

Integrated Land and Water Management Illustrated with an Example of the Recreational Function of the City

Agnieszka SZCZEPAŃSKA, Adam SENETRA, Mirosław BELEJ

Key words: water resources, lake, recreational potential, tourism

SUMMARY

Surface waters located within the administrative boundaries of cities have great recreational potential. The proper development of coastal areas provides conditions for both active and passive recreation for inhabitants and is also an aspect that affects the city's image and the development of tourism functions.

The study analysed the level of the recreational development of lakes and the resulting possibilities for spending free time, using Olsztyn, the capital city of the Warmia and Mazury region, as an example. The characteristic features of Olsztyn are its 11 lakes, with an area of over 1 ha (and several smaller ones), as well as extensive forest areas. Strategic documents of both the city and the region prioritise the development of various forms of tourism, sports, and leisure activities as major functions based on the existing potential of the environment. This can be achieved through the reasonable management of these resources. In the past, this sphere of development was neglected, but numerous measures have been taken in recent years. This paper presents the quantitative and qualitative effects of the measures taken by the city authorities as part of the integrated management of water resources, whose main goal is to ensure the sustainable use of lakes.

SUMMARY

Wody powierzchniowe położone w granicach administracyjnych miast stanowią duży potencjał rekreacyjny. Odpowiednie zagospodarowanie terenów przybrzeżnych tworzy warunki do aktywnego i biernego wypoczynku mieszkańców. Jest to także element wpływający na wizerunek miasta i rozwój funkcji turystycznych.

Celem pracy jest analiza poziomu zagospodarowania rekreacyjnego jezior oraz wynikających z tego możliwości spędzania wolnego czasu, na przykładzie Olsztyna, stolicy regionu Warmii i Mazur. Charakterystyczną cechą miasta jest występowanie 11 jezior o powierzchni powyżej 1 ha (oraz kilku mniejszych) i znacznych obszarów leśnych. Dokumenty strategiczne miasta i regionu jako priorytet wskazują rozwój różnorodnych form usług turystyki, sportu i rekreacji jako funkcji dominujących, opartych o istniejący potencjał środowiska, co można osiągnąć poprzez racjonalne zarządzanie tymi zasobami. W przeszłości ta sfera rozwoju była zaniedbywana, ale w ciągu ostatnich lat podjęto liczne działania w tym zakresie. W pracy przedstawiono efekty ilościowe i jakościowe działań podjętych przez władze miasta w ramach zintegrowanego zarządzania zasobami wodnymi, którego głównym celem jest zapewnienie zrównoważonego użytkowania jezior.

Integrated Land and Water Management Illustrated with an Example of the Recreational Function of the City

Agnieszka SZCZEPAŃSKA, Adam SENETRA, Mirosław BEŁEJ

1. INTRODUCTION

Tourism involving the use of water resources puts significant pressure from recreationists and tourism traffic operators on the environment and its components, particularly aquatic ecosystems. Lakes are an essential part of many of the world's most popular tourist places. Therefore, for many years, there has been a search for an integrated approach to the management of water tourism systems (Hall and Härkönen, 2006). Inland water tourism is regarded as an attractive tourism product that generates significant economic benefits and raises environmental awareness. Moreover, it contributes to the diversification of the use of all water resources, which allows the coastal areas of water bodies to be better protected (Sánchez-Rivero, 2020).

Tourism related to inland waters is developing very rapidly. Tourists appreciate the attractiveness of water systems situated in resorts. An additional aspect of attracting tourism traffic is often the connection of water systems (lakes, rivers, canals) with history and contemporary functions. This enhances the uniqueness of a place, including the aquatic environment and the adjacent locality area (Hadwen et al., 2012; Olsson, 2016). Tourism based on inland water resources is also an impulse for social and economic development. This is reflected in an increase in the inhabitants' standard of living, revenue from economic activities involving tourism traffic servicing and an increase in the possibilities and enrichment of leisure scenarios for visitors (Sánchez-Rivero 2020).

Water is also the main destination for natural or open-space tourism. Water tourism is usually supplemented by leisure and recreational facilities and attractions while enjoying the landscape or pursuing tourism activities (Fachrudin & Lubis, 2016). A tourism facility is an embodiment of human creativity, a way of life, a reflection of art, culture, and the history of the place and the nation or the condition of nature (attractive to tourists).

In addition to the above-listed advantages, the following adverse effects of the development of water tourism in inland areas also need to be mentioned. The rate of changes related to tourism development translates into an increased danger of degradation of the aquatic ecosystems under pressure. The main hazards are related to the degradation of biodiversity, i.e. the variety of life at all levels of its organisation: genes, species and ecosystems (Kurleto, 2013). Another significant danger in aquatic areas is the progressive eutrophication of waters (Dynowski et al., 2019; Senetra et al., 2020), understood as the enrichment of water with nutrients, particularly nitrogen and phosphorus compounds, which cause accelerated growth of both algae and higher forms of plant life. These processes result in undesirable disturbances to biological relationships in the aquatic environment as well as a deterioration in the quality of these waters (Water Law, 2020). Increased investment in coastal areas also results in the loss of their natural values (a significant increase in the anthropogenic investment level at the expense of natural resources).

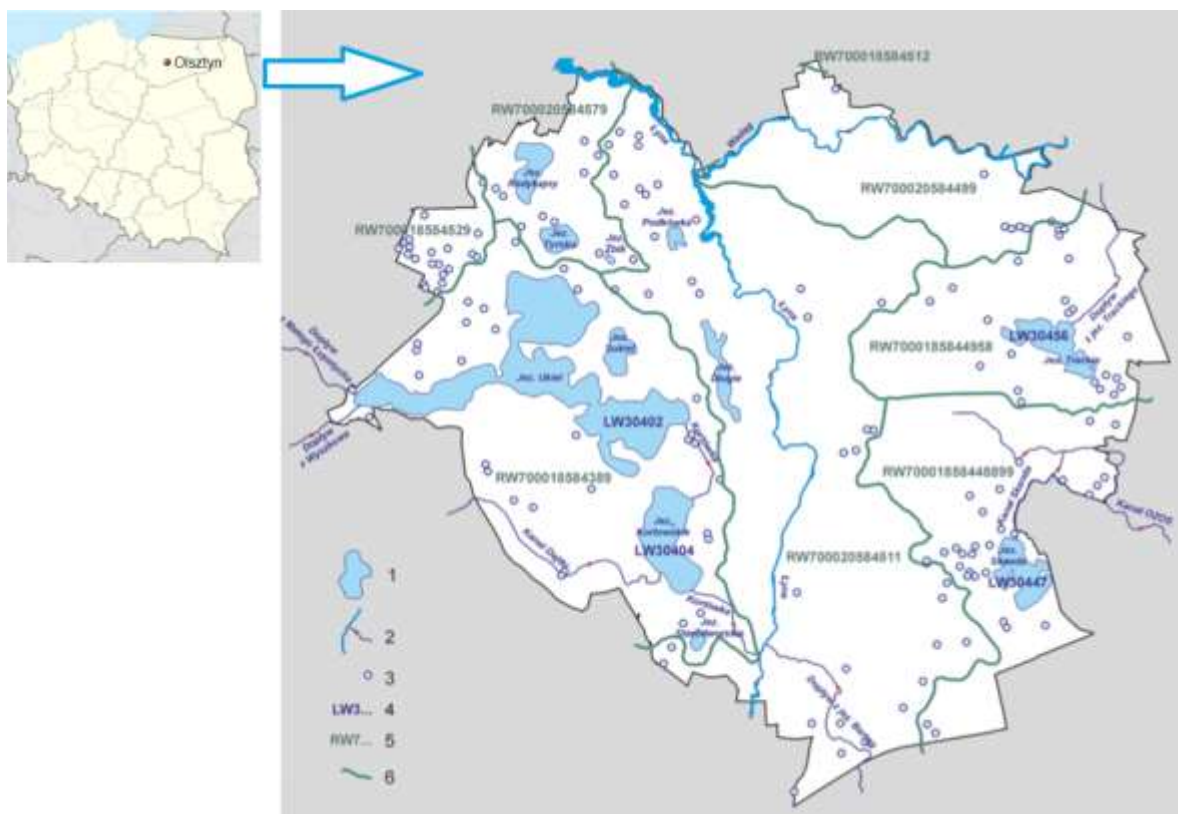
The potential of the landscape, with particular reference to waters, is the main factor contributing to the development of water tourism. Hence, an assessment of the recreational and tourism potential of lakes is most frequently based on a component assessment of the landscape, comprising its main parts (topography, climate, water bodies, and the soil and vegetation cover). For example, for an assessment of the tourism potential of Lake Alakol, a comprehensive assessment of the components forming the landscape around this water object was conducted (Mukayev et al., 2020). This approach allows water resources to be considered as an important landscape component contributing to the possibility of their use by tourists. On the other hand, Demir (2014) applied the Travel Cost Method to assess the value of the recreational use of Lake Tuz. The paper demonstrates significant relationships between the quality of the lake surroundings' assets and their economic value generated by tourists' visits. This confirms the thesis that the crucial stage of reasonable planning of tourism projects is the correlation between the utility features of the environment as well as the development of space and the tourism trends and their proper interpretation.

Understanding the dynamics and trends in the ongoing processes of water tourism in inland areas is necessary for the optimal planning and development of these areas. This study analysed the measures taken by the city authorities, leading to an increase in the level of recreational development of waters and the resulting possibilities for spending free time, using the city of Olsztyn, the capital of the Warmia and Mazury region, as an example. Lakes Ukiel (Krzywe) and Skanda were subjected to a detailed analysis due to the municipal beaches operating at these lakes and upgrading works were also conducted.

2. MATERIALS AND METHODS

2. 1. Study area

Olsztyn is an urban settlement situated in north-eastern Poland and the capital city of the Warmia and Mazury region. The area of the city in 2019 amounted to 8,833 ha. It is worth noting that within the administrative boundaries of Olsztyn, there are 11 lakes with an area of over 1 ha (with a total shoreline length of 54,361 m, and an area of 725 ha) and three rivers (Łyna, Wadąg, and Kortówka), which are an extremely valuable component of the landscape, and a natural as well as a tourism and recreational asset. Moreover, Olsztyn is characterised by a great number (reaching 200) of small-sized water bodies, either permanent or temporary (Fig. 1). What deserves special mention is Lake Ukiel, the largest body of water situated within the city's administrative boundaries.



1 – lakes, 2 – watercourses, 3 – small-sized water bodies, 4 – SWB codes for lakes; 5 – SWB codes for rivers, 6 – SWB boundaries
 SWB - surface water bodies

Fig. 1. Location of the study object. Source: Own elaboration based on the basic components of Olsztyn’s hydrographic network along with the division into surface water bodies. Source: Environmental Protection Programme for the City of Olsztyn up to 2020.

In addition to considerable water resources, Olsztyn also has extensive forest resources (communal forests with an area of 1,283 ha), including the Municipal Forest and numerous parks within the city centre. The Municipal Forest complex is an area of 1054.7 ha, situated within the city’s administrative boundaries, which is unique throughout Europe. Within the city boundaries, there are also 18 walking and recreational parks with a total area of 103 ha, 66 green squares (33.13 ha), street greenery with an area of 177 ha and housing estate green areas (214 ha). In Olsztyn, there are also numerous uncontrolled greenery areas, namely meadows situated in river valleys and the vicinity of the lakes, and numerous allotments which are large enclaves of green areas among the buildings.

Most of the water bodies are situated in the western part of the city and the dense forest complexes in its northern part. The spatial structure of land use is shown in Figure 2.

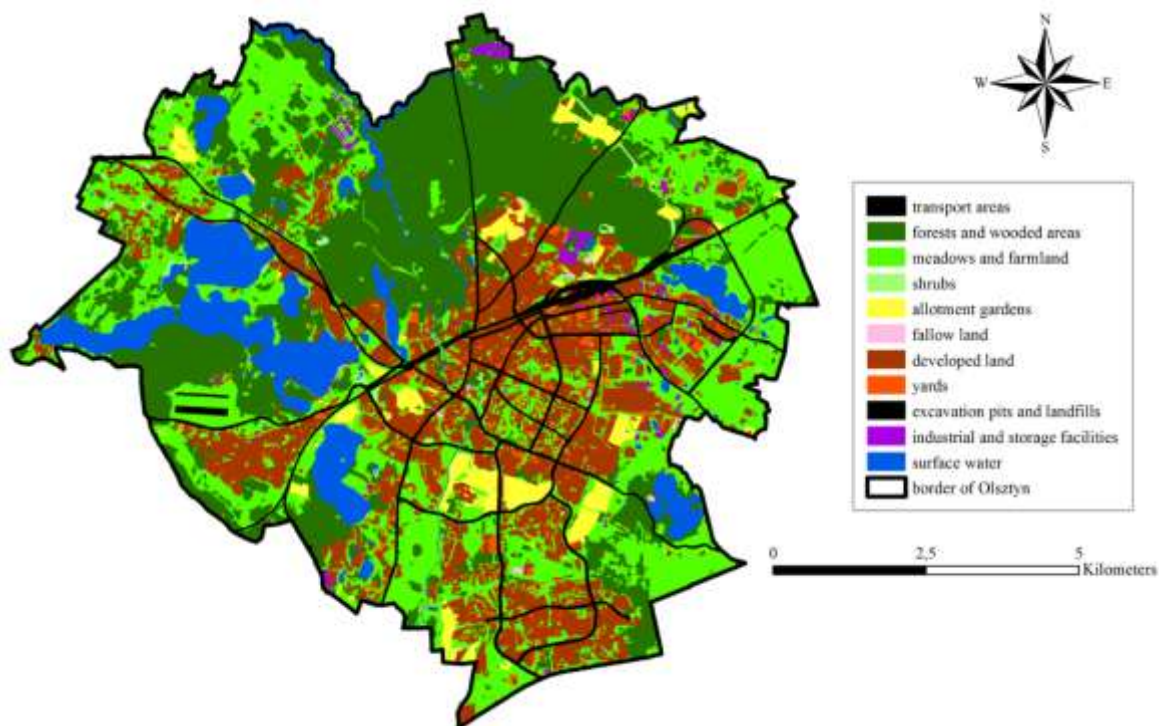


Fig. 2. The spatial distribution of the structure of land use in Olsztyn. Source: Szczepańska A., Wasilewicz-Pszczółkowska M., 2018

In summary, Olsztyn is characterised by a specific (for a city) structure of use, in which the blue-and-green infrastructure accounts for more than 30% of the city area, including water bodies accounting for approx. 10%, and forests as well as wooded land and bushland accounting for over 20% of the city area (Fig. 3). This provides incredible potential for the development of recreational and tourism functions to be used by both the inhabitants and visiting tourists.

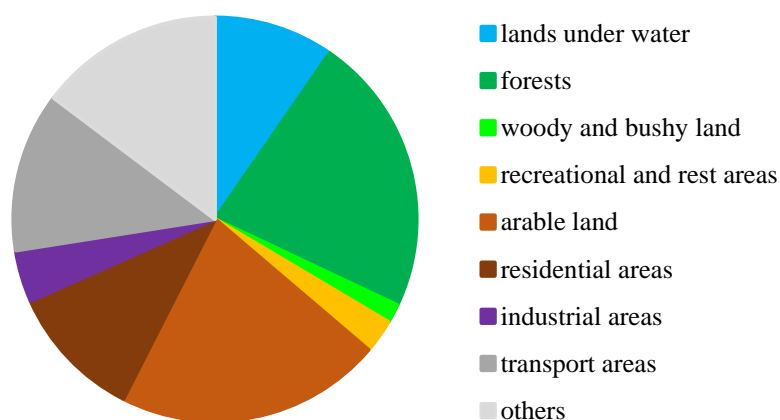


Fig. 3. The structure of land use in Olsztyn in 2017. Source: Own elaboration based on the Land Inventory kept by the Provincial Centre for Land Surveying and Cartographic Documentation in Olsztyn.

2.2. Research methodology

This paper analyses urban tourism and recreational investments related to the development of inland water bodies and watercourses. The available strategic documents and the data available in the city's Public Information Bulletin were analysed. These documents were divided into two groups. The strategic documents included:

- the Development Strategy for the city of Olsztyn, 2020,
- Environmental Protection Programme for the City of Olsztyn up to 2020,
- Environmental Protection Programme for the Olsztyn Powiat up to 2020,
- Report on the condition of the city of Olsztyn, 2019.

The second group comprised planning documents including:

- A study on determinants and directions of the spatial development of Olsztyn
- Local Area Development Plan for Lake Długie in Olsztyn,
- Local Area Development Plan for Lake Ukiel in Olsztyn,

In the next stage, the surface water resources were characterised, with particular emphasis on the lakes located within Olsztyn's administrative boundaries. Moreover, the main tourism and recreational investments related to the coastal development of waters were analysed.

In the final stage, the visits of customers of the year-round Ukiel Leisure and Sports Centre were analysed based on a continuous monitoring system. This enabled the analysis of attendance and the utilisation of recreational potential, including the determination of the effect of the COVID-19 pandemic in this regard.

3. RESULTS AND DISCUSSION

The Development Strategy for the City of Olsztyn 2020 in a SWOT analysis indicates the natural assets (the Lake Krzywe shores, the Łyna River valley, the Municipal Forest complex, and 11 lakes within the city limits). In accordance with a study on the determinants and directions of the spatial development of Olsztyn (Resolution XXXVII/660/13 on an amendment to the study on determinants and directions of the spatial development of the City of Olsztyn), the aim of improving the quality of life in the city is to shape the public space landscape throughout the city and to raise the significance of the development of public space up to the distinguishing feature of the city's identity and the quality of inhabitants' lives. This is to be achieved through comprehensive projects for protection, regeneration and providing access to natural areas, including the development of these areas for recreation, tourism and sports, which also includes programmes and projects involving the development of lake surroundings, the Municipal Forest, and the Łyna River valley, which are the components of Urban Activity Belts. The study indicates the following directions for the development of the urban space in the context of the existing water resources:

- striving to establish greenery belts and walking & cycling links between the Łyna River corridor and the external greenery enclaves
- recreational and tourism development of lakeshores (kayak and sailing marinas, beaches, and sports grounds)
- recreational and tourism development of the Łyna River. It is only possible if no adverse effects on the following goals and objects of protection of the Central Łyna River Valley Protected Landscape Area are demonstrated:

- extension of the network of bicycle lanes and pedestrian pathways at lakes, in forests and in the uncontrolled greenery (landscape) areas.

The appropriateness of the directions taken in relation to the use of available blue-and-green infrastructure was confirmed by a study conducted among Olsztyn inhabitants who indicate that the most valuable tourism and recreational assets of their city include the proximity and accessibility of the lakes and rivers (Bielinis et al., 2015). According to a study on Olsztyn inhabitants' opinions on their problems and visions of the city, the greatest asset and advantage of living in Olsztyn include its location and natural assets. The respondents emphasise that the ubiquitous forests and lakes offer enormous opportunities for quiet leisure, active recreation, playing sports, close contact with nature, peace and tranquillity, and pure, pollutant-free air. Olsztyn inhabitants indicate the following as the advantages of living in their city: lakes 45% (the highest percentage of all indications), green areas/parks 20%, forests 20%, landscape/nature/wildlife 20%.

Of all the natural resources of the city, it is the lakes that are particularly characterised by great recreational and leisure potential, and they are used by the locals and tourists alike. The characteristics of major water bodies are provided in Table 2 and their spatial distribution in Fig. 3.

Table 2. The characteristics of selected lakes in Olsztyn.

Lake name	Water table area [ha]	Maximum depth [m]	Shoreline length [km]	Shoreline development	Purity class
Ukiel	412.0	43.0	22.5	3.14	II
Kortowskie	89.7	17.2	4.80	1.43	IV
Track	52.8	3.8	4.65	1.86	V
Skanda	51.1	12.0	4.05	1.72	V
Długie	26.8	17.3	4.08	2.23	II
Redykajny	29.9	20.6	2.72	1.41	II
Tyrsko	18.6	30.4	1.62	1.10	II
Podkówka	6.9	6.0	1.38	1.48	III
Sukiel	20.8	25.0	2.10	1.30	IV
Starodworskie	6.0	23.3	0.90	1.04	III
Czarne	1.5	7.1	0.45	1.04	III

Source: Dunalska et al., 2017

One of the ways to make recreational use of the lakes is to establish publicly accessible bathing areas. In 2020, in Olsztyn, in accordance with the Resolution of the City Council of 29 April 2020 No XX/348/20 on the List of Bathing Areas in the Municipality of Olsztyn, three municipal bathing areas operated:

- (1) Bathing Area No 1, the City Beach in Olsztyn at Kapitańska Street 23 (the Lake Ukiel area),
- (2) Bathing Area No 2, the City Beach in Olsztyn at Kapitańska Street 23 (the Lake Ukiel area),
- (3) The Skanda Bathing Area in Olsztyn at Plażowa Street (the Lake Skanda area).

The only bathing area of the past which is still operating in the city is the City Beach at the Lake Ukiel, which was established, according to various sources, in 1928 or 1932 (Gadomska, 2006).

As can be seen from the above list, Lake Ukiel plays a leading role in satisfying the recreational and leisure needs of the population. It is the deepest and the largest lake with the

longest shoreline in Olsztyn, situated near the city centre. For this reason, this water body is characterised by great tourism and leisure potential (Furgała-Selezniow et al., 2012). As early as 1942, a design was produced for the development of the surroundings of the lakes Ukiel and Długie by a municipal councillor who envisaged the recreational development of the area concerned (Gadomska, 2006). The infrastructure along the lake shores has been only subjected to significant upgrading in recent times, since the area around the lake was included in the comprehensive development plan. As part of the Regional Operational Programme for Warmińsko-Mazurskie Voivodeship, measure 2.1.: An Increase in Tourism Potential, the municipality of Olsztyn in the years 2012-2014 implemented a project entitled “The construction of a year-round sports and recreational infrastructure at Lake Krzywe in Olsztyn” using funds from the European Regional Development Fund. The project value was PLN 63,022,976.61 including EU co-financing of PLN 22,108,374.851. In December 2009, the competition for architectural concepts of the Lake Ukiel development was settled. According to the assumptions, the architects’ concepts were intended to help the city achieve the following:

- a coherent urban planning concept of the Lake Ukiel surroundings in order to actually make the lake shores accessible to Olsztyn inhabitants and tourists alike,
- a programme-and-spatial concept of urban recreational and sports ground in the vicinity of the lake, with particular emphasis on the need to offer possibilities for water sports, both for the general public and for sports clubs and training centres;
- attractive architectural propositions for the shaping of buildings and “landscaping elements” on the lake shores;
- programme and spatial proposals for the development of the lake surface.

On 27 January 2010, the City Council adopted a resolution on setting about implementing the investment project. The project implementation resulted in the establishment of year-round Ukiel Recreational and Sports Centre, the Kayaking Centre and the Water and Ice Sailing Centre (Fig. 5). As part of the upgrade, the following have been established: catering facilities, recreational facilities (beach volleyball courts, playgrounds, walking promenades and cycling lanes, a pier, a volleyball hall, squash courts and a gym, a sports equipment rental facility, a kayaking centre, viewing and mooring platforms, and leisure platforms and terraces), a marina with a sports equipment rental facility, a kayaking centre, the Captain’s Office, City Guard and Police stations, rooms for lifeguards serving the bathing areas and car parks. Numerous sports events (e.g. in 2015, Olsztyn became the host of the World Beach Volleyball Competition - FIVB Beach Volleyball World Tour 2015) and cultural events (e.g. Olsztyn Green Festival) are held in this area. On the lakeshore, there are hotel facilities (Przystań Hotel & Spa 4*, Tiffi Boutique Hotel 4*, Hotel Omega 3*, and Pensjonat u Jacka).



Fig. 4. The Lake Ukiel shore development. Source: own photo.

The implementation of the above-mentioned project obligated the City's Sports and Leisure Centre to keep statistics related to the daily record of entries and exits in the years 2015-2020. The results of the record kept are provided in Fig. 5.

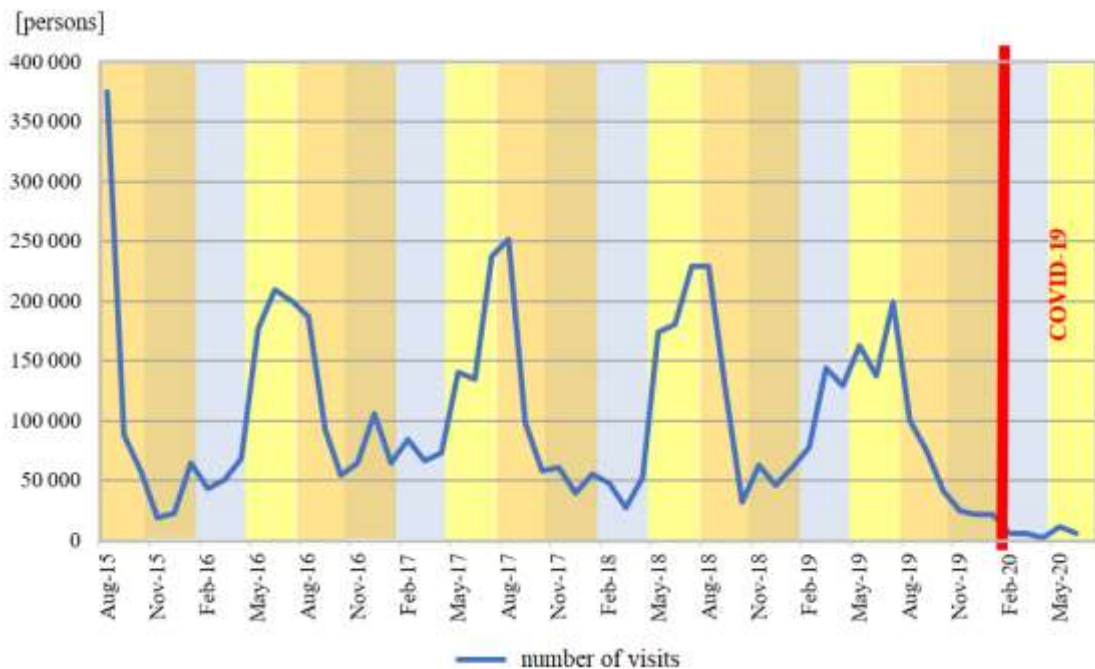


Fig. 5. The record of entries to the Ukiel Leisure and Sports Centre, based on the continuous monitoring system. Source: data of the Sports and Leisure Centre in Olsztyn.

Figure 4 presents the attendance at the Ukiel Leisure and Sports Centre, based on the continuous monitoring system. The scope of the data includes the monitoring period from August 2015 to mid-June 2020. Unfortunately, the system was suspended in July 2020 due to the completion of the project.

As shown in the above diagram, the Ukiel Leisure & Sports Centre is visited by hundreds of thousands of people on an annual basis, particularly during the summer months. What can also be seen is the evident drop in the number of visitors during the initial period of the COVID-19 pandemic. While this is obvious in the months of strict lockdown, the further effect on the pandemic during the period from May to June 2020 is also undeniable, even though sanitary restrictions were significantly loosened at that time. As compared to the previous year, the number of visitors dropped in May by 151,558 people (from 163,468 to 11,910) and in the first half of June by 48,473 people (from 54,546 to 5,803), respectively. It can therefore be concluded that in the initial stage of sanitary restriction loosening, the majority of inhabitants and tourists continued to exercise extreme caution and avoided large human concentrations. This situation had a direct impact on all spheres of life. As regards the social sphere, it was a reduced quality of life, withdrawal from physical activity, reduced interpersonal contacts, abandonment of hobbies, etc. As for the economic sphere, the operation of accommodation and catering facilities, gyms and other tourism services located along the lakeshore was restricted. In this case, the environmental sphere was the only one to gain advantages due to limited penetration. During this period, the effect of adverse phenomena on the lakes (the degradation of their biodiversity and eutrophication) was significantly restricted. At that time, the supply of nutrients accelerating the eutrophication process (food leftovers, partially filled bottles, cosmetics and human waste) was considerably restricted.

A beach at another Olsztyn's lake, namely Lake Skanda, has undergone upgrading as well. The project was implemented in 2018 and financed with funds from Olsztyn's Participatory Budget in the amount of PLN 460,000. According to the project documentation, the subject of the investment was to develop the City Beach area in terms of tidying up the area, to obtain a clear urban planning composition making use of the topography, scenic points, the existing greenery complexes and opening to the beach space and the picturesque lake. The conducted works included: transport of sand to the beach, the construction of a floating platform, the allocation of a bathing area for children and swimmers, the construction of a beach volleyball court including viewing tribunes, the construction of a camping shelter with a barbecue, the construction of transport routes with stairs, the installation of lighting and monitoring systems, the installation of land development components and greenery plantings.

Another example of an upgrading project is the development of the Lake Długie shores. In 2012, a walking and cycling route was established around the lake, which offers walking pathways, benches, deckchairs, and a footbridge across the lake to the inhabitants.

Another example of water management is the development of the Łyna River banks (Fig. 6). The Operational Programme: Regional Operational Programme for Warmińsko-Mazurskie Voivodeship for the years 2014-2020, priority axis VI: Culture and heritage, Measure: 6.2 Natural heritage, Submeasure: 6.2.3 Efficient use of resources, project value: PLN 7,188,386.49, EU's contribution: PLN 3,617,375.85 – 2017. The project involved the construction of a system of recreational paths along with the accompanying infrastructure, situated on the Łyna River banks, within the boundaries and in the immediate vicinity of the Central Łyna River Valley Protected Landscape Area, or the so-called Łynostrada. The

developed infrastructure serves both tourists and Olsztyn inhabitants without exceeding the tourist absorption capacity and exerting excessive anthropogenic pressure.



Fig. 6. The Łyna River bank development in the Municipal Forest. Source: own photo.

A component of water resource management is the local planning documents that constitute local law. These documents include:

- Resolution No XIX/255/16 of the Olsztyn City Council of 27 January 2016 on the adoption of the Local Area Development Plan for the Lake Długie in Olsztyn,
- Resolution No XXII/372/12 of the Olsztyn City Council of 25 April 2012 on the adoption of the Local Area Development Plan for the Lake Ukiel in Olsztyn.

The cited documents specify the functions and uses of the land adjacent to water bodies. They are primarily aimed at regulating the issues of coastal area development and integrating the improvements on land with the environmental determinants.

4. CONCLUSIONS

Olsztyn is unique compared to the rest of Poland, not only because of the great number of water bodies located within the administrative boundaries but also due to numerous experiments and implementations of lake reclamation methods as well as the model cooperation in this field between scientific institutions and administrative authorities in shaping the tourism and recreational space (Parszuto et al., 2018).

The aim of the implementation of the above-mentioned projects concerning the development of surface waters was primarily an increase in tourism potential through the development of multifunctional sports and recreational infrastructure. Over the past years, tourism has been the fastest-growing branch of the economy and the estimated increase in tourism traffic has been approx. 40%. The city has invested in the so-called Enterprise Zones at Lake Ukiel and has already sold most of the land designated for tourism and recreational activities. Not only have tourism investments commenced on municipal land but also in private

areas. (Report on the condition of the city of Olsztyn, 2019). These investments offer even wider possibilities for making use of the recreational potential of Olsztyn's lakes, create jobs and improve the quality of life while leading to the inevitable degradation of natural resources. This is reflected in the conclusions arising from the public consultations "Olsztyn's lakes and rivers in the context of updating the study on determinants and directions of the spatial development of the city of Olsztyn". The conclusions emphasise that since the lakes are a common space, they need to be preserved in the most natural condition: the greatest possible naturalness of the green areas at the lakes should be maintained/preserved and the tourism and recreational functions should not be changed into functions related to housing developments. The condition of lakes is strictly determined by the processes occurring in their immediate vicinity, including progressive organisation (including the tourism development) and the transformation of the drainage area, which contribute to the intensification of degradation processes (Szymański et al., 2014). Therefore, the reasonable use of both lakes and their surroundings is essential due to their functional and landscape functions. Particular attention should be paid to the protection of lakes against the loss of biodiversity, which is highly endangered while being used by tourists. The eutrophication of lakes, however, is an inevitable phenomenon in lakes with highly developed infrastructural facilities. Daily tourist activity results in the inevitable progress of the eutrophication process which needs to be constantly monitored, and whose range needs to be limited. The initial period of the COVID-19 pandemic contributed to a reduction in the supply of nutrients, which reduces and temporarily halts the processes of eutrophication and degradation of lake biodiversity. Although environmental benefits have been noted in the area, there are enormous losses in the social and economic spheres.

The area of Olsztyn, particularly the areas developed for tourism purposes, requires both the continuous monitoring of all changes and the implementation of new investment projects. The excessive extension of infrastructure which encourages increased tourism traffic results in adverse environmental and social processes. One of the tools sanctioned by Polish law is an environmental impact assessment for projects of this type. However, after the completion of the project implementation, the process of monitoring environmental quality is a prerequisite for maintaining its high quality.

REFERENCES

1. Act of 20 July 2017 – Water Law (Journal of Laws of 2020, item 310).
2. Assessment of the water quality of lakes studied in 2014. Notice No 40. Provincial Inspectorate for Environmental Protection (WIOŚ) in Olsztyn.
3. Badanie opinii mieszkańców Olsztyna ich problemów i wizji miasta. Olsztyn 2016.
4. Bielinis, L., Bielinis, E., Zawadzka, A., Omeland, A., Makowska, M. (2015). Walory turystyczne, rekreacyjne, przyrodnicze Olsztyna i okolic według opinii mieszkańców [In English: The touristic, recreational and natural assets of Olsztyn city and its neighbouring area in the opinion of the residents]. *Ekonomia i Środowisko*, 4 (55), 235-242.
5. Demir, A. (2014). Recreational use value of Tuz Lake in Turkey. *Journal of Food, Agriculture and Environment*, 12(2), 1092-1096.
6. Development Strategy for the City of Olsztyn, 2020. Resolution of the Olsztyn City Council No XLV/752/13 of 30 October 2013.

7. Dunalska J., Ciecierska H., Napiórkowska-Krzebietke A., Ruszczyńska J., Sieńska J., Szymański D., 2017. *Jeziora Olsztyna – najpiękniejszy dar natury. Stan troficzny i ekologiczny (Olsztyn's Lakes – the Most Beautiful Gift of Nature. Trophic and ecological status)*. Wyd. Mantis, Olsztyn.
8. Dynowski, P., Senetra, A., Żróbek-Sokolnik A., Kozłowski J. (2019). The Impact of Recreational Activities on Aquatic Vegetation in Alpine Lakes. *Water*, 11, 173.
9. Environmental Protection Programme for the City of Olsztyn up to 2020. 2016, Olsztyn.
10. Environmental Protection Programme for the Olsztyn Poviát up to 2020. Resolution No VII/107/2019 of the Poviát Council in Olsztyn of 27 September 2019.
11. Fachrudin, H.T., Lubis, M.D. (2016). Planning for Riverside Area as Water Tourism Destination to Improve Quality of Life Local Residents, Case Study: Batuan – Sikaming River, Medan, Indonesia. AMER International Conference on Quality of Life, AicQoL2016Medan 25 – 27 February 2016, Medan, Indonesia.
12. Furgała-Selezniow, G., Skrzypczak, A., Kajko, A., Wiszniewska, K., Mamcarz, A. (2012). Touristic and recreational use of the shore zone of the Ukiel Lake (Olsztyn, Poland). *Polish Journal of Natural Sciences*, 27(1), 41-51.
13. Gadomska, W. (2006). Walory krajobrazowe olsztyńskich jezior i ich zagospodarowanie [In English: The landscape values and site planning of the lakes on Olsztyn]. *Inżynieria Ekologiczna*, 15, 27-33.
14. Hadwen, W.L., Boon, P.I., Artington, A.H. (2012). Aquatic ecosystems in inland Australia: Tourism and recreational significance, ecological impacts and imperatives for management. *Marine and Freshwater Research*, 63(4), 325-340.
15. Hall, M., Härkönen, T. (2006). Lake Tourism: An Integrated Approach to Lacustrine Tourism Systems. In: *Lake Tourism: An Integrated Approach to Lacustrine Tourism Systems*, M., Hall, T., Härkönen (Eds.). Channel View Publications.
16. Information on the condition of property of the city of Olsztyn. Olsztyn, 2018.
17. Kurleto, M. (2013). Sustainable management of lakes taking into consideration the tourism and nature conservation in Australia nad New Zeland. *Polish Journal of Natural Sciences*, 28(1), 91-106.
18. Mukayev, Z.T., O zgeldinova, Z.O. Janaleyeva, K.M., Ramazanova, N.Ye., Zhanguzhina, A.A. (2020). Assessment of the tourist recreation capacity of Lake Alakol basin. *Geojournal of Tourism and Geosites*, 30(2), 875-879.
19. Olsson, A.K. (2016). Canals, rivers and lakes as experiencescapes-destination development based on strategic use of inland water. *International Journal of Entrepreneurship and Small Busines*, 29(2).
20. Parszuto, K., Tandyrak, R., Grochowska, J. & Sienska, J. (2018). Rekułtywacja trzech jezior w Olsztynie w kontekście rozwoju przestrzeni rekreacyjnej miasta [In English: Restoration of the three lakes in Olsztyn, in the context of the development of recreational area city]. *Prace i Studia Geograficzne*, 63(4), 129-144.
21. Report of the Consultations “Olsztyn’s lakes and rivers in the city in the context of updating the Study on determinants and directions of the spatial development of the city of Olsztyn. 2018, Olsztyn.
22. Report on the condition of the city of Olsztyn, 2019.
23. Resolution No XIX/255/16 of the Olsztyn City Council of 27 January 2016 on the adoption of the Local Area Development Plan for Lake Długie in Olsztyn.

24. Resolution No XXII/372/12 of the Olsztyn City Council of 25 April 2012 on the adoption of the Local Area Development Plan for Lake Ukiel in Olsztyn.
25. Resolution of the City Council of 29 April 2020 No XX/348/20 on the List of Bathing Areas in the Municipality of Olsztyn (Official Gazette of Warmińsko-Mazurskie Voivodeship of 2020, item 2115 of 11 May 2020).
26. Sánchez-Rivero, M., Rodríguez-Rangel, M.C., Fernández-Torres, Y. (2020). The Identification of Factors Determining the Probability of Practicing Inland Water Tourism through Logistic Regression Models: The Case of Extremadura, Spain. *Water* 12, 1664.
27. Senetra, A., Dynowski, P., Cieślak, I., Żróbek-Sokolnik, A. (2020). An Evaluation of the Impact Tourism on the Ecological Status of Alpine Lakes – A Case Study of the Valley of Dolina Pięciu Stawów Polskich in the Tatra Mountains. *Sustainability* 12(7), 2963.
28. Szczepańska A., Wasilewicz-Pszczółkowska M. 2018. Green infrastructure as a determinant of quality of urban life and a barrier to the development of a city: a case study. *Geographia Polonica*, 91(4), 1-19, <https://doi.org/GPol.0131>.
29. Szymański D., Dunalska J., Brzozowska R., Sieńska J., Zieliński R. 2014., Ocena stanu troficznego jezior miejskich Olsztyna na podstawie indeksu Carlsona, [In English: assessment of the trophic status of urban lakes located in Olsztyn on the basis of the Carlson's index]. In: *Interdyscyplinarne zagadnienia w inżynierii i ochronie środowiska*. Traczewska T.M., Kaźmierczak B. [Eds.]. Wyd. Politechniki Wrocławskiej, pp. 872-881.
30. The Study on determinants and directions of the spatial development of Olsztyn. Resolution of the City Council No XXXVII/660/13 on an amendment to the study on determinants and directions of the spatial development of the City of Olsztyn of 15 May 2013.

BIOGRAPHICAL NOTES

Agnieszka Szczepańska is a Research Fellow at the University of Warmia and Mazury in Olsztyn, Poland. She obtained her Ph.D. from the technical science. She has been awarded the Professor title in the Architecture and Urban Planning Science at Gdańsk University of Technology. She has worked as a real estate appraiser. She is a member of Polish Geographical Society and Cultural Landscape Commission PGS. Her interests are in urban planning, urban development and suburbanization process, public spaces, real estate market analysis, property and land valuation, decision-making process.

Adam Senetra is a research fellow at the University of Warmia and Mazury in Olsztyn, Poland. He obtained his Ph.D. in Technical Science. He has been awarded the Professor title in the Earth Sciences at Nicolaus Copernicus University in Toruń, Poland. He is an author of numerous scientific publications in the field of geography, regional studies, land management, urban studies and real estate market. He is a member of Polish Geographical Society and Cultural Landscape Commission PGS. He is also a section editor in the field of geography in *Acta Scientiarum Polonorum Administratio Lokorum* magazine editorial staff.

Mirosław Belej is a research fellow at the University of Warmia and Mazury in Olsztyn, Poland. He has been awarded the Professor title in Technical Science at Warmia and Mazury in Olsztyn, Poland. He is an author of numerous scientific publications in the field of real estate spatial analysis, land management, and nonlinear dynamics modelling. He is the member of a main board of Polish Real Estate Scientific Society. He is also a section editor in the field of land management in Real Estate Management and Valuation journal.

CONTACTS

Agnieszka Szczepańska

Department of Socio-Economic Geography, Institute of Spatial Management and Geography,
Faculty of Geoengineering, University of Warmia and Mazury in Olsztyn
Prawocheńskiego 15, 10-724 Olsztyn,
POLAND

Tel. +48 89 523 43 99

Email: aszczep@uwm.edu.pl

ORCID ID 0000-0001-5184-0710

Adam Senetra

Department of Socio-Economic Geography, Institute of Spatial Management and Geography,
Faculty of Geoengineering, University of Warmia and Mazury in Olsztyn
Prawocheńskiego 15, 10-724 Olsztyn
Poland

Tel. + 48 89 523 4948

Email: adam.senetra@uwm.edu.pl

ORCID ID 0000-0001-5379-9600

Mirosław Belej

Department of Spatial Analysis and Real Estate Market, Institute of Spatial Management and
Geography, Faculty of Geoengineering, University of Warmia and Mazury in Olsztyn
Prawocheńskiego 15, 10-724 Olsztyn
POLAND

Tel. + 48 89 523 38 01

Email: caprio@uwm.edu.pl

ORCID ID 0000-0001-8650-6990