

Disappearance of Lake Jelenino Since the End of the XVIII Century as an Effect of Anthropogenic Transformations of the Natural Environment

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Abstract

This study presents the contribution of reclamation works to the disappearance of Lake Jelenino. On the basis of cartographic materials from the 19th and 20th centuries, as well as historical records, it was possible to establish that the lake of area 495.2 ha disappeared as a result of precise actions aimed at creating new settlements. Reclamation works proceeded in two stages. After the first stage, which took place in 1778-86, the area of Lake Jelenino was reduced by over 360 ha. In the 1970s the reservoir, whose area then amounted to 130 ha, was completely dried. Such a transformation of the natural environment was followed by social and economic changes – inhabitants of Jelenino village, who until then lived by fishing, in a short period of time retrained for agriculture and breeding.

Keywords: transformation of environment, anthropopression, reclamation, lake disappearance

Introduction

Changes occurring in the natural environment are most often the effects of two types of impact: natural (being the result of natural evolution of the environmental components) and anthropogenic (exerted intentionally or unexpectedly by humans). The hydrosphere is particularly sensitive to transformations because aquatic environments quickly respond to any interference. This concerns both water quality [1-5] and the fluctuations of water level [6]. Anthropogenic influence on hydrographic conditions dates back to the 20th century, when the growth of human population and the development of agrarian culture caused an

interest in wetlands, until then considered useless. Large areas in Poland were drained, which caused irreversible transformations of the hydrographic net, such as the changes in river courses, drying up of swamps, shrinking of lakes, or their total disappearance. Reclamation works were particularly intensive in the river basins of the Noteć and Obra rivers (in western Poland). They were performed by specifically raised aquatic companies, which often wrongly assessed the influence of reclamation on hydrographic conditions. Kaniecki [7, 8] reported on a few lakes in which the observed water levels turned out to be considerably lower than the predicted values. Therefore, one can conclude that those were the side-effects of reclamation, i.e. differed from the assumptions. Reclamation works aimed at the drainage of lakes have been conducted with various levels of inten-

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sity up to now and their consequences are described in numerous papers [9-16]. Particularly interesting from an environmental point of view are the cases in which the applied hydro-technical works aimed at the total disappearance of a lake or a river. Such a situation concerned also Jelenino Lake, which dried up as the result of specific decrees.

Characteristics of the Study Area

The studied reservoir was located in northwestern Poland, near the town of Szczecinek, in the Drawskie Lake District (Fig. 1).

Owing to the climate features, it belongs to the Central Polish Region, which also covers part of the Pomeranian Lake District. A higher number of days with moderately warm weather and considerable clouds as well as cool and rainy conditions are observed there compared to other regions [17]. Average annual precipitation for the years 1961-2000 recorded at the Silnowo station amounted to 667 mm, which exceeded the average annual precipitation for Poland by over 10% [18].

That area was formed in the latest glaciation and it is an extension to the south of the moraine of the Pomeranian phase. Three terminal moraines can be distinguished there, separated by concave forms of terrain after dead-ice which formed numerous lakes [19]. At the time when the Jelenino lake basin was filled with water, it was surrounded from the north and northeast by low-permeable beds (clay, dust deposits) while from the south by moderately permeable sands. Nowadays, the lake depression is covered by peat, and lake sediments – gyttja and marl.

The investigated region is located in the Gwda River catchment, which is part of upper Noteć River basin. Water flows through a channel to Pile Lake and then as the Piława River to Gwda. Hydrological characteristics based on the data of water flow rates and water levels of Piława indicate that those dynamic discharges are some of the most stable in Poland. Their regimes are even, predomi-

nated by ground and snow water supply with annual water yield $6-8 \text{ dm}^3 \cdot \text{s}^{-1} \cdot \text{km}^{-2}$. The total denudation in the area analyzed is particularly low and amounts to $1.7 \text{ t} \cdot \text{km}^{-1}$ [18], typical for lakeland regions.

The village of Jelenino, which was located at the lake, was a fishing settlement referenced already in 1278 [20]. At present, the population of the village numbers around 350 inhabitants.

Materials and Methods

The transformations of Lake Jelenino were investigated using the cartographic method. According to Saliszczew [21], this approach is based on maps that serve as the model of the studied phenomenon. A map is then a tool of investigation and reflects actual processes that cannot be directly analyzed. Five maps from different time sections were used in this study: Karte des Konigl, Preuss, Herzogthums Vor – und Hunter – Pommern at a scale of 1:180,000 from 1789; three maps at a scale of 1:25,000 (Urmesstischblätter, Messtischblätter) from 1839, 1877, and 1915; and the map at a scale 1:50,000 from 2000. The outline of lake disappearance was described on the basis of historical records from various sources.

Results and Discussion

The reclamation treatments of Lake Jelenino started in the XVIII century. After the ordinance of Frederick William II, the King of Prussia, the reservoir was considerably drained in 1778-86. As a result, two new small settlements were raised: Auenfelde (at present Przyjezierze) and Wilmshorst (at present Jelonek). Meadows and fields accessible after reclamation amounted to almost 500 ha and were passed on to new settlers while houses and farm buildings were financed by the King of Prussia [20]. The area covered by Lake Jelenino after the first stage of reclamation is presented in Fig. 2.

The topographic map Messtischblätter on the scale of 1:25,000 (from the second half of the 19th century) was used to assess the original area of Jelenino Lake (Fig. 3). The assumption was made that the coastline before reclamation works corresponded to the range of peat bogs and swampy grasslands visible at the Messtischblätter map.

It has been established that the area of Lake Jelenino in the 18th century amounted to 495.2 ha. It was a considerably large natural reservoir. According to Choiński [22], recently only 76 lakes in Poland exceed the area of 500 ha, and 26 of them (including 9 coastal lakes) are located in the Pomeranian Lake District. Therefore, if Jelenino Lake still existed, it would be one of the largest lakes in Poland. Hydrotechnical works performed over the years 1778-86 caused the water level to decrease by around 2 m. Taking into consideration the current location above sea level (around 139 m a.s.l.), the maximum depth of Jelenino would amount to 5 m. The decrease in water level resulted in the reduction of lake area by over 70% – down to 130.5 ha.

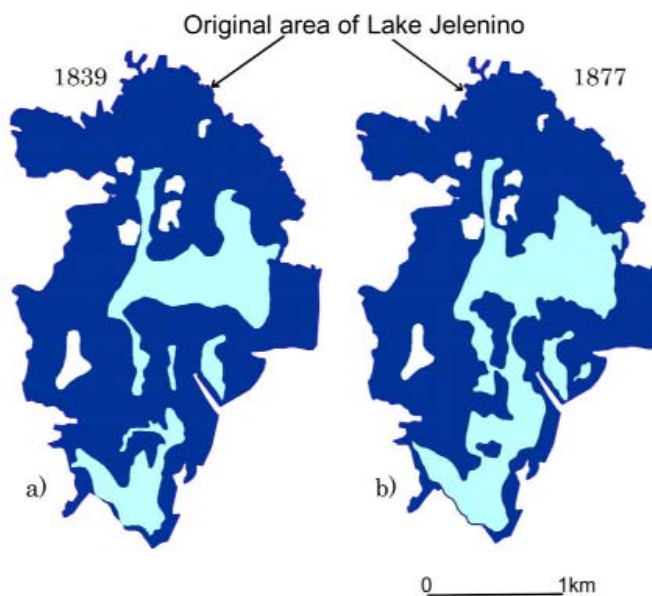


Fig. 1. Location of the study area.



Fig. 2. Fragment of the map Karte des Konigl. Preuss. Herzogthums Vor – und Hunter – Pommern (1789) with partly dried up Lake Jelenino.

At that time the lake was drained by a few reclamation ditches located in the northern and western parts of the lake – water flew to the remaining fragment of the lake and further toward the south to Jeleń Lake.



The last stage of reclamation works took place in the 19th century. In 1870 the lake dried up, which is presented in the updated Messtischblatter topographic map from the 1930s (Fig. 4).

The net density of reclamation ditches increased and the drained area was adapted for agricultural use by former fishermen who retrained for horse trade. Grasslands exist up to now thanks to the reclamation system, which still works (Figs. 5 and 6).

Conclusions

Anthropogenic impact on the natural environment affects many aspects of its functioning. Depending on their needs, humans either create new elements of the landscape or remove existing ones. A great example of the destructive activity is reclamation. Draining of wetlands, common since the 19th century, covered considerable areas of river basins. Newly formed polders were adapted mainly to agricultural use. More intensive outflow of water from drainage areas caused the fluctuations of water level in lakes and many small reservoirs disappeared. However, the case of Lake Jelenino was very specific. Although it was a large reservoir with an area of almost 500 ha, it dried up as the result of strict orders of reclamation works. That case indicates how humans can radically affect the landscape and natural processes. Taking into consideration the average period of existence of lakes in Poland established by Choiński [23], in most cases it varies from a few hundreds to 2,000 years. Shallowing processes can shorten that range [24-26]. The disappearance of lakes (particularly of large areas) within the period shorter than 100 years should be considered as an extreme situation. Jelenino Lake, which dried up in two stages, was such a case.

The above time ranges indicate that the existence of natural aquatic reservoirs is relatively short from a geological



Fig. 3. Area covered by Jelenino Lake: a) based on the Urmesstischblatter map, b) based on the Messtischblatter map, with the original lake area established from the Messtischblatter map.

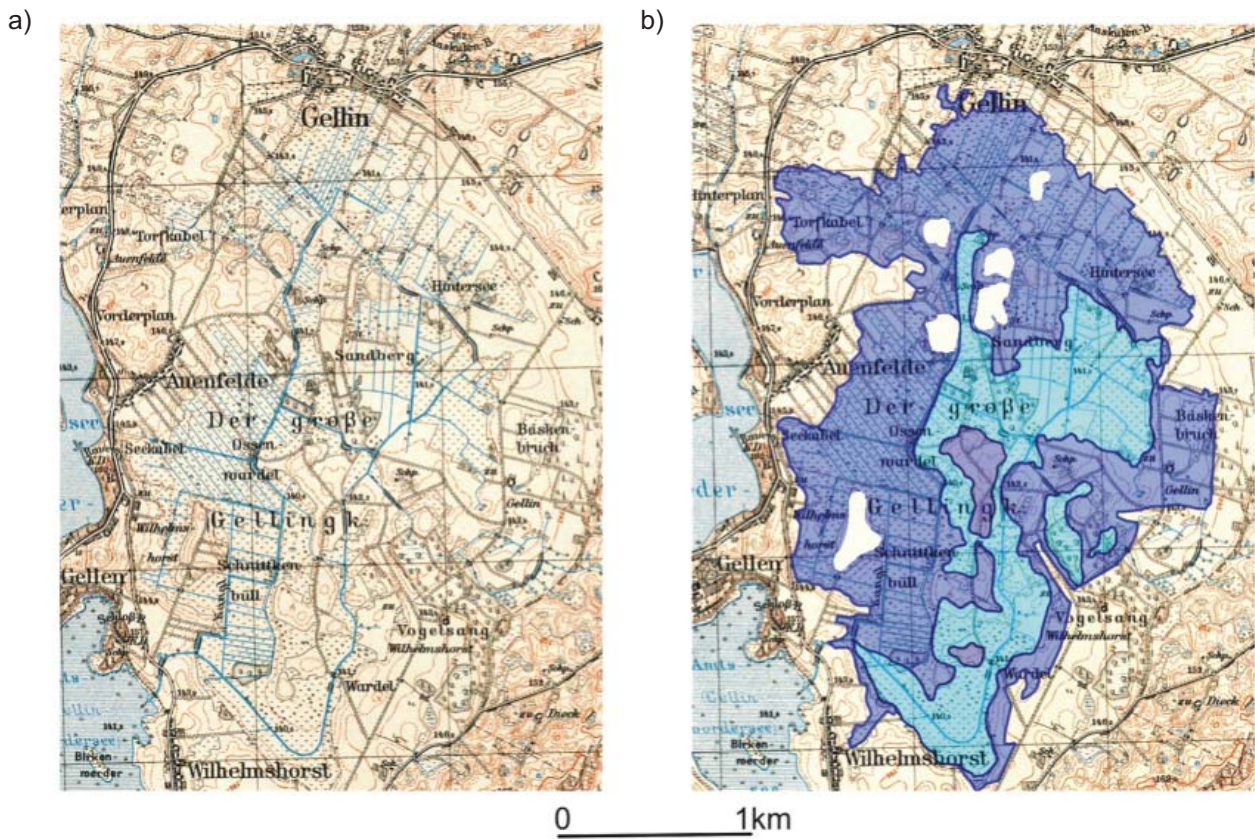


Fig. 4. a) Dried-up Lake Jelenino (1937), b) range of coastline before the first and second stages of reclamation works.

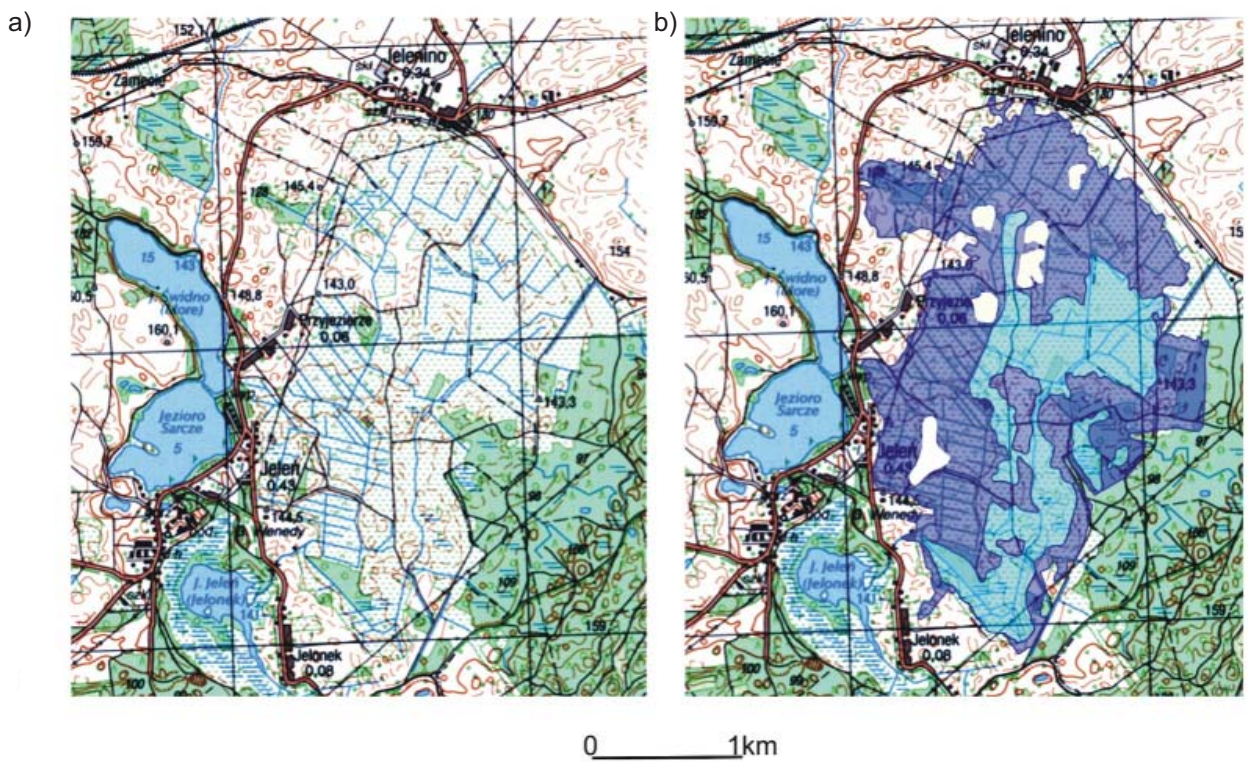


Fig. 5. a) Dried-up Lake Jelenino, present state, b) range of coastline before the first and second stages of reclamation works.



Fig. 6. Agricultural land at the area of non-existent Lake Jelenino.

point of view. The acceleration of lake disappearance and thus the elimination of all the benefits connected to their presence should be assessed critically. A question should be asked every time before such a drastic action as drying up a lake is taken – should this landscape element be preserved (crucial for water cycling, microclimate, biodiversity etc.) or should it be adapted to short-term benefits? The drainage of lakes (mostly for agricultural purposes) seems to be attractive since it brings new arable lands of high soil evaluation class. However, in the course of time, organic soils change their properties and the preservation of their high production level is cost-intensive, which involves an increase in the amount spent on fertilizers. Possible further revitalization, concerning particularly biotic elements, can be ineffective or impossible.

Anthropogenic changes in the natural environment presented in this study indicate the close relationship between humans and environmental components. As a result, inhabitants of Jelenino village who used to live by fishing, had to face the challenge of quick social and economic transformation.

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