people, including 31 school-age children. The memorial was commissioned by the first Czechoslovak president, Tomáš Garrigue Masaryk.

The Bohemian part of the research project includes the middle section of the Labe River, between the cities of Mělník and Kolín. A total of 48 ferry sites were assessed (Fig. 6), the average value of cultural-historical significance was 8.38 (out of 27), i.e. slightly higher than on the Morava and Dyje rivers. The facilities were established in a density significantly higher than in the Moravian regions. The Bohemian regions currently offer slightly more unique structures with a high typological value (A – typology value average 1.25 out of 3) than on the Morava and Dyje rivers. In the past, ferry transport embodied a relatively common possibility of crossing the river in this geographical sector; in the given context of typological value, we focused mainly on freight ferry areas with additional technical facilities. The highest average values in the

Fig. 4: The Nové Mlýny ferry site memorial
Photo: I. Dostál

Fig. 5: An information signboard presenting a poem and describing the accident of 1936 at Nové Mlýny ferry site
Photo: I. Dostál

Fig. 3: The Nedakonice new ferry grounds with the preserved anthropogenic formations, including the water slip road and ferryman's house. Photo: I. Dostál

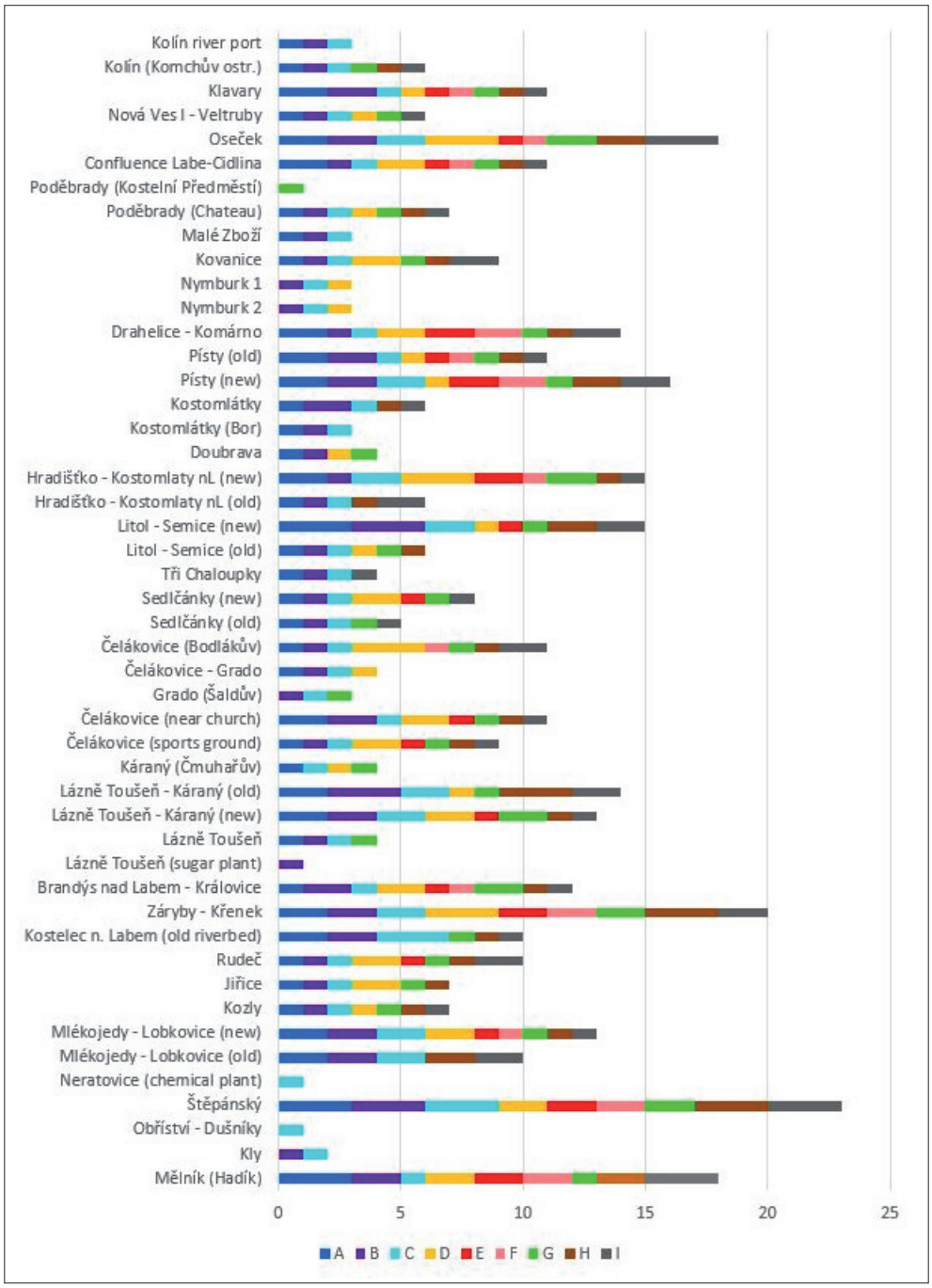

Fig. 6: The Labe River ferry sites, with both the cultural-historical values relating to the individual types and the overall cultural-historical value (Notes: A – typology value; B – technological flow value; C – system links value; D – authenticity value; E – architectural value; F – art historical value; G – landscape value; H – historical value; I – age value /continuity; total – complete art historical value of the area)
Source: Authors' elaboration

Labe River section are achieved by B – technological flow value (average 1.31 out of 3) ferries. It has been documented that ferries played an important role in the transport of people, materials and goods in some locations on the Labe River. Specific ferries were also linked to the development of industry and commuting to work. The most common purpose of the ferries was to connect the main regional roads and settlements and provide general accessibility.

Starting from the mid-19th century, the connection to the rail stations gradually came to the fore. C – system links value reached an average of 1.21 out of 3 on the Labe River, i.e. a slightly higher value than on the Morava and Dyje rivers. In the case of D – authenticity value, we can observe specific patterns in these areas, such as preserved ferry houses, which are currently used for permanent housing or cottages and replicas of original houses. Numerous anthropogenic river inlets are embedded in the banks along the studied section of the Labe River. Previously, these formations allowed for safe boarding and disembarking of the ferry outside the main current. The bays then increase the authenticity of the Labe River ferries and allow them to significantly outweigh other cultural and historical value classes (Fig. 6). In these locations with preserved objects, E – architectural value; F – art historical value are therefore also more significantly assessed. In general, the values of the criteria G, E and F are higher in the Labe River section than in the Morava and Dyje rivers.

Regarding the cultural-historical assessment, the most prominent values were revealed at Štěpánský ferry near Obříství village (Fig. 7); the ferry site provided for a traditional cross-river service to connect the Labe river's left bank with the imperial road, and one of its buildings has housed a traveller's inn that is still active today. The grounds, together with a major berth close by,

were of substantial interest to boats heading for Germany. In the above-presented context, a peak cultural and historical value is found also in the Záryby–Křenek site, the main reason being that the ferryman's home has been reconstructed sensitively, including the original furnishings (Fig. 8). Both of the locations exhibit considerable importance in terms of their tourism-related and educational roles, especially where the focus is on the structural arrangement of old ferry sites.

Some culturally and historically interesting buildings are no longer exploited in original way, as they have been owned privately and ceased to fulfil their former functions. Such is the case with most surviving ferryman's homes, a large number of them having been converted into larger regular or part-time residences. To illustrate the process, we can expose a house of this type that has become a cottage, see Figure 9. The remains of some geomorphological formations, river bays in particular, are now usable exclusively in relation to minor informative projects; these may involve, for instance, designing data boards that tell the story of the ferry grounds by such means as exhibiting excerpts from archival documents, including topographic maps. An open potential is available in, above all, spots situated directly on hiking trails, as has shown on the disused ferry grounds at Lázně Toušeň (Fig. 10).

Fig. 7: The restaurant Na Štěpáně near the village of Obříství: a part of the Štěpánský ferry facilities, possessing strong historical transport features and links (an accessory component to the imperial road and the river boat traffic). Photo: I. Dostál

Fig. 8: The ferryman's house at Záryby – Křenek: post-reconstruction, partially furnished. Photo: I. Dostál

The average values for the individual categories of cultural and historical values range from 0.24 to 1.47 for the Morava and Dyje rivers (Tab. 1), and from 0.38 to 1.31 for the Labe River (Tab. 2; potential maximum was 3.00). The lowest average values achieved are E – architectural value and F – art historical value. These categories also have the highest zero value share as these are conditioned by the preservation of the buildings. On the contrary, the highest average values are achieved in both study areas in the case of B – technological flow value (Tabs. 1 and 2). The Morava and Dyje rivers have a significantly higher average for I – age value caused by the higher continuity of ferry operations in the past. In general, the average values for both study areas are also higher for categories A – typology value and C – system links value. The average and standard deviations are also high for categories H and I, where both the historical and age values are well distributed on a scale of all values from 0 to 3. In the case of ferries on the Morava and Dyje rivers, the standard deviation values are generally higher for categories A – typology value; B – technological flow value; C – system links value. In the case of ferries on the Labe River, the standard deviation is higher for D – authenticity value, which is indicative of the preservation of some ferry landforms and objects, but also of the existence of sites which vanished without traces.

The boxplot from the PCA analysis shows that the medians of the total cultural-historical values of individual ferries do not differ for the Labe, Morava and Dyje rivers (Fig. 11). More significant differences are recorded in the standard deviations, where their

Fig. 9: A preserved ferryman's house on the Labe River in Brandýs nad Labem, now used as a recreational facility
Photo: I. Dostál

Fig. 10: Typical anthropogenic shape at the former ferry on the Labe River near the village of Lázně Toušeň. Photo: I. Dostál

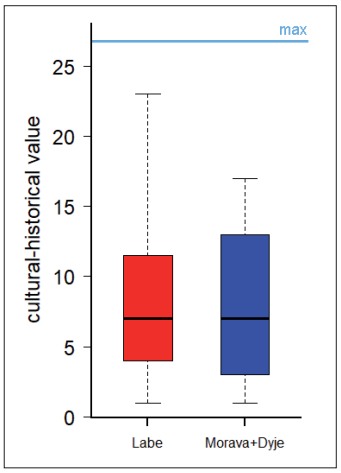

Fig. 11: The boxplot from PCA for total cultural-historical values of ferries in Labe River, Morava and Dyje rivers
Source: Authors' calculations

variability is higher for the Morava and Dyje rivers (colored bars in the graph). The dashed line records the maximum and minimum for the total cultural-historical values of ferries. The minimum in both areas reached the value 1. The maximum value for the Morava and Dyje rivers was 17, for the Labe River the maximum was 23 (out of a potential maximum of 27). Principal Component Analysis replicates the overall cultural-historical value on the first axis and shows a large variability of ferries on the Morava and Dyje rivers, especially along the second axis (Fig. 12). The composition and variability of cultural-historical values do not differ between ferries on different rivers (tested in multidimensional space; PERMANOVA, PERMDISP).

Only some variables are correlated within the cultural-historical values (Fig. 13). The most important are architectural vs. art-historical value and then historical value vs. continuity. In the first case, the connection between architectural value and art-historical value is given by the preservation of any objects related to the operation of ferries (ferryman's house, inn, boat or raft, stairs or access to the water and other elements). In the case of

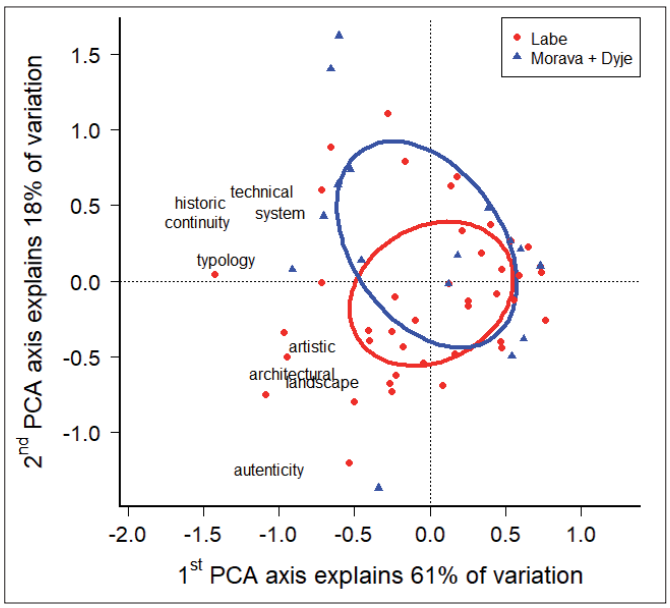

Fig. 12: Principal Component Analysis (PCA) for total cultural-historical values of ferries in Labe River, Morava River and Dyje River
Source: Authors' calculations

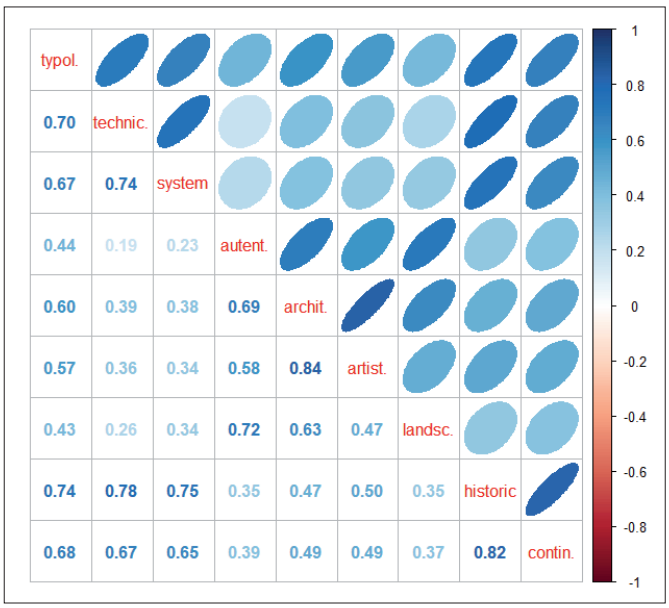

Fig. 13: Correlation of individual cultural-historical values of ferries
Source: Authors' calculations

Cultural-historical value	A	B	C	D	E	F	G	H	I
Average (out of 3)	1.12	1.47	1.18	0.76	0.35	0.24	0.53	1.18	1.41
Frequency value 0	5	2	5	7	12	13	10	6	4
Proportion value 0 (%)	29.41	11.76	29.41	41.18	70.59	76.47	58.82	35.29	23.53
Mean deviation	0.75	0.79	0.80	0.63	0.50	0.36	0.62	0.93	0.96
Standard deviation	0.96	0.92	0.92	0.81	0.59	0.42	0.70	1.10	1.09

Tab. 1: Statistics of individual categories of values – Morava and Dyje rivers (n = 17; Notes: A – typology value; B – technological flow value; C – system links value; D – authenticity value; E – architectural value; F – art historical value; G – landscape value; H – historical value; I – age value /continuity; total – complete art historical value of the area)
Source: Authors' research and calculations

Cultural-historical value	A	B	C	D	E	F	G	H	I
Average (out of 3)	1.25	1.31	1.21	1.08	0.50	0.38	0.83	0.83	0.98
Frequency value 0	8	4	3	17	30	35	14	19	17
Proportion value 0 (%)	16.67	8.33	6.25	35.42	62.50	72.92	29.17	39.58	35.42
Mean deviation	0.66	0.58	0.45	0.82	0.63	0.55	0.49	0.66	0.69
Standard deviation	0.76	0.67	0.82	0.90	0.69	0.68	0.75	0.88	0.90

Tab. 2: Statistics of individual categories of values – Labe River (n = 48; Notes: A – typology value; B – technological flow value; C – system links value; D – authenticity value; E – architectural value; F – art historical value; G – landscape value; H – historical value; I – age value / continuity; total – complete art historical value of the area)
Source: Authors' research and calculations

longer continuity of ferry operation, it is also possible to evaluate the greater historical significance of the object, so this correlation is also logically justifiable.

5. Discussion

The registered ferry sites with the accompanying database of old topographic maps embody a suitable basis for assessing the significance of the relevant cultural heritage. The precise localization of the buildings and facilities allows performing follow-up archival and field research projects to assess objectively the potential of the river ferry sites for cultural heritage. From the perspective of cultural heritage, analyzing transportation entails involving entire sections of historic roads with the relevant complementary structures. The roads are seen as a heritage, cultural, and identity reference, which generally captures diverse historical processes (Molina-Castaño et al., 2023). In particular, historic bridges are among the most frequently protected cultural sites (Gagliardi et al., 2022; Manos et al., 2019). When discussing and enforcing their protection, experts focus on maintaining, conserving, and safely reconstructing the segments that feature cultural-technical prominence (Gagliardi et al., 2022).

The results of the research showed that the assessment of the cultural and historical significance of river ferries is methodologically more complicated than the assessment of industrial buildings or water management structures (Ryšková et al., 2022; Matěj & Ryšková, 2018). The main complication is the lack of preserved objects directly related to the operation of river ferries, very rarely the ferryman's house is preserved, sometimes a nearby inn or a building with technical facilities. This then has a direct impact on the very low values of E – architectural value and F – art historical value. The lack of physical remains is most evident at ferry sites identified in the earliest historical periods that have not survived to the present day. This is due to the fundamental transformations of the landscape along the watercourses that were the result of economic regulations and flooding (Brázdil et al., 2011; Fošumpaur et al., 2020). Conversely, in sites where ferries operated in the period after the flow regulation, physical remains are common. The greatest correlation was also demonstrated between values of E – architectural value and F – art historical value, but it is still appropriate to preserve both of these values in the methodological procedure, because the localities of ferries with these high values are very valuable in the protection of cultural heritage.

The fundamental finding from this research can be considered that ferries from older periods have a solid age value, but do not have preserved authenticity, because the area has often undergone significant changes and regulation of watercourses. The initial limit may therefore be the suitability of the selection of the area, in the case of this study, it was rivers that are mainly tied to lowland valleys and wide floodplains, which lack geomorphological diversity in the context of river regulation. On the contrary, interesting anthropogenic shapes remain after ferries, which add diversity to the landscape, the uniformity of the banks of regulated rivers was thus disrupted in the 20th century by the bays of ferries. Preserved anthropogenic shapes can be used for education and use in tourism (Dostál & Havlíček, 2021).

Some ferry sites exhibit a dynamically utilizable potential for preserving specific facilities in the landscape, such as bays with water access paths made of historically valuable paving stones. Similarly, in this case, it is also possible to associate the research with an investigation of the building stones (their origins and use) or with examining the geomorphological shapes (Kubalíková & Zapletalová, 2021). In recent years, in the landscape geotourist and geoeducational activities are designed, the emphasis being on a comprehensive promotion of natural and cultural heritage. Geotourism has been conceptually developed also in urban areas (Kubalíková et al., 2020). Some defunct ferry sites can thus be considered spots of geotourist significance. Importantly in this context, the safeguarding of intangible cultural heritage is as important as the protection of tangible cultural heritage (Demir, 2021). While bridges over the river have a much higher level of preservation, including historical and architectural values, ferries have a significantly lower level of preservation. Historical events associated with ferry sites such as Nové Mlýny 1936 are rare. By definition, ferry sites, whether defunct or preserved, do not possess the fundamental cultural-historical significance of road components, such as China's corridor bridges (Knapp et al., 2020) or study of the historical and structural aspects of the Imperial Bosnian Road with significant stone bridge (Akšamija et al., 2024), some of the ferry sites may nevertheless become classified and interpreted as valuable structures worth promotion.

Therefore, new technologies may come to the play to promote relics and remains of the past. Presentations of virtual cultural heritage artefacts are often communicated via interactive digital storytelling. The synergy of a storied narrative embedded within a 3D virtual reconstruction context has a high consumer appeal and edutainment value, and this finding is conveniently implemented in, for example, a case study that describes the bridge diving tradition at Stari Most, the historic bridge in Mostar, Bosnia (Selmanović et al., 2020). Similarly, modern computerized procedures could allow exposing effectively the outcomes of the research on ferries in the Czech Republic, with the old maps, plans, images, and facility details being the central primary sources. The tourism attractiveness of selected ferry sites is also enhanced via the classic ways, namely, by using information signs to advertise particular preserved elements (a ferryman's house, an inn, a bay, a water entrance, a ferry vessel, parts of the boarding pier, and other items). In our project, such facilities were documented at several locations within the model regions. The overall cultural-historical significance of the ferry site and its accessibility via tourist routes then determines its role in tourism: Locations that are better accessible and well-documented also offer more options for being included in the network of educational trails to broaden their instructive potential (Nevřelová & Ružičková, 2019).

6. Conclusions

The registration of historic ferry sites, accompanied with a database compiled from old topographic maps, possesses a relatively broad perspective in estimating the importance of the locations' cultural heritage. The actual mapping, the continuity of the facilities, and the historical context recorded on the maps deliver baseline yet worthwhile data concerning the cultural and historical value of specific ferry grounds.

Follow-up archival and field research at the sites, however, embodies an essential precondition for an objective assessment of the potential of the river ferry sites for cultural heritage. In field research, aspects of architectural value, landscape value, technological and art historical value are important to capture. From a tourism point of view, several interesting sites were found in the Labe River basin as well as in the Morava and Dyje River basins, where information signs with the history of the sites and maps or photographs were available. In the Dyje and Morava River basins these were the sites of Nové Mlýny, Rohatec, Lanžhot, in the Labe River basin these were the sites of Oseček, Záryby, Čelákovice and others.

In general, however, some knowledge and information about historical river ferries can be used to make the sites even more attractive for tourism. Nowadays, there are possibilities to promote the topic of historical ferries through digital map applications, or

by locating objects on traditional digital tourist maps, by including sites in educational trails, and nowadays 3D technologies can also be applied.

Compared to methodologies for assessing the cultural and historical significance of industrial sites and water management facilities, the applied methodology for assessing river ferries has certain limitations and limits. Nevertheless, it is possible to apply this methodology in other locations, because the research results are applicable in practice.

The follow-up research is expected to offer viable options for comparing the cultural impact of the Bohemian and Moravian ferry grounds with that of relevant sites in other European countries or subregions. Such areas are characterized by a cultural and historical context resembling the Czech Republic's milieu, especially at locations where ferries were a truly indispensable means to cross the river. The applied methodology features a major potential for use in transportation research; cultural-heritage, history, and geography projects; tourism; and related provinces. Importantly, the approach is further refinable by substituting the binary criterion with a more precise range and via setting the weights of the individual factors.

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References:

Akšamija, A., Chabbouh Akšamija, L., & Ademović, N. (2024). Methodological Procedure for Preservation and Restoration of Kozija Ćuprija: A Study on Sustainability in Stone Masonry Arch Bridges. In N. Ademović, T. Tufek-Memišević, & M. Arslanagić-Kalajdžić (Eds.), Interdisciplinary Advances in Sustainable Development III. BHAAAS 2024. Lecture Notes in Networks and Systems, Vol. 851 (pp. 20–45). Springer. https://doi.org/10.1007/978-3-031-71076-6_2

Argyroudis, S. A., & Mitoulis, S. A. (2021). Vulnerability of bridges to individual and multiple hazards- floods and earthquakes. Reliability Engineering & System Safety, 210, 107564. https://doi.org/10.1016/j.ress.2021.107564

Bignon, E., & Pojani, D. (2018). River-Based Public Transport: Why Won't Paris Jump on Board? Case Studies on Transport Policy, 6(2), 200–205. https://doi.org/10.1016/j.cstp.2018.05.002

Bogart, D. (2013). The Transport Revolution in Industrializing Britain: A Survey. Working Papers, 121306. University of California-Irvine, Department of Economics.

Brázdil, R., Řezníčková, L., Valášek, H., Havlíček, M., Dobrovolný, P., Soukalová, E., ..., & Skokanová, H. (2011). Fluctuations of floods of the River Morava (Czech Republic) in the 1691–2009 period: interactions of natural and anthropogenic factors'. Hydrological Sciences Journal, 56(3), 468–485. https://doi.org/10.1080/02626667.2011.564175

Britannica. Editors of Encyclopaedia (2024, April 21). ferry. Encyclopedia Britannica. https://www.britannica.com/technology/ferryboat

Cheemakurthy, H., Tanko, M., & Garme K. (2017). Urban Waterborne Public Transport Systems: An Overview of Existing Operations in World Cities. KTH Royal Institute of Technology. https://doi.org/10.13140/RG.2.2.32606.69446

Čížek, K. (1886). Právo vodní dle Zákona ze dne 28. srpna 1870 pro Království České. Tisk a sklad Jindř. Mercy-ho.

Demir, H. (2021). Dicle (On Gözlü) Köprüsü'nün somut ve somut olmayan miras olarak korunması. Milli Folklor, 17(132), 226–249.

Derry, T. K., & Williams, T. I. (1993). A Short History of Technology: From the Earliest Times to A.D. 1900. Oxford University Press.

Dostál, I., & Havlíček, M. (2021). Historical ferry locations-potential for increasing the tourist attractiveness of the rural areas? In J. Fialová (Ed.), Public Recreation and Landscape Protection – With Sense Hand in Hand! Conference proceedings (pp. 245–250). Czech Society of Landscape Engineers and Mendel University in Brno.

Dostál, I., Havlíček, M., & Svoboda, J. (2021). There Used to Be a River Ferry: Identifying and Analyzing Localities by Means of Old Topographic Maps. Water, 13(19), 2689. https://doi.org/10.3390/w13192689

Doswald, C. (2019). Rivers and Transport Routes – The significance of river crossings for transit networks in Alpine valleys. In S. Muhar, A. Muhar, E. Egger, & D. Siegrist (Eds.), Rivers of Alps: Diversity in Nature and Culture (pp. 214–225). Haupt Verlag.

Fošumpaur, P., Hladík, M., Horský, M., Kašpar, T., Králík, M., Kučerová, J., ..., & Zukal, M. (2020). Historie a současnost Labsko-vltavské vodní cesty. Vodní hospodářství, 70(7/8), 1–5.

Fouad, S. S., & Sharaf Eldin, S. (2021). Public Perception Influence on the Reshaping Urban Heritage: A Case Study of Port Said Historic Quarters. Space and Culture, 26(4), 579–597. https://doi.org/10.1177/12063312211018397

Gagliardi, V., Ciampoli, L. B., D'Amico, F., Alani, A. M., Tosti, F., & Benedetto, A. (2022). Remote sensing measurements for the structural monitoring of historical masonry bridges. In C. Pellegrino, F. Faleschini, M. A. Zanini, J. C. Matos, J. R. Casas, & A. Strauss (Eds.), Proceedings of the 1st Conference of the European Association on Quality Control of Bridges and Structures. EUROSTRUCT 2021. Lecture Notes in Civil Engineering, Vol. 200 (pp. 632–641). Springer. https://doi.org/10.1007/978-3-030-91877-4_72

Haselsberger, B. (2014). Decoding borders. Appreciating border impacts on space and people. Planning Theory & Practice, 15(4), 505–526. https://doi.org/10.1080/14649357.2014.963652

Havlíček, M., & Dostál, I. (2020). Ferry Boats in Moravia and Silesia in Historical Context. Geografické informácie, 24(2), 55–69. http://dx.doi.org/10.17846/gi.2020.24.2.55-69

Havlíček, M., & Svoboda, J. (2022). Potential Of Water Management Facilities in The Hodonín District For Tourism. In J. Fialová (Ed.), Public Recreation and Landscape Protection - With Environment Hand in Hand… Conference proceedings (pp. 238–242). Czech Society of Landscape Engineers and Mendel University in Brno. https://doi.org/10.11118/978-80-7509-831-3-0238

Ivanič, P. (2019). Collection of Road Toll in Southwestern Slovakia in the Middle Ages on the basis of Written Sources. Studia Historica Nitriensia, 23(2), 426–455. https://doi.org/10.17846/SHN.2019.23.2.426-455

Ivanič, P., & Husár, M. (2019). Crossings over the lower and central reaches of the River Váh in the high and late Middle Ages in the context of written and material sources. Archaeologia Historica, 44(2), 1029–1055. https://doi.org/10.5817/AH2019-2-22

Janata, T., & Cajthaml, J. (2021). Georeferencing of multi-sheet maps based on least squares with constraints – First military mapping survey maps in the area of Czechia. Applied Sciences, 11(1), 299. https://doi.org/10.3390/app11010299

Junxiang, W. (2020). Ferry distribution at the lower reaches of the Yellow river on the former Japanese military maps. Japanese Journal of Human Geography, 72(1), 21–38. https://doi.org/10.4200/JJHG.72.01_021

Knapp, R. G., Miller, T. E., & Liu, J. (2020). China's corridor bridges: Heritage buildings over water. Built Heritage, 4(10). https://doi.org/10.1186/s43238-020-00010-w

Kröger, L. (2018). Ferry stations as small harbours. The role of river crossings in the workaday life at southern German rivers. In C. von Carnap-Bornheim, F. Daim, P. Ettel, & U. Warnke (Eds.), Harbours as objects of interdisciplinary research – Archaeology + History + Geoscience (pp. 403–414). Römisch-Germanisches Zentralmuseum.

Kröger, L. (2023). Fähren an Main und Neckar: Eine archäologische und historisch-geographische Entwicklungsanalyse mittelalterlicher und frühneuzeitlicher Verkehrsinfrastruktur. Monographien des RGZM, 160. Propylaeum. https://doi.org/10.11588/propylaeum.1077

Kromoser, B., Spitzer, A., Ritt, M., & Grabner, M. (2023). Wooden bridges: Strategies for design, construction and wood Species–From tradition to future. International Journal of Architectural Heritage, 18(4), 652–668. https://doi.org/10.1080/15583058.2023.2181719

Kubalíková, L., Kirchner, K., Bajer, A., Balková, M., & Kuda, F. (2020). Developing urban geotourism in Brno (Czech Republic). In J. Fialová (Ed.), Public Recreation and Landscape Protection – With Sense Hand in Hand? Conference proceedings (pp. 95–99). Czech Society of Landscape Engineers and Mendel University in Brno.

Kubalíková, L., & Zapletalová, D. (2021). Geo-cultural aspects of building stone extracted within Brno city (Czech Republic): A bridge between natural and cultural heritage. Geoheritage, 13, 78. https://doi.org/10.1007/s12371-021-00585-5

Lauzikas, R. (2005). Digitization of cultural heritage: model of an integral, three-dimensional spatio-temporal thesaurus. Archeologia e Calcolatori, 16, 93–112.

Lucas, A. R. (2005). Industrial Milling in the Ancient and Medieval Worlds: A Survey of the Evidence for an Industrial Revolution in Medieval Europe. Technology and Culture, 46(1), 1–30. https://dx.doi.org/10.1353/tech.2005.0026.

Machar, I. (2013). The effect of landscape character change on the recreation function of a water management construction in the landscape case study: Bata canal, South Moravia (Czech Republic). In J. Fialová (Ed.), Public Recreation and Landscape Protection – With Environment Hand in Hand? Conference proceedings (pp. 190–195). Czech Society of Landscape Engineers and Mendel University in Brno.

Manos, G. C., Simos, N., & Lambri-Gaitana, N. (2019). Dynamic and seismic behaviour of stone masonry arch bridges in Greece utilising in-situ measurements and numerical predictions. In M. Papadrakakis, & M. Fragiadakis (Eds.), COMPDYN Proceedings, Vol. I. (pp. 282–299). https://doi.org/10.7712/120119.6919.19262

Martínek, J., Létal, A., Šlézar P., Vích D., Kalábek, M., & Mířijovský, J. (2014). Poznáváme historické cesty. Centrum dopravního výzkumu, v.v.i.

Matěj, M., & Ryšková, M. (2018). Metodika hodnocení a ochrany průmyslového dědictví z pohledu památkové péče. Národní památkový ústav.

McGrath, E., Harmer, N., & Yarwood, R. (2020). Ferries as Travelling Landscapes: Tourism and Watery Mobilities. International Journal Culture Tourism Hospitality Research, 14(3), 321–334. https://doi.org/10.1108/ijcthr-10-2019-0184

Molina-Castaño, D.-E., Ramírez-Bacca, R., & Valencia-Llano, A. (2023). Caminos en el territorio del Gran Caldas (Colombia): Su historicidad y revision. HiSTOReLo, 15(32), 240–281. https://doi.org/10.15446/historelo.v15n32.100989

Nevřelová, M., & Ružičková, J. (2019). Educational potential of educational trails in terms of their using in the pedagogical process (Outdoor learning). European Journal of Contemporary Education, 8(3), 550–561. https://doi.org/10.13187/ejced.2019.3.550

Ortiz, C. N. (2021). Cultural and Territorial Dimension of the Historical Ways in Galicia and its Instruments for Protection. Quintana, 20. https://doi.org/10.15304/quintana.20.8051

Ostafin, K., Pietrzak, M., & Kaim, D. (2021). Impact of the cartographer's position and topographic accessibility on the accuracy of historical land use information: Case of the second military survey maps of the Habsburg empire. ISPRS International Journal of Geo-Information, 10(12), 820. https://doi.org/10.3390/ijgi10120820

Panecki, T. (2023). Mapping Imprecision: How to Geocode Data from Inaccurate Historic Maps. ISPRS International Journal of Geo-Information, 12(4), 149. https://doi.org/10.3390/ijgi12040149

Parry, K. (2021). Our bridge is down, what do we do? Repair and maintenance of Marlow's wooden bridge over the Thames 1620–1820. Construction History, 36(2), 57–80.

Pascu, M., & Pătru-Stupariu, I. (2021). The Assessment of the Authenticity and Conservation Status of Cultural Landscapes in Southern Transylvania (Romania). Geographies, 1(1), 3–21. https://doi.org/10.3390/geographies1010002

Popelka, S. J., & Smith, L. C. (2020). Rivers as political borders: a new subnational geospatial dataset. Water Policy, 22(3), 293–312. https://doi.org/10.2166/wp.2020.041

Redwood, S. D. (1994). The history of the ferries across the River Dee at Aberdeen. Northern Scotland, 14(1), 1–25. https://doi.org/10.3366/nor.1994.0002

Rovelli, R., Senes, G., Fumagalli, N., Sacco, J., & De Montis, A. (2020). From railways to greenways: A complex index for supporting policymaking and planning. A case study in Piedmont (Italy). Land Use Policy, 99, 104835. https://doi.org/10.1016/j.landusepol.2020.104835

Ryšková, M., Dzuráková, M., Račoch R., & Honek D. (Eds.) (2022). Methodology for Classification and Evaluation of the Industrial Heritage from the Perspective of Heritage Management – Water Management. Národní památkový ústav and Výzkumný ústav vodohospodářský T.G.Masaryka, v.v.i.

Selmanović, E., Rizvic, S., Harvey, C., Boskovic, D., Hulusic, V., Chahin, M., & Sljivo, S. (2020). Improving accessibility to intangible cultural heritage preservation using virtual reality. Journal on Computing and Cultural Heritage, 13(2), 1–19. https://doi.org/10.1145/3377143

Singh, T., & Page, D. (2018). Case studies on the history and use of timber bridges in New Zealand. Wood Material Science and Engineering, 13(3), 159–166. https://doi.org/10.1080/17480272.2017.1411393

Smrčka, A. (2021). Cultural Heritage Viability: An Example of Traditional Transport in Central Europe. Muzeológia a kultúrne dedičstvo, 9(2), 27–44. https://doi.org/10.46284/mkd.2021.9.2.2

Tarkowski, M., Połom, M., & Puzdrakiewicz, K. (2021). Bridging Tourist Attractions. The Role of Waterbuses in Urban Tourism Development: The Case of the Coastal City of Gdańsk (Poland). GeoJournal of Tourism Geosites, 34(1), 126–131. https://doi.org/10.30892/gtg.34116-627

Timár, G., Molnár, G., Székely, B., Biszak, S., Varga, J., & Jankó, A. (2006). Digitized Maps of the Habsburg Empire – The Map Sheets of the Second Military Survey and their Georeferenced Version. Arcanum.

Tomeček, O. (2000). Rekonštrukcia cestnej siete Zvolenskej stolice v prvej polovici 16. storočia. Acta Historica Neosolensia, 3, 40–46.

Vangel, J., & Decký, M. (2010). Historical development of toll collection in the territory of present-day Slovakia. Perner's Contacts, 5(3), 387–403.

Vletter, W., & Spek, T. (2021). Archaeological features and absolute dating of historical road tracks in the North-western European Sand Belt: An interdisciplinary case study of a late medieval and early modern trade route at the Hoge Veluwe National Park (Central Netherlands). Landscape History, 42(2), 23–39. https://doi.org/10.1080/01433768.2021.1999012

Map sources

1st Military Survey, Austrian State Archive/Military Archive, Vienna, Geoinformatics Laboratory, University of J.E.Purkyne, Ústí nad Labem, Ministry of Environment of Czech Republic

2nd Military Survey, Austrian State Archive/Military Archive, Vienna, Geoinformatics Laboratory, University of J.E.Purkyne, Ústí nad Labem, Ministry of Environment of Czech Republic

3rd Military Survey, Charles University, Prague, Faculty of Science, Map Collection, The Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Brno

Czechoslovak military mapping, Military Geographical and Hydrometeorological Office Dobruška, The Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Brno

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