

**USE OF RIVER RESERVOIRS FOR TOURISM
AND RECREATION
CASE STUDY: SOLIŃSKIE LAKE IN POLAND**

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A b s t r a c t

The creation of an artificial reservoir usually enhances the tourist attractiveness of the region. Thanks to that, very often tourism around the reservoir develops. The paper deals with the use of artificial reservoirs for tourism and recreation purposes. In the first part, the history of dam construction world-wide and in Poland is briefly discussed, as well as the importance of reservoirs. In the second part, the phenomenon of tourism in the vicinity of one of the most popular reservoirs in Poland, Solinskie Lake, is characterized. Results of studies conducted by the author are also presented.

**TURYSTYCZNO-REKREACYJNE WYKORZYSTANIE JEZIOR ZAPOROWYCH
NA PRZYKŁADZIE JEZIORA SOLIŃSKIEGO W POLSCE**

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Słowa kluczowe: turystyka, rekreacja, zbiorniki zaporowe, Jezioro Solińskie.

A b s t r a k t

Powstanie sztucznego zbiornika wodnego najczęściej zwiększa atrakcyjność turystyczną obszaru. Dzięki temu bardzo często następuje rozwój turystyki wokół takiego obiektu. Artykuł dotyczy turystyczno-rekreacyjnego wykorzystywania sztucznych zbiorników wodnych. W pierwszej części krótko omówiono historię budowy zapór wodnych na świecie i w Polsce oraz znaczenie zbiorników. W części drugiej artykułu scharakteryzowano turystykę nad jednym z najpopularniejszych zbiorników wodnych w Polsce – Jezioro Solińskim. Przedstawiono wyniki badań własnych.

Introduction

River reservoirs are most often anthropogenic creations which can generally be defined as “water basins of varying size created by constructing a barrier across the river bed or valley, as a result of which its waters become impounded and – which is not necessarily the rule – flow beyond the limits of the naturally formed riverbed” (WIŚNIEWSKI 1998, 79). The majority of reservoirs has been created as a result of constructing an impounding structure across the river valley – a dam. The history of dams in the world goes back to antiquity, when several dam reservoirs were created in Egypt, Syria, Mesopotamia, Rome, Persia, Babylon, Greece and Anatolia (GŁODEK 1985). The oldest dam reservoir in the world was created in 2900 b.c.e. on the Nile; it had 15 m height and ca. 450 m length.

In the Middle Ages in Europe, civilizational regress could be observed also in the case of hydrotechnical engineering. By contrast, it was developing outside Europe, in Japan, India, and Ceylon (Sri Lanka). In China, many water engineering structures were built, too, although the building of dams impounding the water was rather rare. Structures in India and Ceylon had modest height, but significant length. An example is the Padawiya dam in Ceylon with its height of 21 m and its length of 18 km (GŁODEK 1985). Spain was the leading country in the building of dams in the Middle Ages and in modern times. The Spaniards transferred their experiences to their colonies in America (mostly to Mexico). In the 18th and 19th centuries, hydrotechnical engineering flourished in Europe. Even well-developed water routes were being engineered, and technical solutions – carried over to other world regions – were being perfected. The 20th century is the next stage in the development of water engineering, also because of technological progress. The number of dams, together with their size, grew fast.

The goals of dam building and creating reservoirs varied as the time passed. In the beginning, the main goals were irrigation and water supply. The next functions of the dam reservoirs were navigation, flood protection, and then, together with the development of alternative energy sources, energy supply. Because of high investment costs – both economic and environmental – modern reservoirs fulfill several functions. Single-purpose reservoirs are rare. Despite the complexity of the reservoirs, however, most often one function dominates, while the remaining ones are subordinate to it. This is a result of the conflict between some functions: for example, reservoirs used for residential water supply should be very clean, and for that reason their recreational function is excluded.

As a short overview of the development of dam reservoir functions shows, the recreational function of the objects under discussion is relatively “young”.

Nowadays, the use of artificial reservoirs for tourism and recreation is common (cf. NEMETH and DAVID 2007); it is often regarded as an alternative for the overloaded and overcrowded seashore regions. As de REPARAZ (1991) remarked, in France, this caused a movement of tourists towards “artificial interior shores”. One should also mention that the very creation of a dam reservoir raises the tourist attractiveness of the region and can contribute to the increase of tourist traffic and to the development of tourism in the region (cf. Duda-Gromada et al. 2010). This is caused, above all, by the landscape values created this way, especially in the mountains, where the combination of a lake and mountains is often regarded as very attractive, even unique. Moreover, opportunities occur for the development of tourism forms related to the direct contact with water.

In Poland, small dams were being built in the 19th century, and some of them even earlier. But all the large dams (above 15 m in height) were built in the 20th century. As CHOIŃSKI (2007) notes, in Poland conditions for building large reservoirs are not favorable, which is due above all to low water flow in the rivers, large variations of runoff, as well as disadvantageous natural conditions. There are slightly over 100 larger dam reservoirs, with maximum capacity over 1 million m³, in Poland (WIŚNIEWSKI 1998). Their total volume is ca. 3.5 km³, which constitutes 18% of water resources of lakes in Poland, while their total surface area is ca. 500 km², that is, almost 18% of the area of Polish lakes (CHOIŃSKI 2007). The spatial distribution of dam reservoirs in Poland, in particular of the large ones, is non-uniform, which seems obvious. One can observe, however, a distinct concentration of reservoirs in the mountains and foothills, and in the Pomeranian Lake District and the Małopolska Upland.

A decided majority of contemporary dam reservoirs in Poland are multi-function lakes. Many are used also for tourism purposes. Their importance for tourism, however, was most often not taken into account during the planning and construction phases. Therefore, in the case of artificial reservoirs in Poland, their tourism function is most often secondary.

Materials and Methods

In the present paper, both secondary and primary sources have been used. The former have been used as a basis for the discussion of general issues related to dam reservoirs, their history and use for tourism and recreation; as well as for a characterization of Solińskie Lake. The latter, on the other hand, allowed to present basic tourism- and recreation-related issues at the reservoir in question. They were supplied by a survey conducted among tourists in the most frequently visited place at Solińskie Lake: the crown of the dam in Solina,

in July of 2006. Two hundred five questionnaires of the survey have been filled out. In parallel with the survey, a field study was also conducted. Its main part consisted of an inventory of the tourist base, conducted in 2007 and 2008. Facilities in three groups have been counted and localized: accommodation, food services, and auxiliary facilities. Hence, the inventory was conducted from the quantitative and spatial points of view, with facilities being marked on a map. The study was a part of a field study conducted for the doctoral dissertation (DUDA-GROMADA 2009a).

Results – case study: Solińskie Lake in Poland

The area under discussion is situated in south-eastern Poland, in the Małopolskie voivodship. Due to the construction of a dam on the San river in the town of Solina, an artificial reservoir – Solińskie Lake – was created, with its characteristic forked shape. One branch, of 26 km length, fills the San river valley, while the other one, of 11.7 km length, the Solinka river valley. In April 1967 the last segment was completed, which caused the closing of the flow and filling of the reservoir. The water layer as measured by the dam grew slowly, reaching 48.8 m above the San river level at the end of May 1968. The dam and reservoir were put into use on 20 July 1968.

The main functions of the reservoir in Solina are:

- hydropower industry – electrical energy production thanks to water retention;
- discharge equalization – raising of minimum discharge;
- flood protection – flood wave reduction;
- water supply;
- recreation – creating conditions for tourism and recreation.

The dam at Solina is the highest dam in Poland, the longest concrete dam, and has the largest total capacity of its concrete bulk. The reservoir created is also the largest in Poland. The original capacity of the lake was 474 million m³, but as a result of silting by the material brought by the inflow and that originating from the shore abrasion, it decreased to 470 million m³ (CHUDY 2004). Basic technical parameters of the dam and the reservoir are presented in Table 1.

As mentioned above, the lake has also a recreational function, thus it is used for tourism purposes. SROCZYŃSKI (2006) conducted studies of the attractiveness of the coastal zone of Solińskie Lake. The studies were conducted for the tourism-recreational use, by means of the physionomical method. Taking into account the practical values first, the author divided the shores into:

- not very friendly – narrow and steep;
- friendly – wider, with gentler profile and well-developed beaches.

Table 1

Technical parameters of the dam and reservoir in Solina

Parameter	Value
dam	
Height	81,8 m
Length	646
Volume of concrete bulk	768 thousand m ³
Discharge capacity of spillways at 420 m a.s.l.	1278 m ³ s ⁻¹
Discharge capacity of spillways at maximum impoundment	1863 m ³ s ⁻¹
reservoir	
Capacity	ca. 470 million m ³
Useful capacity	ca. 300 million m ³
Surface area	ca. 21 km ²
Length (along the former San riverbed)	ca. 25 km
Maximum ordinate of impoundment	420 m a.s.l.
Average depth	ca. 20 m

Source: own study based on CHUDY (2004).

Shores which are most useful for various forms of tourism as well as water and near-water recreation, take up around 15.5% of the shoreline length. Average-friendly shores, accessible with some difficulties when the water level is average and low take up as much as 66% of the shoreline length. Hard to access, but scenic shores – cliff and rocky shores – take up around 5.5% of the shoreline length.

The characteristic features of Solińskie Lake and the technical parameters of the reservoir and dam made the place into a tourist attraction. Thanks to the diversity of its shores, despite of their mostly difficult access, the area doesn't lose its attractiveness, because it preserves its virginal element. Thanks to this, expectations and needs of various tourist groups can be fulfilled: both of those who expect to find a managed place with high-level tourist services, and of those for whom relaxing by the water, far from bustling civilization is of essence.

As the survey conducted among tourists at Solińskie Lake shows, the main reasons for the choice of destination were natural values (Figure 1): proximity of mountains (63.9% of answers), microclimate (45%), variety of flora and fauna (23.8%). Hence, contact with nature is an important reason for a tourist-recreational trip for the respondents arriving to Solińskie Lake (cf. David et al. 2012). Next to natural values, opinions of other people were an important motivation (as much as 33.7% answers). This may indicate, for example, the popularity of spending free time by a lake, or else, a certain kind of fashion or

fad for trips to Solińskie Lake and for a visit to the tallest water dam in Poland (cf. DUDA-GROMADA 2009b). Worth mentioning is also the category “others”: the respondents listed mostly natural environmental values, among which the combination of water and mountains (5 answers) and the proximity to the Bieszczady Mountains (3 answers) dominated. The combination of these two important natural assets – water and mountains – is regarded as an important tourist value also in the opinion of the representatives of local authorities (cf. DUDA-GROMADA, DUDEK-MAŃKOWSKA 2008).

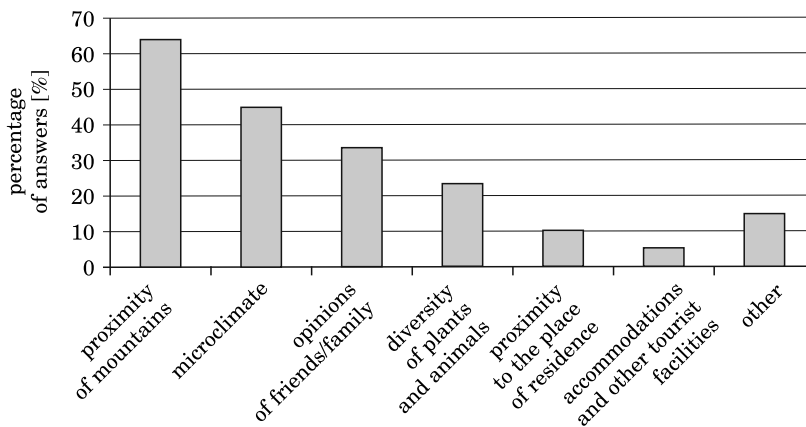


Fig. 1. Tourists' motivation for a trip to Solińskie Lake

The artificial reservoir was also an important motivation for the trip. As the survey shows, for over a half of respondents (52.7%), Solińskie Lake was the main reason for coming here. Hence, an artificial reservoir is an important hydrographical object not only from the point of view of water management, but also from that of tourism. A vast majority of tourists is also of the opinion that Solińskie Lake contributes to the increase of the area's tourist attractiveness.

The time spent during one day near the reservoir is an evidence for the tourists' substantial use of the presence of the lake. As much as 62% of respondents spent at least a few hours by the lake, and around 10% of them declared that they spent almost entire days on tourist-recreational activities near the reservoir. Less than 30% of respondents devoted no more than one hour during a day to water-related recreation.

Tourists were also asked about their way of spending time in the vicinity of Solińskie Lake (Figure 2). Most often, the respondents admired the landscape

(68.6% of answers) and went for walks (54.6%). A large part indicated such forms of tourism and recreation as: sunbathing (38%), bathing (32.2%), or using water recreation equipment (26.8%). Around 16% of answers dealt with visiting water engineering constructions. This is particularly important in the case of the dam in Solina, since – as it was already mentioned – this is the tallest dam in Poland. Studies show that tourists are indeed interested in it. Moreover, since 2006, there has been an opportunity to visit the hydropower plant in Solina and the interior of the dam. Thus, the gamut of tourism and recreational activities has been enriched by elements of industrial (cultural) tourism.

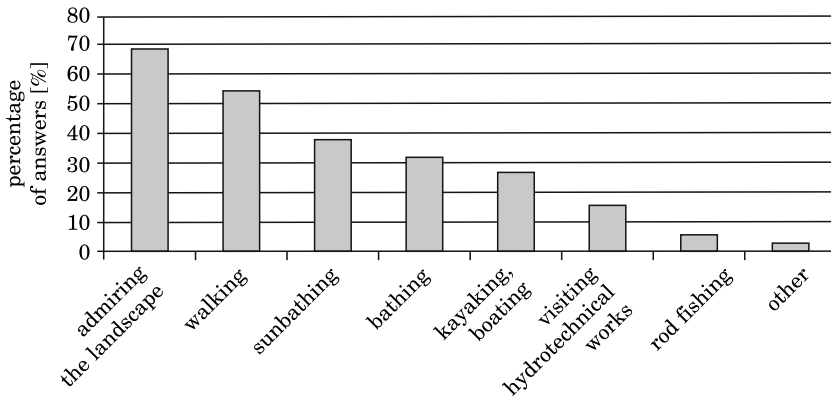


Fig. 2. Tourism and recreational activities by Solińskie Lake

The tourism infrastructure is an important factor attracting tourists. Not only tourism values are a condition for large tourist traffic, but also facilities and services present on the given area, which aim at fulfilling the needs of the recreationers. Among various types of tourism development, accommodation facilities are of particular importance. A characteristic, and very important from the point of view of the potential tourist, feature of the accommodation in the area under discussion is its variety. Accommodation facilities range from hotels with high standards to smaller pensions and campsites. Of particular importance is the large number of agricultural farms and private rooms offered by the locals. This wide range of accommodation caters to various social groups. During the field study, 271 accommodation facilities have been inventoried (Table 2) as well as 32 food facilities with public access (bars, restaurants).

Table 2

Number of accommodation facilities inventoried near Solińskie Lake in 2007

Hotel, pension, inn	12
Sanitarium	6
Recreational center	12
Private accommodation, agritourism farms	227
Campsite	14
Total	271

Auxiliary facilities make it possible for the tourists to take advantage of the values. In the case of near-lake tourism, very important are tourist facilities related to various forms of water tourism. In various parts of the lake, 14 harbors have been inventoried; almost every vacation center has its own harbor and equipment rental at its disposal. Moreover, ships and boats of the Bieszczady fleet navigate regularly Solińskie Lake; they depart from Solina and Polańczyk. But tourism in the wide sense of this word is not limited to the water basin; also other tourist amenities, conducive to other forms of tourism, are important. On the area around Solińskie Lake there are around 15 hiking trails. Also several bicycle trails, of varying length have been marked out, which is important from the point of view of less advanced cyclists. Moreover, there are also equestrian recreation centers. Souvenir kiosks and stands are another important and visible element of tourist development; they are mostly in close proximity of the dam and in Polańczyk. Altogether, 45 such objects have been inventoried.

The distribution of the above-mentioned tourism development facilities around Solińskie Lake is very non-uniform. Field observation suggests that there is a distinct concentration of the facilities close to the reservoir. For this reason, equidistant lines at 500 and 1000 meters from the Solińskie Lake shoreline have been drawn; next, objects located in the given zone have been enumerated. Table 3 presents the number of individual accommodation facilities, depending on the distance from the shoreline. There are 95 facilities within 500 m from the Solińskie Lake shoreline, which constitutes 35%. In the next zone, that is, at the distance between 500 and 1000 m from the shoreline, there are 62 facilities, or 23%. Farthest from the shoreline, beyond 1000 m, 114 facilities have been inventoried, or 43%. One can therefore state that accommodation facilities are concentrated as close to Solińskie Lake as possible.

The food facilities inventoried (bars and restaurant) and auxiliary facilities (souvenir shops and kiosks) is concentrated to an even larger degree in close proximity to the lake. Almost 85% of food facilities and 65% of souvenir shops and stands are located within 500 m from the lake. They cater to tourists and

Table 3
Number of accommodation facilities depending on the distance from the Solińskie Lake shoreline

Distance from the Solińskie Lake coastline	Hotel, pension, inn	Sanitarium	Recreational center	Private accommodation, agritourism farms	Campsite	Total
< 500 m	6	6	11	59	13	95
500–1000 m	4	0	0	58	0	62
> 1000 m	2	0	1	110	1	114
Total	12	6	12	227	14	271

very often are open when tourist traffic is at its most intensive, that is, in July and August, but also on holidays and long weekends (in particular on the May weekend).

Conclusions

Solińskie Lake is an example of an artificial reservoir localized relatively far from larger urban agglomerations. The studies conducted show specific features of tourism around the reservoir under discussion. They are presented briefly in Table 4.

Table 4
Characteristic features of tourism at the lakes under study

Feature	Solińskie Lake
Tourist traffic	most often trips of several days or longer, half of the respondents visited this area for the first time
Tourist motivation	above all, natural environmental values
Main tourism functions	sightseeing, recreation
Tourism infrastructure	well-developed, diversified, large share of agricultural farms

A characteristic feature of tourist development around Solińskie Lake is a diversity of facilities, and therefore of services. On the other hand, an analysis of the development map allowed for a few conclusions. The distribution of facilities comprising the tourism infrastructure is non-uniform. One can distinguish areas which are intensively developed (Polańczyk, Solina, Wolkowja), and such which are not developed, for various reasons. The calcula-

tions performed indicate a relationship between the intensity of development and the distance from the shoreline. The farther from Solińskie Lake, the fewer tourism-related facilities there are. Therefore, even though studies dealing with the distribution of tourist traffic in the entire gmina are lacking, one can state that the largest number of tourists are in close proximity of the lake. This is an evidence, in author's opinion, of the significant importance of the Solina reservoir for tourism in the region in question.

Using reservoirs for tourism and recreation purposes is common both in Poland and in the entire world. The phenomenon of tourism by Solinskie Lake in Poland, described in the paper, is only one of many examples. The studies conducted show clearly the importance of the reservoir for the development of tourism in the area under study. That's why it is worthwhile to undertake further analyses dealing with tourism in the vicinity of artificial lakes.

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