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The underground city: the tourism potential of water and sewage infrastructure: the example of Poland

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Abstract. Industrial tourism and technical facilities are a fast-growing branch of tourism that contains areas of great growth potential. The article deals with one of them. The tourist potential of water and sewage infrastructure in selected Polish cities was analysed and assessed. The study covered 11 cities of diverse socio-economic potentials around the country. For each city, data were collected that had various levels of detail with regard to visitor numbers, tourist types, facilities made available, events and other special celebrations. For supplementary data, unstructured interviews were also conducted with relevant employees identified in businesses.

The analysis showed the studied form of tourism to have very high tourism potential. The work focuses on factors and features accounting for its currently low level of development. It is also emphasised that, based on current tourism trends, it should be expected to continue to grow rapidly in the coming years, and thus warrants further research.

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1. Introduction

The specificity and character of cities have always subjected them to constant spatial changes. This applies to changes on the micro scale (e.g. the construction of a new building, small shop) and the macro scale (e.g. the construction of a new district, multi-lane highway). The intensity of changes in cities can often very quickly completely transform a city in part or, in extreme cases, in its entirety. Some city facilities resist transformation due to their function, historical significance or cultural values. Such objects usually also function as tourist attractions. Two extremely interesting examples of this are industrial facilities and technical infrastructure. Such facilities began to be appreciated for their tourism value not long ago – only in the 20th century. The de-industrialisation of Western Europe that began in the 1970s made people think about the development of historic post-industrial objects (Price, 2021). This primarily concerned heavy industries and mining. Good examples in this regard are the revitalisations of the Belgian Blegny-Mines mine (Zhang et al., 2021) and post-industrial facilities in the Ruhr District (Eckart, 2003; Chmielewska & Otto, 2014). These projects have been successful and continue to attract thousands of tourists a year.

Industrial and technical facility tourism, which is a form of cultural tourism, has been gaining importance in recent years (Cheng-Fei, 2015). For this reason, the number of articles on the issue has also been growing dynamically. Numerous publications contain detailed analyses of the industrial tourism of a region (Gržinić et al., 2009; Bangstad, 2011; Boros et al., al 2013; Rosicka 2018), a city (Chmura & Mikoś , 2009; Klempa et al., 2016) or a post-industrial site transformed into a tourist attraction (Janas, 2005; Gyuricza, 2008; Van Westering – Emmanuelle Niela 2008). One extremely rarely in the literature is the issue of using water and sewage infrastructure for tourism and recreation. It is a relatively new issue in industrial tourism and technical facilities, and has high development potential. It fits directly into the main goal of industrial tourism development, which is to present a region's industrial heritage and technological achievements (Mazurek-Kusiak, 2019).

Water and sewage infrastructure usually entails a network of conduits and other facilities not seen on a daily basis due to being underground. They constitute an "underground city" of sorts in which, for example, the tunnels are the equivalent of a network of roads and pavements. Access to this underground labyrinth is, with few exceptions, very limited for tourists. However, there is also a significant portion of the water and sewage infrastructure above ground that is thus more accessible to visitors.

The aim of the article is to analyse and evaluate the tourist potential of water and sewage infrastructure in selected cities in Poland. Ultimately, the study was conducted for 11 cities in different parts of the country and characterised by different socio-economic potentials. It should be emphasised that the study included water and sewage infrastructure facilities that are still in use, as well as those of a historical and museum nature.

2. Methods and materials

The first stage of the research procedure was the selection of research objects. Due to the specificity of water and sewage industry activities, each city is usually served in its entirety by a single water and sewage company. It should also be noted that almost all water and sewage companies in Poland are owned by local government units. To facilitate the analysis and interpretation of results, the research facilities will be identified with the cities in which the water and sewage companies are headquartered. This study is limited to a query of companies in Poland's largest cities (of over 100,000 inhabitants) with regard to their providing visitors access to water and sewage infrastructure. The analysis focuses on specially selected facilities within the companies, usually taking the form of specialist museums. Other ways of making facilities and infrastructure of enterprises available for special occasions in the form of parties, events and festivals were also taken into account.

The next stage of research involved obtaining information from the selected research objects. The companies provided data at various levels

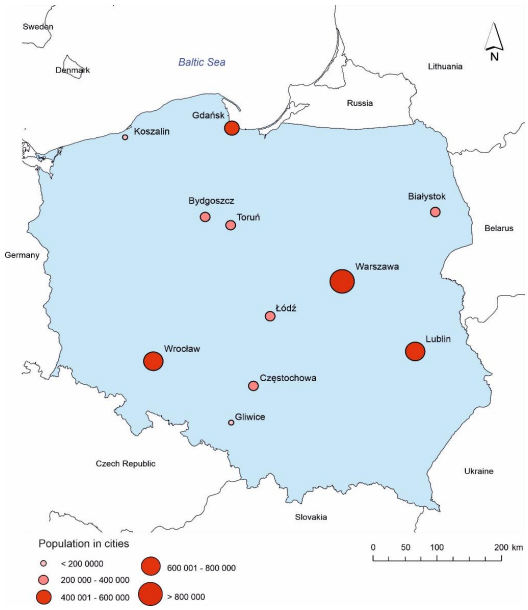

Fig. 1. Location of the selected research cities in Poland.
Source: author's own work.

of detail with regard to visitor numbers, tourist types, facilities made available, events and other celebrations. In addition, unstructured interviews were conducted with designated relevant employees in each company. During the meetings, additional information was obtained about the specifics of how the water and sewage facilities operated and were made available to visitors.

The collected quantitative and qualitative data were appropriately processed to form the basis for a detailed analysis and assessment of tourism potential in the selected cities.

3. Results and discussion

The data were very heterogeneous with regard to visitor numbers in each city. Annual total visitor numbers were obtained from only seven cities, while the other cities provided only general information. In the cities that provided annual visitor numbers, there is a systematic increase in tourist numbers. In the years 2012–2020, the tourist numbers were highest at the facilities in Łódź and Bydgoszcz.

In Łódź, a water and sewage museum was opened in 2008 in the premises of a defunct reservoir used for the periodic cleaning of conduits in the city centre. Unfortunately, in this case, visitor numbers were obtained for 2017–2019 only. The attractiveness of this place is evidenced by its annual visitor numbers being highest of all cities, at more than 15,000 (Waterworks and Sewage System Company in Łódź 2021).

Growth in visitor numbers was greatest in Gdańsk. In the city, the "Gdańsk Water Supply Trail" has been established, and includes such facilities a: the Stara Orunia Reservoir, the Kazimierz Reservoir, and the Stary Sobieski Reservoir. Since 2015, the number of tourists visitors to the attraction has totalled almost 40,000 (Gdańsk Water Supply and Sewerage Infrastructure 2021).

A similarly number of tourists as Gdańsk's has been attracted to the Warsaw Museum of Water and Sewerage since 2015. The first Warsaw Museum of Waterworks and Sewerage was established in the early 1930s and was destroyed in the war. The museum was rebuilt in 1986 to mark the 100th anniversary of the Warsaw waterworks.

Significantly smaller visitor numbers were recorded in Toruń, Gliwice and Lublin. In these cities, attractions related to water and sewage infrastructure attracted several thousand people each year.

For the remaining four cities, as already mentioned, only general information on visitor numbers was provided. The "Hydropolis" Water Museum in Wrocław deserves special attention. Since 2015, this museum has been visited by over 1.3 million tourists (Municipal Water and Sewerage Company in Wrocław 2021). The museum is located in a 19th-century underground clean water tank. It should be noted that the museum presents a very wide range of topics under the common topic of water. The museum presents seven permanent thematic zones and periodic temporary exhibitions. Far more modest visitor numbers are recorded in Koszalin, where the "Museum of Water" is located. This museum has annual visitor numbers of around 1000 people a year (Municipal Water Supply and Sewer Water Museum in Koszalin 2021). There is no special entity dedicated to serving tourists in Białystok or Częstochowa. There, facilities related to water and sewage infrastructure are made available to organised groups only, and visits are mainly educational.

The presented tourist numbers for individual cities are quite difficult to interpret unequivocally. This is because of the very short period for which

the data are taken and their high heterogeneity. In a few cases, the visitor numbers provided were only approximated, or the total visitor numbers for a certain time period was provided. Additionally, attention should be paid to the year 2020, when most tourist facilities were temporarily closed due to the pandemic. Furthermore, the lack of detailed visitor numbers may indirectly indicate the approach that particular facilities take to making water and sewage infrastructure facilities available to tourists. The lack of detailed statistical reporting indicates the companies' modest level of commitment in this regard. This is confirmed by the information obtained from the company employees in interviews.

Defunct water and sewage infrastructure facilities very often have great architectural value. They are therefore subject to conservation protection and entered in the register of immovable monuments. The buildings of former pumping stations and water towers are particularly attractive in terms of tourism. Examples include the 19th-century Stare Bielany pumping station in Toruń and the neo-Gothic buildings of the pumping station and water tower in Bydgoszcz (Michniewicz-Ankiersztajn & Podgórski, 2015). These facilities are usually no longer engaged in the distribution of drinking water and can thus be made available to visitors. They often host museums and thematic exhibitions devoted to the techniques and technologies of obtaining, treating and distributing water in cities.

The limitations on the availability of individual water and sewage infrastructure facilities to tourists are largely due to the specifics of such facilities. A large part of the facilities continues to perform its function, i.e. they are involved in providing inhabitants with drinking water or waste disposal. This is important because water and sewage infrastructure is widely regarded to be a critical infrastructural feature of every city. It is of fundamental importance to the functioning of society and the economy. For this reason, often, despite its great attractiveness, access to some of the facilities must be limited or completely forbidden. However, even when a water and sewage infrastructure facility is no longer in operation, there may still be obstacles limiting the ability to make it available to visitors. One example is old conduits that used to transport water or drain sewage. In many cases, these can constitute a great tourist attraction. However, it should be remembered that these were created for a different purpose and cannot always be adapted for tourist purposes (Wartak & Wieja, 2011).

Regular events (e.g. Night of museums) and special local events attract the largest number of tourists to museum and exhibition facilities.

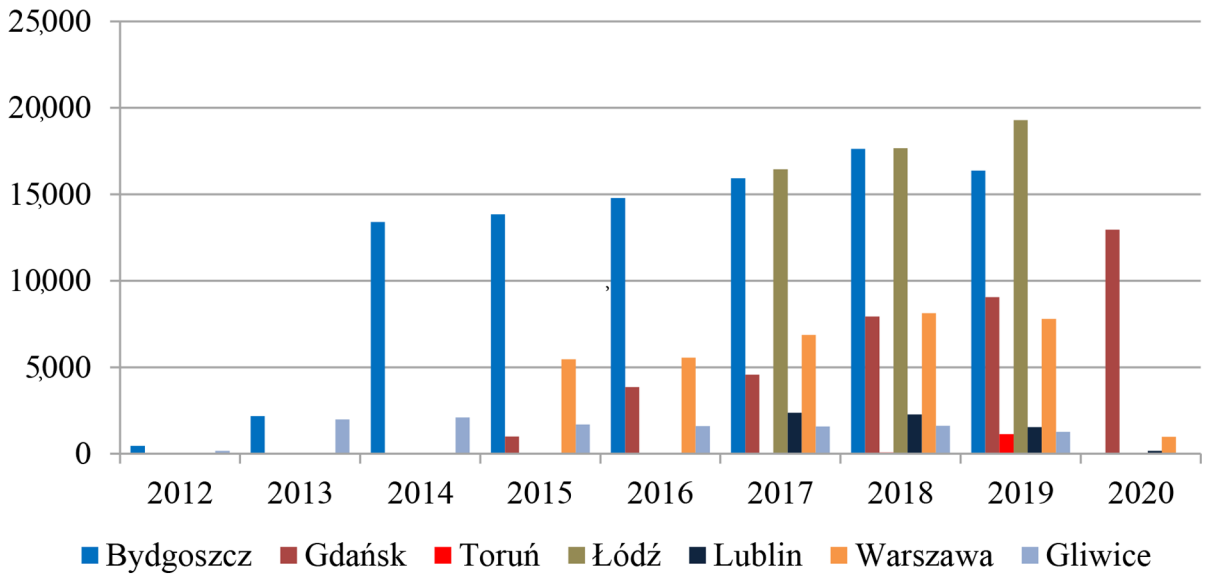

Fig. 2. Number of visitors to tourist attractions related to water and sewage infrastructure in selected cities in Poland. Source: author's own work.

A similar pattern is seen for tourist attractions related to water and sewage infrastructure (Krakowiak & Skrydalewicz, 2013). Such cultural events, having a local and national dimension, are usually well promoted. Information about them is disseminated on many mass media, including radio, television and the Internet. This shows the great importance of a promotional campaign and advertising in attracting tourists to such facilities. In Poland, interest in industrial and technical tourism is still less than in Western Europe (Jędrysiak, 2011). Data for 2010 indicate that out of 2,098 post-industrial facilities serving as a tourist attraction, 273 were water towers, and 285 were municipal waterworks (including six defunct canals) (Jędrysiak, 2011).

The conducted research made it possible to specify the tourist profile and specificity of the most frequently visited sites. Organised groups predominate among the visitors. Individual tourists are a minority, which is often explained by the way in which attractions are made available to visitors. For most of the surveyed companies, sightseeing was possible only for organised groups. This approach is justified because, as already mentioned, some of the facilities still perform their original design function. Therefore, their availability to visitors must be fully controlled and planned so as not to disturb their operation. School children predominate among the organised groups. This is a very particular visitor group focused primarily on education. However, as noted by M. Kamel (2012), school students belong to the most reliable and numerous group of visitors to various cultural institutions. Usually, students have no choice but to participate in cultural excursions and events because they are organised as part of classroom activities. It should be emphasised that this form of knowledge acquisition away from the school desk often reaches students better, allowing them to deepen and consolidate educational content (Denek, 2000). Therefore, the many forms of didactic and educational activity organised for school children hold a particularly important place for forms of tourism that combine theoretical knowledge with practice (Łobożewicz 1996). Such a possibility is undoubtedly offered by organised visits to water and sewage companies. This is because they make it possible to learn and understand the functioning of modern water and sewage management in cities.

The quoted numbers of tourists visiting water and sewage infrastructure facilities in individual cities clearly show that the potential of school children has still not been fully tapped. Establishing permanent cooperation with schools in nearby towns would ensure a large group of visitors each year. An additional benefit for enterprises would be the possibility of educating young people in the proper use of the water and sewage infrastructure. The issue of proper exploitation relates mainly to materials carried in wastewater to sewage treatment plants. Unfortunately, many people treat the sewage system like a rubbish bin. One example of items thrown into the sewage system is personal care products, such as popular, double-tipped cotton buds. When they get into sewage treatment plants, they can block and damage pumps (Wandelt, 2014). Furthermore, the concentration of raw sewage pollutants (especially organic substances) has been increasing in Poland for several years (Janczukowicz et al., 2016). The main reason is the decrease in water consumption related to the increase in water metering, as well as the installation of water-saving sanitary installations, bathroom fittings and household appliances (Gorączko & Pasela, 2015; Lewandowska & Piasecki, 2019).

The growth of each area of tourism should be considered a potential stimulus of local development. For this reason, it seems advisable, at the local level, to take further actions to create comprehensive tourist products related to water and sewage infrastructure in cities. There is very great potential for this form of tourism in Poland but, with some exceptions (Wrocław, Łódź, Gdańsk), it is not being exploited. An individual approach is important in this respect, as the attractiveness of facilities varies greatly from city to city. In some cities with less such potential, it will probably only be a supplementary product in the city's tourist offer. In large urban centres, where water and sewage infrastructure facilities are usually of impressive size or where unique hydrotechnical solutions have been used (due to specific local conditions), their attractiveness will be significantly greater. In such cases, they may be turned into a separate tourist product of a supra-local nature.

The uniqueness and limited availability of water and sewage infrastructure facilities is currently a strong motivator for individual tourists. Currently,

increasing numbers of people are looking for such attractions due to their reticence towards mass tourism. Tourists are increasingly less interested in common, mass products, and are looking for unconventional, innovative products with their own identity – products that they can taste and touch (Jalinik, 2008).

4. Summary

The analysis showed the great tourist potential of water and sewage infrastructure in selected cities in Poland. It was also indicated that it remains – with the exceptions of Wrocław, Łódź and Gdańsk – an undervalued and very poorly promoted form of tourism. The study considered the specificity of facilities, the method by which they are made available, visitor numbers and tourist profiles. In most cities, public access to facilities was found to be severely limited. This is mainly due to objective factors related to the specifics of such facilities and the need to ensure their proper protection. In some cities, the companies were only modestly committed to promoting this form of tourism. It was indicated that most visitors come in organised groups, which is mostly justified by the specifics of water and sewage infrastructure facilities.

In the coming years, further growth in water and sewage infrastructure tourism should be expected. This largely results directly from trends seen in tourism, and part of society turning away from mass tourism in favour of new, unique tourism products. An undoubted advantage of this form of tourism is its educational dimension. This may make it an excellent basis for educating young people and the elderly in the management and protection of the valuable and limited resource that is water.

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