

EXTRAORDINARY WINTER WEATHER EVENTS IN THE AREA OF PTUJ FROM 1700 TO 1941

IZVANREDNI ZIMSKI VREMENSKI DOGAĐAJI NA PODRUČJU PTUJA OD 1700. DO 1941. GODINE

Nataša KOLAR

Ptuj - Ormož Regional Museum, Slovenia
natasa.kolar@pmpo.si

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Summary

*The author of the present paper based herself on archives and printed newspaper sources to present extraordinary winter extreme weather events in the Ptuj area between 1700 and 1941. Extreme weather events have been affecting man's everyday life since always and changing his living environment. Data about the extreme weather events that Ptuj citizens had to live through were recorded by chroniclers. All town chronicles read about severe winters, ice on the river Drava which represented the major obstacle, and consequently floods in the town in 18th and until the mid-20th century. The Ptuj citizens focused on particular on the frozen Drava in 1766, the event that was represented on a votive painting *The Ice on the River Drava* by a local painter, Franz Josef Fellner. Ptuj district office set up a crisis management board each time the river froze in order to monitor the foreseen danger and protect and save the citizens by following strict measures.*

Although the then town administration had a system of information and action due to repeated floods and frequent icy winters to quickly resolve the situation after each flood and melting ice, the town needed a lot of energy, will and financial resources to redevelop, and the reconstruction was carried out slow; the renovation processes were also slow due to additional financial burdens rather long.

In 1896 the Municipality of Ptuj decided to build a new Drava embankment between the two bridges (road and railway) in the length of 236 meters. Between 1897 and 1907 river banks were strengthened with supportive walls. With this investment, they protected the lower part of the town from further floods. The Drava embankment with supportive walls between the two bridges protects the lower part of the town Ptuj from floods even in the 21st century.

Keywords: Ptuj, 1700-1941, climate, winter conditions, ice, Drava

Ključne riječi: Ptuj, 1700-1941, klima, zimski uvjeti, led, Drava

INTRODUCTION

Extreme weather events have been affecting man's everyday life since always and changing his living environment. In the past centuries, weather, weather conditions and climate played an important role on which often crucially depended wars, agriculture and harvests, the latter being still strongly dependent on the weather. Indirectly, the weather thus helped shape economic and political decisions concerning man's living in a certain place. It also often decisively determined man's choice of clothing and food supply, and was the main cause for health risks and general well-being. Due to the consequences caused by natural events, people had to adapt to the newly emerged situation and took measures to change and improve their living environment as much as their economic situation allowed them to. Major natural



Figure 1: Location of Ptuj on the map of Slovenia

disasters due to intense climate processes, such as droughts, storms, landslides, floods, frosts and other, were recorded in the past.

For the contribution of extreme weather events and their social consequences, we used the resources (chronicles, records of administrative measures, minutes of tax and construction authorities) we have available in the Zgodovinski arhiv na Ptuj, Slovenija (Historical Archive in Ptuj, Slovenia) and the Steiermärkisches Landesarchiv Graz, Austria (Styrian Provincial Archives and Graz, Austria). However, we also used printed word reports mentioned by reporters in various newspapers in the form of a short or long report from the affected area.

Based on the written data, we could draw conclusions about the intensity and type of damage as well as about possible long- and short-term consequences, such as the closing down of smaller business units (mills), lack of food, and spread of diseases caused by polluted vegetables and drinking water.

The Ptuj Historical Archives keep community, school and parish chronicles in which exceptional weather events that occurred in the 18th, 19th and 20th centuries are recorded. Fonds of town and municipal archives preserve files and plans which include notes issued to warn the citizens against impending natural disasters, e.g. swollen or frozen Drava river, and measures to prevent damage. As a result of these measures follow several suggestions about how to arrange and improve town infrastructure to contribute to a better quality of life for all citizens in a given period. Among chroniclers from Ptuj, two historians hold a special place: Simon Povoden¹ and Ferdinand Raisp². They both created and collected archive material and records about various contemporary events, and they left manuscripts, chronicles and books to the town and researchers; there are records of elementary disasters and events in them. Among their manuscripts and chronicles, many are still waiting to be explored and published. The present article will shed light on some of them.

¹ Curate Simon Povoden (1753-1841) from Ptuj, was an important historian for the entire Podravje region. A socially sentient priest, benefactor, co-founder of Agricultural Society in Ptuj, as well as of other societies, Povoden proved to be a diligent collector of archive evidence and Roman monuments, as well as author of more than 30 historical documents. In 1830, he had Roman stone monuments, he had found and kept, built into the walls of town tower. Thus, in the territory of Slovenia, he created the first open-air museum in Ptuj (*sub divo*). In his honour, the museum was named after him: Povoden museum. His biography is to be found in: Glazer, Janko: Povoden, Simon (1753–1841). [online]. Accessible on: <http://www.slovenska-biografija.si/oseba/sbi453467/#slovenski-biografski-leksikon> (10th February 2020).

² His biography is to be found in: Baš, Franjo, 2013: Raisp, Ferdinand (1818–1898). [online]. Accessible on: <http://www.slovenska-biografija.si/oseba/sbi482054/#slovenski-biografski-leksikon> (10th February 2020).



Figure 2: Ptuj, the building of Mr. Behrbalk, where the meteorological station was, before 1941. Photo-documentation: Ptuj - Ormož Regional Museum

Data about extreme weather conditions endured by the citizens of Ptuj were recorded in all town chronicles³, the only difference is their length, personal experience and vision of the reporter, especially if the reporter witnessed some of the events and thus wrote about them directly. Some, though, wrote about the events by summarising ancient documents that were still available at that time, but later unfortunately destroyed and the data was lost. Few accounts from those documents survived in Simon Povoden's copies that figure in the Town Reading Book I and II. Chroniclers noted, among other facts, extreme weather conditions that happened every now and then, but not every year. Exceptionally high or low temperatures were also recorded following the contemporary Réaumur (Ré) temperature scale, while at the beginning of the 20th century, temperatures were already reported in Celsius (C). All events were recorded and at the end of each year normally followed, but not always, a general report about the yearly events, harvests of fodder, cereals, vegetables, fruits and wine. Everything was described in detail, as for example: exceptional, good, average and bad harvest year.

Since mid-19th century on, some towns in Slovenia recorded weather conditions in their own meteorological stations for shorter or longer periods. The collected data was then transferred to the Central Institute for meteorology and geodynamics in Vienna. The station in Ptuj was set up in the premises of the second pharmacy, on the corner of Krempljeva and Aškerčeva Streets and Minoritski Square, by Master Behrbalk.⁴

³ Vodnik ..., 2009.

⁴ SI_ZAP 0070/00071, Mestna Kronika Ptujja I, 137. StLA, Statthalterei IV, 70-23251/1893, N. 20310 / 1894. Gavazzi, Artur, 1925, 56; Pučnik, Janko, 1980, 74.

CLIMATE IN PTUJ

The climate of the Lower Drava region, which also includes Ptuj, belongs to the temperate continental climate of eastern Slovenia (subpannonian climate), and is characterized by a more pronounced continental precipitation regime, warm summers and cold winters.⁵

In the 19th century, quite a few topographic manuals were published concerning regions in the Habsburg monarchy, in which different data about different locations can be found, as well as descriptions of the climate. In one of the topographic statistical descriptions of Styria, Josef Janisch described the climate in Ptuj in following words: “Concerning the climate and atmospheric conditions, the air is mild, less harsh; in general the air is dry, although the spring and autumn fogs make it humid, and changes of weather are often very harsh.”⁶ Josef Felsner described rather similar weather conditions and temperatures in his travel manual of Ptuj and its surroundings, written in 1895. He recorded two extreme points of annual temperatures: summer temperature in the shade was 26°Ré (32°C), while winter temperatures in the sun descended to –10°Ré (–12°C). In addition, he also noted the most drastic deviations from average temperatures of a particular location. A very similar point of view can be found in the Krajevni leksikon Dravske banovine (Drava District Lexicon), namely the climate of the Ptuj area is typically subpannonian with cold winters.⁷

WINTER CONDITIONS AND ICE ON THE RIVER DRAVA

During harsh winters, ice on the river caused big problems. Ptuj citizens were never able to predict the extent of damage that would occur at the period of thaw: Will only the bridge suffer or the embankments as well? To what extent the melted ice will flood the town? Namely, each time after floods, the lower part of the town had to be cleaned up and the damage repaired, which was also true for the citizens whose houses were flooded.

From the mid-14th to the beginning of the 18th century, the ice and its melting as well as floods caused by the Drava moved and changed the river bed in the area of Ptuj. O.H. Šalamun, in his local-historical short-story entitled Ptuj⁸, mentions some important data taken from town chronicles about natural disasters in Ptuj. For the 18th and 19th centuries in particular, he cites the records about harsh winters and consequently flooding of the town of Ptuj by the river Drava and Grajena stream: 1708, 1709, 1766, 1799, 1811, 1812, 1813, 1829, 1830, 1841, 1879, 1880, 1891, 1895.

In 1708, the winter in Ptuj was very severe, according to the Ptuj citizens who judged it by the wine that froze in barrels and some barrels even cracked. The year after, in 1709, the winter was very long and all grapevine froze at Pentecost (19th May). In 1736, the crash of enormous ice chunks on the river tore off four bridge supports⁹; in 1737, a powerful flow of ice sheets and swollen river damaged two bridge supports¹⁰. After each disaster, the municipality had to repair the bridge as it represented the main part of the Ptuj traffic network connecting southwest to northeast direction (first direction Venice - Gorizia and Trieste - Ljubljana - Celje - Ptuj - Varaždin towards Budapest, second towards Osijek, third towards Dalmatia) and southeast to northwest direction (first direction towards Salzburg and Nürnberg, second towards Vienna).¹¹ The maintenance of roads and bridges was mostly paid for with the collected road and

⁵ More about this in Ogrin, Darko, 1996, 45. [online] Accessible on: URN:NBN:SI:doc-UW4TG97F from <http://www.dlib.si> (10th August 2020).

⁶ Janisch, Joseph, 1885, 451.

⁷ Srez Ptuj, 499. [online] Accessible on: URN:NBN:SI:DOC-IXXHRWQE from <http://www.dlib.si> (27th February 2020).

⁸ Šalamun, Anton, 1896, 765. [online] accessible on: URN:NBN:SI:doc-KM46DBL7 from <http://www.dlib.si> (18th February 2020).

⁹ Raisp, Ferdinand, 1858, 159.

¹⁰ SI_ZAP 0070/0042, POVODEN, Simon, 1821, 273.

¹¹ More about traffic network connecting's in Šamperl-Purg, 1987, 36 in 37. Curk, Jože, 1978, 238-268.



Figure 3: Franz Josef Fellner, *Ex voto – Ice on the river Drava*, 1766. Photo-documentation: Ptuj - Ormož Regional Museum

bridge toll¹². In 1740, again, the winter was very harsh and very long, and in May, there was a lot of snow in the fields so the start of the growing season was delayed. Another harsh winter occurred in 1799.¹³

In 1766, Ptuj citizens were quite concerned with an extreme winter event: the ice on the river Drava, that would eventually thaw and inundate the lower part of the town, especially parts closer to the river. On 22nd January 1766, the accumulated ice chunks were threatening to severely damage the bridge. The citizens, members of the town council and church dignitaries formed a procession begging the patroness of the town, Holy Mary, to save them from the disaster. And their prayer was heard¹⁴. The same year, in order to mark the event, the citizens ordered from the local painter, Franz Josef Fellner, an *ex voto* (a votive) painting: *Ice on the Drava river*. The painting depicts the Ptuj townscape, frozen river and procession of citizens as well as town patrons: Virgin Mary, St. George and St. Florian¹⁵. The following year, in 1767, the votive painting was moved to the parish church of St. George¹⁶.

According to the Josephine measurements for the territory of the Republic of Slovenia, between 1763 and 1787 the river Drava in the town of Ptuj was 151.68 meters wide and from 3.79 meters to 7.58 meters deep, and the height of the banks was up to 7.58 meters.¹⁷

¹² Kolar, Nataša, 2002, 51.

¹³ Raisp, Ferdinand, 1859, 159 in 160.

¹⁴ Raisp, Ferdinand, 1859, 157 in 158.

¹⁵ SI_ZAP 0070/00040, POVODEN, Simon, 1821, 273.

¹⁶ SI_ZAP 0070/00033, Kronika nadžupnije sv. Jurija/Chronicle of the St. George arch-parish 1732–1849, 537. The painting was officially handed over to the Ptuj museum to keep and to expose in 1988; however, it has been in the museum unofficially since the second world war. Namely, during WW II, the secretary of the Museum Society, Anton Smodič, archaeologist, museologist and teacher, took the painting *Ice on the River Drava* and transferred it from the St. George's church to the museum in order to protect the painting. Kotnik, Doroteja, 2019, 214.

¹⁷ Slovenija na vojaškem zemljevidu 1763-1787. 2000. Stadt Pettau / Mesto Ptuj, 189.



Figure 4: The situation plan runs along the Drava River from Vurberg Castle past Ptuj to Borl Castle on the cadastral plan from 1880 to 1885.*

* Austro-Hungarian cadastral plan 1:75.000 (1880-1885) D48 [online]. Accessible on: <https://gisportal.gov.si/portal/apps/webappviewer/index.html?id=df5b0c8a300145fda417eda6b0c2b52b> (11th August 2020).

Cold weather and abundant snow occurred also in 1829/1830¹⁸ and 1840/1841. Between 5th and 12th January 1841, the Drava froze. The accumulated ice put in peril houses situated close to the river. Some inhabitants put away their belongings from the yards, cellars and ground-floors, or even took them with them upon leaving their homes. Fortunately, on 12th January the ice broke and partially melted near Borl, from where it was swiftly moved back towards Vurberk, but the bridge in Ptuj did not suffer.

The river Drava froze again in January and February 1864, and the ice melted completely between 24th and 25th February.¹⁹ The chronicler Raisp did not notice any particularities at that period. But it was quite different in 1876. In mid-February the Drava froze anew. The local government set up a special commission to monitor the weather conditions and protect people against the threatening danger in the area of Ptuj, the suburbs Kaniža and Breg, and for the community of Videm near Ptuj. On 15th February, the river was frozen between the road traffic and railway bridges. The morning air temperature after the night from 13th to 14th February 1876 was -14°Ré (-17°C). As we do not know the data on the general water level of the Drava River at that time, and from the available sources we can only guess about the usual winter level of the Drava, whether it was high or low, the water level was 0.43 meters higher that night. On the morning of 15th February, the water level rose by 1.50 meters and dropped by 0,20 meters to 1.30 meters at 12 o'clock, and the thermometer showed a morning temperature 3°Ré (3°C).²⁰

¹⁸ Raisp, Ferdinand, 1859, 164.

¹⁹ SI_ZAP 0070/00027, Raisp, Ferdinand, 1857–1887, 54.

²⁰ The station measuring water level of the Drava river was located in Ptuj since 1853. The recorded data read by the ombrometre were communicated to the hydrographic office for Styria in Graz by town toll-collector officer. StLA. Statthalterei IV, 70-23251/1893, N. 35441/1898.



Figure 5: Ptuj, lower Drava training plot of pontoon engineers and anchored vessels – barges, after 1907. Photo-documentation: Ptuj - Ormož Regional Museum

The quick swelling of the river alarmed those living close to it. Ptuj pontoon engineers were in stand-by, and in the village of Pobrežje²¹, by means of two pontoons and one barge²², 12 of them took to safety 16 inhabitants, 8 animals with horns²³, and 10 pigs. In the afternoon of 15th February 1876, the ice on the river broke as a result of thaw, a large crack was visible in the ice and the water started to flow freely; consequently, the water level dropped for one meter below the critical level; thus, people living in the endangered area did not have to be evacuated. It thawed during the night of 16th February 1876. The water level decreased to 0.50 metres above a certain zero point, which, for the reasons already mentioned, is unknown to us; while in Ptuj, from the traffic bridge downstream a huge crack - trail appeared. Near Borl, the ice on the river Drava was broken by pontoon engineers.²⁴

As mentioned above, the harsh winters of 1880 and 1895 were already documented at Ptuj by Šalamun. A terribly cold winter was felt in Ptuj in 1880, when the river was frozen to the point that people could cross it walking on the ice. Town chronicles and in particular a notice the Ptuj local government sent at the beginning of February 1880 to the town municipality, offer a good insight into difficult winter conditions the town was subject to. The Chronicle of provincial-princely chamber town of Ptuj I contains a rather long report on that particular weather event. It starts on 29th January, when the chronicler wrote about Ptuj and Ormož and huge ice chunks accumulating for several weeks on the river

²¹ The village of Pobrežje was part of Videm pri Ptuj community in the 21st century. [online]. Accessible on: <http://www.videm.si/obcina-videm/kraji> (3rd February 2020).

²² Barge is a flat-bottomed boat. Glossary of transport statistics, 2004, 67. [online]. Accessible on: https://www.stat.si/doc/pub/glosar_transport.pdf (2nd March 2020). Slovenski pravopis, 2001, 353.

²³ The source does not precise what type of animals were there, thus we presume that there were cattle and some smaller animals (author's remark).

²⁴ StLA, Statthaltereiv IV, 70-17/1872, N. 2564/1876.

Drava, floating upstream to Ptuj. On 4th February, the river next to the bridge was caught in solid ice on which it was safe to walk. The ice had only one crack that divided the frozen surface downstream, close to the right embankment, starting in front of the Kukowitz's mill to the first two bridge supporters, past the blacksmith Pobratischak's workshop. On the right side, upstream, the ice reached the Hintze's estate.²⁵ The cold weather began in January and started to warm up at the beginning of February,²⁶ from which can be concluded that it was very cold since mid-January. Because of a great amount of snow and ice on the river and in the town, the town representatives and citizens were very concerned about the winter conditions. The local government notice mentioned above clearly shows the anxiety of what could happen at thaw and melting of the ice, as well as the foreseen measures to alleviate the forthcoming situation. Among the measures was also the establishment of a crisis management board for protection and help. To deal with the hazard coming from the frozen river Drava, the appointed members of the crisis management board were representatives of the district office, Dr. Schrafelly, G. Murschetz and J. Beratschko, Mayor of Ptuj, Dr. Bressnig, representatives of the Ptuj municipality, J. Fürst and Dr. J. Ploj, representatives of the suburb community Breg, M. Gassner and A. Kanitz, and an expert selected by the district office, J. Friedrich, builder apprentice. The board decided to nominate observers and post them in the upper part of town. Their task was to issue warning in case of accumulated ice sheets which would be hazardous for the bridges over the Drava, Studenčnica stream in Breg, and the bridge near Borl. The entire pontoon engineers battalion was constantly ready to intervene in case of necessity.²⁷ The content of the letter²⁸ sent by the head of the district office contained the foreseen measures and guidelines in case of emergency as well as the notice from the town hall warning the citizens against the upcoming hazard in the Podravje region. On 5th February 1880, the Ptuj's head of district office wrote about huge mounds of frozen snow in the Drava including the section between Maribor and Dravograd, and in the region of Carinthia, while the embankments were frozen everywhere. The situation was becoming critical, especially as the sudden thaw would seriously endanger Ptuj and the suburb community Breg. Both bridges, across the river Drava and the stream Studenčnica, were icebound, and at the thaw, ice sheets would crash into one another, the water level would increase and spill over both river embankments. In addition, the river bed at that particular point is rather narrow and all three bridges (road-traffic bridges over the Drava and Studenčnica, and the railway bridge crossing the Drava) present an obstacle to high water level and fast-moving water. In his letter, the head of the district office assessed the situation. According to him, the buildings on the right embankment in the suburb community Breg, between Drava and Studenčnica, were more exposed and that included the blacksmith's workshop, and he concluded that the security measures taken well in advance were of the outmost importance. He addressed political offices in the Upper Drava valley²⁹ asking to be informed immediately in case of thaw, as it would normally happen there before it would happen in Ptuj, and about the movements of ice chunks upstream. As soon as he got a message, he forwarded it to the citizens. The letter continued with the enumeration of measures taken by the board to be carried out by the citizens, especially those living close to the river. The army had its share of preventive measures. The Ptuj pontoon headquarters designated the pontoon engineers battalion to help avoid the danger, namely one officer, six junior officers and thirty-two men, as well as two double pontoons and two barges. Moreover, the preventive measures taken by the board included the recording of old buildings in Ptuj and in Breg by making a list of those that were in bad shape and could have deteriorated even more in case of flood. The first to figure on the

²⁵ Woldemar Hintze (1844-1909), from Orešje pri Ptuju, belonged among big estate-holders, winegrowers and fruit producers in the Ptuj region. He grew Tyrolian apples and produced apple and grapevine sparkling wine. Brence, Andrej, Simonič Roškar, Monika, 2017, 27.

²⁶ "8. 2. Die grosse Kälte, die ununterbrochen seit der ersten Tagen des Januars, in denen ein Kurz andauerndes Trendwetter eingetreten war, gedauert hatte, läst nach." SI_ZAP 0070/ 00031, Kronika, 1873-1913, 40.

²⁷ SI_ZAP 0070/ 00031, Kronika, 1873-1913, 41.

²⁸ SI_ZAP 0005/001/00058, MOP, TE 1, spis 1673/1880 in 245/1880.

²⁹ From the letter from the state deputation office in Graz written on 16th February 1873, it can be concluded that the warning system, including the signalisation, about threatening ice chunks on the river Drava and consequent floods in Carinthia depended on the District office in Beljak which was supposed to send a telegram to inform all communities and district offices located downstream about the frozen river and increased water level. StLA. Statthaltereie IV, 70-17/1872, N. 7116/1873.

list were water mills and cottages along the water. Due to the hazardous situation, the owners of endangered houses had to figure out where to find refuge in case of flood which would be signalled by the appointed observers upstream. It was also planned to post observer sentinels at every point of potential risk to warn people on time. Finally, it was foreseen to evacuate people by force in case they would fail to abandon their houses. Help was offered also by two associations, gymnastic and firefighters'. The town office willingly accepted their offer and cooperation. Once the municipality had received the letter from the district office, it published a similar text to warn the citizens against the forthcoming hazard, in particular inhabitants of Spodnja and Zgornja Dravska Streets and along the town park had to pay special attention and received strong recommendation to search for an adequate lodging and ensure their belongings in case of being forced to leave their homes because of high waters. During the night, people living in Spodnja and Zgornja Dravska Streets had to put lanterns with candles at the disposal of sentinels and other appointed rescue staff in case of need, while both passages across the river Drava and Studenčnica stream were closed earlier than usual. The beginning of danger would be announced by three shots from signalling cannons. Those inhabitants whose houses were on the list of endangered sites would have to leave their homes immediately. The instructions also stipulated that after the signal, all carpenters, bringing their tools, would have to gather on the square opposite the bridge collection tax office and be available for any intervention either alone or with their apprentices. Firefighters and members of gymnastic association who offered help, were also supposed to gather after three signalling cannon shots on the then Wooden Square, today Hrvaški/Croatian Square. The thaw eventually occurred on 10th February 1880, and two days later, i.e. on 12th February 1880, it rained and snowed which caused new fears and anxiety about the floating ice and floods. Then, another thaw happened between 17th and 22nd February; on 17th February, ice chunks floated downstream and the major part of ice flowed away on 18th February damaging two supportive pillars on the bridge on the right side by breaking two poles on one and three on the other pillar. The damaged parts of the bridge were strengthened between 19th and 22nd February 1880 by the carpenter master Bressnig with the help of ice-breaking pilot boats. Other pillars were strengthened by carpenters of the pontoon battalion. During the following days, the ice continued to float downstream but in lesser quantities; however, the danger of floods was still pending, and on 24th February, it snowed and rained again. The river Drava swelled considerably, but the river bed was not covered by ice; thus, the town citizens were persuaded that the main danger had been avoided. It was not before 27th February 1880 that the river in Ptuj was truly free of ice, although downstream, in Ormož, there were still huge ice sheets, but fortunately, there was a crack in the middle foretelling the thaw.³⁰

Even worse winter followed in 1890-1891. During three months, it was very cold and it kept snowing all the time. Many articles describing the winter conditions were published in *Pettauer Zeitung*. Ptuj and its surroundings suddenly changed in a beautiful winter and snow-clad landscape. In January 1891, the citizens of Ptuj enlivened their everyday life with a rare winter activity, the snow-sledging on the Drava river and its tributaries to Videm pri Ptuj, Destrnik, Jurovec and Vurberk, and ice-skating on the frozen pond in Ljudski Vrt park. They did not forget the animals, and the citizens were regularly reminded to think about bird food.³¹ Besides winter fun, the abundant snow caused other troubles connected to the safety and safeguarding of the bridge. For example, an unknown citizen warned the town authorities that the snow on the town bridge was not dangerous only for pedestrians and transporters, but also for the stability of the bridge itself. The article appeared in *Pettauer Zeitung* emphasising the huge amount of snow that needed to be shovelled away; the removed snow could be used to make a big snow wall in front of the bridge. The writer also expressed his concern about the unusually huge amount of ice on the river, which was the result of exceptionally cold weather; he was suggesting that the snow piled up in a snow wall would retain ice when the thaw would come which could be very dangerous for the bridge. At the same time, he wished for all his co-citizens that the town authorities could eliminate such

³⁰ SI_ZAP 0070/ 00031, Kronika, 1873–1913, 41. SI_ZAP/0070_00027, Raisp, Ferdinand, 1857–1887, 133.

³¹ Winterleiden, 4. [online]. Accessible on: URN:NBN:SI:doc-U3E8FZOR from <http://www.dlib.si> (17th February 2020).



Figure 6: Ptuj, ice-skating on the frozen pond of Ljudski Vrt park, around 1900. Photo-documentation: Ptuj-Ormož Regional Museum

flaws quickly.³² From this short notice it can be deduced that the town administration did not prove to be very efficient in organising the snow removal and cleaning of the infrastructure, and it can be assumed that this short notice incited the authorities to summon the citizens to remove the heaps of snow in the town and on the bridge. As the town chronicler wrote on 21st January 1891, the citizens prompted by the municipal decree separated the snow from the ice and the snow thus piled up amounted to the top of the fence on the bridge. At that point, the river was deeply frozen near the bridge. In January and February, the temperature moved between -13°Ré and -10°Ré (-16.3°C and -12.5°C). The layer of compacted snow in Ptuj measured about 85 cm. The snow was taken from the town to be deposited along the left river bank downstream towards the railway bridge thus making huge piles of snow. The railway traffic was stopped,³³ and the road traffic was very heavily affected. At the end of February, the river Drava was still frozen between Ptuj and Borl. Ice chunks were more than a metre thick. In order to preserve the traffic and railway bridges,³⁴ Ptuj pontoon engineers came to help. Between two bridges, where the river bed is narrowest, and in only five days (from 28th February to 4th March 1891), they broke the ice with mining, sawing and breaking in order to make way for the upcoming high water.³⁵ In the same way, the pontoon engineers broke the ice at the Borl bridge.³⁶ The thaw finally came at the beginning of March.³⁷

³² Eisstauung, 3. URN:NBN:SI:doc-U3E8FZOR from <http://www.dlib.si> (17th February 2020).

³³ SI_ZAP 0070/00072, Kronika, 1886–1892, 167 and 168.

³⁴ SI_ZAP 0070/00026, RAISP, Ferdinand, 1888–1898, 19.

³⁵ Vom Winter, 3 [online]. Accessible on: URN:NBN:SI:doc-ERKZOGAV from <http://www.dlib.si> (18th February 2020). SI_ZAP 0070/00072, Kronika, 1886–1892, 169.

³⁶ SI_ZAP 0070/00026, RAISP, Ferdinand, 1888–1898, 19.

³⁷ Vom Winter, 3 [online]. Accessible on: URN:NBN:SI:doc-ERKZOGAV from <http://www.dlib.si> (17th February 2020).



Figure 7: Johann Winkler, Ptuj, ice sheets in the Drava and protected bridge supports in February 1891. Photo-documentation: Ptuj - Ormož Regional Museum.

On Wednesday, 4th March 1891, the citizens of Ptuj woke up to the announcement of accumulated ice chunks floating towards the bridge. (*“Der Eisstoß sei gegen die städtische Brücke in Bewegung /.../”*).³⁸ The image of threatening ice chunks floating on the river was not a pleasant sight for the Ptuj citizens. A witness and reporter of the event, whose article was published in *Pettauer Zeitung*, wrote about the horrible sight of the piled up and moving and floating ice (*“Es war auch in der That ein scheuerlichen Anblick die gewaltigen, sich schiebenden und bäumenden Eismassen zu sehen, wie sich dieselben übereinandergethümmert zeitweise sich festsetzend, wie ein schwimmendes, drohendes Ungeheuer gegen die Brücke drängten /.../”*)³⁹ Almost at the same time, while the pontoon engineers were mining and breaking the ice to relieve both bridges, the thaw came. It damaged a mill on the left river bank, the wheel and boat were broken, and the complete destruction of the mill was near, but during the day, the river changed its course, turned to the right bank, and ice chunks started travelling upstream.⁴⁰ Thawing was very quick. Already on 5th March, there was no ice on the river, while by 11th March 1891, all the snow in the Lower Podravje region was gone. For a few days, daily temperature amounted to 6°Ré (7.5°C).⁴¹ In what condition were the streets during the winter time in the lower part of town can be deduced from the writing posted by a worried citizen who described the tidiness in Poštna and Dravska Streets after the thaw. He wrote that finally the pavement could be seen and that the frozen layers partially melted due to the thaw and partially they were removed by the citizens who used various tools.⁴² All these published texts talking about the way the town was maintained suggest a conclusion that the printed media were used by the citizens to regularly expose their opinions on flaws in the municipal infrastructure, thus expressing their remarks about how the town should be governed, when the authorities took too much time to respond and put in practice citizens’ ideas how to make the town more beautiful and living in it safer.

At the turn of the 19th into 20th century, winters in Crown of Styria were either cold and dry or humid and mild. In the first half of the 20th century, the climate data and the winter statistics already suggested the modern climate warming. The year 1916 was very warm, while terrible cold and harsh winters were recorded in 1940, 1942 and 1947. Researchers of Central European historical weather data

³⁸ Der Eisstoß, 2. [online]. Accessible on: URN:NBN:SI:doc-UJYACL5W from <http://www.dlib.si> (18th February 2020).

³⁹ IDEM

⁴⁰ IDEM

⁴¹ SI_ZAP0070/00072, *Kronika*, 1896–1892, 169.

⁴² Allerlei, 3 in 4. [online]. Accessible on: URN:NBN:SI:DOC-3ZEAT4R5 from <http://www.dlib.si> (19th February 2020).



Figure 8: Alois Kasimir, View of the castle of Borl and a part of the bridge, 1895. After Felsner, 1895, 125.

compared temperatures and concluded that winters in the first half of the 20th century were generally rather warm.⁴³

Information about winter weather conditions in Ptuj can be found also in school chronicles. Here are some chosen excerpts from different school chronicles. During winter 1909-1910, the weather was very mild until Christmas. In December, temperatures in the morning ranged between 10°Ré to 12°Ré (from 12.5°C to 15°C). On certain days, the school caretaker did not have to heat the classrooms. Many pupils came to school barefoot. Until 22nd December 1909, the last month of the year was very mild, and then 6 cm of snow fell. Almost every day, the thermometer showed between -2°Ré and -4°Ré (from -2.5°C to -5°C). On 22nd December, the temperature descended to 0°Ré (0°C), and it snowed only on 28th December.⁴⁴ In the winter season of 1911-1912, on 5th February 1912, up to 42 centimeters of snow fell and because of this few children came to school.⁴⁵ Until 31st December 1912, the weather was very mild with temperatures descending below -3°Ré (-3.8°C) only four times. There was little snow that melted almost immediately. Thus, the school attendance was very good which was due to the mild winter,⁴⁶ but it was very poor during the 1913-1914 winter season during which the temperature fell to -17°Ré (-21°C). The cold persisted until the end of January with an average outside temperature of -14°Ré (-17.5 °C).⁴⁷ From 1918 to 1921, winters were rather mild and dry without any rain or snow.⁴⁸ On the other hand, in 1921-1922, the winter was very cold, as it was snowing already in October, while the temperatures in the middle of winter ranged between -16 °C to -20 °C; the summer was very hot.⁴⁹ The school year of 1923-1924 was marked by a very long winter that lasted half a year, and the other half of the year it was raining all the time.⁵⁰

Between both wars, in 1929, the winter and spring were very cold and ice chunks on the river Drava were threatening the towns of Ptuj and Ormož, as well as other places along the river all the way downstream to the Croatian border. Slovene newspapers reported on harsh winter in Central Europe, while temperatures at Ptuj descending below zero were described in schools' chronicles. The newspa-

⁴³ Glaser, Rüdiger, 2001, 178 in 179.

⁴⁴ SI_ZAP/0121/009_00001, Kronika, 1899-1959, 75.

⁴⁵ SI_ZAP/0121/009_00001, Kronika, 1899-1959, 82.

⁴⁶ SI_ZAP/0121/009_00001, Kronika, 1899-1959, 91.

⁴⁷ SI_ZAP/0121/009_00001, Kronika, 1899-1959, 97.

⁴⁸ SI_ZAP/0121/009_00002, Šolska kronika, 1918-1940, 19.

⁴⁹ SI_ZAP/0121/009_00002, Šolska kronika, 1918-1940, 2.

⁵⁰ SI_ZAP/0121/009_00002, Šolska kronika, 1918-1940, 39.

per *Slovenski Gospodar* regularly informed its readers about winter conditions. It wrote about abundant snow that covered Europe, Slovenia and Yugoslavia end January 1929. Snowdrifts, snowstorms and avalanches represented a huge obstacle for the railway traffic.⁵¹ Candlemas, 2nd February 1929, and Sunday after Candlemas, were two coldest days in Europe; in Slovenia, at some places, it was -30°C . The reporter also wrote that at some places along the river Drava downstream from Ptuj, “.../ the winter is so severe these days that across the fields there are plenty frozen rabbits and crows. Partridges and pheasants are looking for the remains of food in farmyards. Side branches of the river are covered with a thick layer of ice. The main river bed is covered with ice with the exception of a few metres in the middle.”⁵² The same information about low temperatures figures also in Ptuj schools’ chronicles with an additional explanation stating that temperatures of -30°C lasted for some time and due to the cold and lack of fuel in schools all classes were cancelled from 16th to 24th February 1929. The classes started again on 25th February 1929.⁵³ In Hajdina next to Ptuj, the temperature was two degrees lower. The chronicle of the primary school Hajdina⁵⁴ gives the following account on the annual weather conditions: Janko Lešnik, chronicler, wrote on 7th November 1929 that in the school year 1928-1929 the winter was so severe that classes had to be suspended for eight days; many days before Candlemas and until March the temperatures ranged around -32°C . Some windowpanes broke because of the cold. The same happened to some trees that cracked and branches broke off. The cold took a heavy toll among fruit trees, namely certain species of apple and nut trees. The newspaper *Slovenski Gospodar* published many articles about the cold winter in the Lower Podravje region and Slovenske Gorice hills. At St. Lovrenc in Slovenske Gorice hills (community of Juršinci), the temperature was -29°C , the snow layer measured 1 metre and all traffic stopped. There was a severe lack of firewood, animal bedding and water. Trees were cracking, potatoes and wine froze in cellars, livestock was nipped by frost. At St. Andraž in Haloze (community of Zgornji Leskovec), the report says that Haloze hills are covered with snow, people could not attend the holy mass and children could not go to school. The cold was everywhere, in stables and cellars, the grapevine in vineyards and fruit trees were damaged by frost. There were numerous avalanches which represented the phenomenon peopled in the region have not experienced long ago (only landslides were customary there). Two girls died in avalanches, on 14th and 17th February 1929.⁵⁵ Since New Year 1929, none of four mills on the river Drava ground for two months because their wheels were icebound. The thaw finally appeared at the end of February 1929 and caused many problems on the river. The author of the article wrote: “With milder weather, the river Drava began to break and freed itself from the ice armour, and from below Zavrč, the enormous ice chunks started to move downstream the river attaining Ormož on Wednesday at three in the afternoon and took two hours to pass by. It was rather thrilling to see the Drava covered all over with an enormous ice sheet. /.../ The ice broke one of the central-bridge icebreakers and damaged all four mills: Sadravec, Šef and two Jeremič’s. /.../ Not far from the bridge, opposite the village of Pušenci, the river found a new way through the forest to Croatia. About one hour north, near the Croatian village of Brezje, ice chunks are piling up to 7 m high. Witnesses report that this is something magnificent, but many are afraid fearing what might happen if these mountains break off and start pounding against the bridges/.../”⁵⁶ The ice on the river Drava, endangering also the bridge beneath the castle of Borl, was mined by pontoon engineers from Ptuj to preserve the bridge from damage,⁵⁷ and the same happened to the bridge in Ptuj. In Ptuj, as evidence shows it, there was not

⁵¹ Snowdrifts – traffic obstructed, 6. [online]. Accessible on: URN:NBN:SI:doc-YN62QK5Y from <http://www.dlib.si>. Winter – cold, 3. [online]. Accessible on: URN:NBN:SI:doc-0DNKZK4X from <http://www.dlib.si> (24th February 2020).

⁵² The coldest days in Europe; Winter so harsh that the eldest cannot remember, 6. [online]. Accessible on: URN:NBN:SI:doc-QFIGFOJD from <http://www.dlib.si> (24th February 2020).

⁵³ SI_ZAP/0144/001_00001, Šolska kronika, 1919–1945, 113. SI_ZAP/0121/009_00001, Kronika, 1899–1959, 207. SI_ZAP/0121/009_00002, Šolska kronika, 1918–1940, 79.

⁵⁴ SI_ZAP/0110/007_00002, Šolska kronika, 1908–1957, 299.

⁵⁵ Sv. Lovrenc v Slov. gor.; Sv. Andraž v Halozah, 11. [online]. Accessible on: URN:NBN:SI:doc-0DNKZK4X from <http://www.dlib.si> (24th February 2020).

⁵⁶ Our millers along Drava in Ormož, 5. [online]. Dostopno na: URN:NBN:SI:doc-MOVU8YNQ from <http://www.dlib.si> (24th February 2020).

⁵⁷ The military mining the ice, 5. [online]. Accessible on: URN:NBN:SI:doc-3LHDDIRA from <http://www.dlib.si> (24th February 2020).



Figures 9, 10: Ptuj, photographs of the frozen Drava, 22nd February 1929. Photo-documentation: Ptuj – Ormož Regional Museum.

much writing in newspapers about the threatening ice on the river Drava, there are only photographs of the event which permit to make a rather good picture of the pending disaster putting the town in danger during the thaw period. If the pontoon engineers had not helped with the mining of the ice thus freeing the bridge, the latter would most probably have been damaged, the town and its suburbs flooded, despite the fact that the embankment had been strengthened with a supportive wall between the traffic and railway bridges on 236 metres between 1897 and 1907.⁵⁸ The building of the bridge was a result of incessant damage repairs after various natural disasters (inundations, severe frost in winters) in the 18th and 19th centuries.

Up to the mid-20th century, another two severe, long and cold winters occurred in 1931-1932, when, on 15th February 1932, the temperature stopped at -24°C ;⁵⁹ there was a thick layer of snow that remained until spring; the second one was in 1940-1941, when in January, in the girls' primary school water pipes and sewage pipes in rest rooms broke, consequently the classes had to be postponed for a few days to repair the damaged pipes. The long and cold winter damaged fruit trees and vineyards. In summer, storms and hail often occurred. Troubles caused by the weather had a very negative influence on harvests.⁶⁰

CONCLUSION

From the beginning of the 18th and until the mid-20th century, many natural disasters hit the town and caused economic damage. That was the time when the Habsburg monarchy led many wars in Europe the money for which was gathered from monarchy's subjects. Numerous levies did not comprise only pecuniary funds, but also goods and human resources (soldiers). Although the then town administration had a system of information and action due to repeated floods and frequent icy winters to quickly resolve the situation after each flood and melting ice, the town needed a lot of energy, will and financial resources to redevelop, and the reconstruction was carried out slow; the renovation processes were also slow due to additional financial burdens rather long.

In 1896 the Municipality of Ptuj decided to build a new Drava embankment between the two bridges (road and railway) in the length of 236 meters. Between 1897 and 1907 river banks were strengthened with supportive walls. With this investment, they protected the lower part of the town from further floods. The Drava embankment with supportive walls between the two bridges protects the lower part of the town Ptuj from floods even in the 21st century.

POVZETEK

Izredni vremenski dogodki so spremljali človekov vsakdan že od nekdaj in spreminjali njegovo okolje. Hude naravne nesreče v obliki intenzivnih vremenskih procesov, kot so suše, neurja, poplave, zmrzali in drugo, so v preteklosti zabeležili mnogi kronisti v kronikah, zajeti so v spisih upravnih ukrepov, v tiskani besedi pa jih omenjajo tudi poročevalci v časopisih. Podatke o izrednih vremenskih dogodkih, ki so jih doživeli Ptujčani, so kronisti zabeležili v vseh mestnih kronikah. Za območje Ptuja je značilno podnebje z izrazitim subpanonskim vplivom s hladnimi zimami in vročimi poletji.

Na Dravi je bil led v hudih zimah velika ovira. Ptujčani niso mogli vnaprej predvideti, kakšno škodo jim bo zamrznjena reka naredila ob odjugu: ali bo poškodovala samo most ali tudi obrežje in v kakšnem obsegu bo poplavlila neposredno okolico mesta. Po vsaki poplavi so morali spodnji del mesta počistiti in poškodovano popraviti, enako pa so morali ravnati tudi tisti meščani, katerih domovi so bili poplavljeni. Mesto je za ponovno ureditev zato potrebovalo veliko energije, volje in finančnih sredstev.

⁵⁸ Vom neuen Drauwai, 4 [online]. Accessible on:URN:NBN:SI:doc-DGXHCJCZ from <http://www.dlib.si> (6th August 2019).

⁵⁹ SI_ZAP/0121/009_00002, Šolska kronika, 1918–1940, 131.

⁶⁰ SI_ZAP/0121/009_00002, Šolska kronika, 1918–1940, 240.

Kronike za 18., 19. in 20. stoletje navajajo zapise o hudih zimah, ledu na Dravi in posledično o poplavah v mestu. Posebno pozornost so meščani namenili zaledeneli Dravi leta 1766. Dogodek je zabeležen tudi na votivni sliki Led na Dravi ptujskega slikarja Franza Josefa Fellnerja. Na nevarne zimske razmere so se zelo skrbno pripravili v letih 1841, 1876, 1880, 1891 in 1929, 1931/1932 in 1940/1941. Ptujsko okrajno glavarstvo je ob vsakokratni zamrznitvi Drave ustanovilo krizni odbor za spremljanje napovedane nevarnosti ter za zaščito in reševanje pred njo. Pripravljeni reševalni ukrepi so vključevali evidentiranje starih, slabih in poškodovanih stavb na Ptuj in na Bregu, ki bi se lahko v primeru nevarnosti poškodovale. V ukrepe so vključili tudi vojsko (pionirsko inženirsko enoto), opazovalne straže, zvočne signale in zbirna mesta za reševalce; gasilci in člani telovadnega društva naj bi se po treh signalnih topovskih streljih zbrali na takratnem lesnem trgu, danes Hrvaški trg, vsi mestni tesarji s svojim orodjem in pomočniki pa na trgu pred mostno mitnico.

Mestna občina Ptuj se je leta 1896 odločila za izgradnjo novega dravskega nasipa med obema mostovoma (cestnim in železniškim) v dolžini 236 metrov. Med letoma 1897 in 1907 sta bila rečna bregova utrjena s podpornim zidom. S to naložbo so zaščitili spodnji del mesta pred nadaljnjimi poplavami. Dravski nasip s podpornim zidom med obema mostovoma ščiti spodnji del mesta Ptuj pred poplavami tudi v 21. stoletju.

SOURCES

Steiermärkisches Landesarchiv Graz (StLA)

1. Statthaltereiviertel IV, K 2511, 70-17/1872, N. 7116/1873.
2. Statthaltereiviertel IV, K 2587, 70-23251/1893, N. 20310/1894.
3. Statthaltereiviertel IV, K 2588, 70-23251/1893, N. 35441/1898.

Zgodovinski arhiv na Ptuj (ZAP)

4. SI_ZAP 0070/00026, Ferdinand Raisp, Kronika mesta Ptuj II, 1888–1898, TE 9, ovoj št. 26.
5. SI_ZAP 0070/00027, Ferdinand Raisp, Kronika mesta Ptuj I, 1857–1887, TE 9, ovoj št. 27.
6. SI_ZAP/0070_00031, Kronika deželnoknežjega komornega mesta Ptuj I, 1873–1913, TE 12, ovoj št. 31.
7. SI_ZAP 0070/ 00033, Kronika nadžupnije sv. Jurija 1732–1849, TE 13, ovoj št. 33.
8. SI_ZAP 0070/00040, Simon Povoden, Meščanska čitanka I, 1821, TE 16, ovoj št. 40.
9. SI_ZAP 0070/00071, Mestna kronika Ptuj I, 1873–1886, TE 28, ovoj št. 71.
10. SI_ZAP 0070/00072, Mestna kronika Ptuj II, 1886–1892, TE 28, ovoj št. 72.
11. SI_ZAP/0121/009_00001, Kronika deške osnovne šole v Ptuj 1899–1959, TE 47, ovoj št. 59.
12. SI_ZAP/0121/009_00002, Šolska kronika dekliške OŠ v Ptuj 1918–1940, TE 47, ovoj št. 59.
13. SI_ZAP/0144/001_00001, Šolska kronika Deške meščanske šole Ptuj 1919–1945, TE 2, ovoj št. 30.
14. SI_ZAP/0110/007_00002, Šolska kronika Osnovne šole Hajdina 1908–1957, TE 53, ovoj št. 141.
15. SI_ZAP 0005/001/00058, MOP, TE 1, št. spisa 245/1880.

Online Sources

16. Austro-Hungarian cadastral plan 1:75.000 (1880-1885) D48 [online]. Dostopno na: <https://gisportal.gov.si/portal/apps/webappviewer/index.html?id=df5b0c8a300145fda417eda6b0c2b52b> [11th August 2020].
17. Nemi zemljevidi. [online]. Dostopno na: <https://www.drustvo-dugs.si/zemljevidi/> [10th August 2020].
18. Pettauere Zeitung (11th January 1891), letnik 2, številka 2. URN:NBN:SI:doc-U3E8FZOR from <http://www.dlib.si> [17th February 2020].
19. Pettauere Zeitung (11th January 1891), letnik 2, številka 2. [online]. Dostopno na: URN:NBN:SI:doc-U3E8FZOR from <http://www.dlib.si> [17th February 2020].
20. Pettauere Zeitung (15th February 1891), letnik 2, številka 7. [online] Dostopno na: URN:NBN:SI:doc-ERKZOGAV from <http://www.dlib.si> [18th February 2020].
21. Pettauere Zeitung (11th March 1891), letnik 2, številka 10. [online]. Dostopno na: URN:NBN:SI:doc-UJYACL5W from <http://www.dlib.si> [18th February 2020].
22. Pettauere Zeitung (21th March 1891), letnik 2, številka 11. [online]. Dostopno na: URN:NBN:SI:DOC-IIXVAXTX from <http://www.dlib.si> [19th February 2020].
23. Slovenski gospodar: podučiven list za slovensko ljudstvo (30th January 1929), letnik 63, številka 5. [online]. Dostopno na: URN:NBN:SI:doc-YN62QK5Y from <http://www.dlib.si> [24th February 2020].
24. Slovenski gospodar: podučiven list za slovensko ljudstvo (6th February 1929), letnik 63, številka 6. [online]. Dostopno na: URN:NBN:SI:doc-QFIGF0JD from <http://www.dlib.si> [24th February 2020].

25. Slovenski gospodar: podučiven list za slovensko ljudstvo (20th February 1929), letnik 63, številka 8. [online]. Dostopno na: URN:NBN:SI:doc-0DNKZK4X from <http://www.dlib.si> [24th February 2020].
26. Slovenski gospodar: podučiven list za slovensko ljudstvo (8th March 1929), letnik 63, številka 10. [online]. Dostopno na: URN:NBN:SI:doc-MOVU8Y9Q from <http://www.dlib.si> [24th February 2020].
27. Slovenski gospodar: podučiven list za slovensko ljudstvo (13th March 1929), letnik 63, številka 11. [online]. Dostopno na: URN:NBN:SI:doc-3LHDDIRA from <http://www.dlib.si> [24th February 2020].
28. Pobrežje. [online]. Dostopno na: <http://www.videm.si/obcina-videm/kraji> [3th February 2020].

BIBLIOGRAPHY

1. Brence, Andrej, Simonič Roškar, Monika, 2017. *Zgodba o goricah in vinu : vinogradništvo na slovenskem Štajerskem in način življenja v Halozah od pojava trne uši konec 19. stoletja do let po drugi svetovni vojni*. Ptuj, Pokrajinski muzej Ptuj - Ormož.
2. Curk, Iva, Curk, Jože, 1970. *Ptuj*. Ljubljana, Mladinska knjiga ; Ptuj, Skupščina občine.
3. Curk, Jože, 1978. *Cestno omrežje na Slovenskem Štajerskem v prvi polovici 19. stoletja*. V: Časopis za zgodovino in narodopisje, let. 49, št. 2, str. 238-268.
4. Felsner, Josef, 1895. *Pettau und seine Umgebung : topografisch-historisch-statistische Skizzen*. Pettau, W. Blanke.
5. Gavazzi, Artur, 1925. *O meteoroloških postajah v Sloveniji*. V: Geografski vestnik, let. 1, št. 1, 55–61.
6. Glaser, Rüdiger, 2001. *Klimageschichte Mitteleuropas. 1000 Jahre Wetter, Klima, Katastrophen*. Wissenschaftliche Buchgesellschaft Darmstadt, Seeheim.
7. Janisch, Joseph Andr., 1885. *Topographisch-Statistisches Lexikon von Steiermark mit historischen Notizen und Anmerkungen II*, Graz.
8. Kolar, Nataša, 2002. *Ptuj v prvi polovici 19. stoletja*. Ptuj, Pokrajinski muzej.
9. Kotnik, Doroteja, 2019. *Muzej mesta Ptuj in njegove zbirke v času nemške okupacije*. V: Zbornik Pokrajinskega muzeja Ptuj - Ormož 6. Ptuj, Pokrajinski muzej, 201–222.
10. Pučnik, Janko, 1980. *Velika knjiga o vremenu*. Cankarjeva založba v Ljubljani.
11. Raisp, Ferdinand, 1858. *Pettau, Steiermarks älteste Stadt und ihre Umgebung*, Graz.
12. Slovenski Pravopis, 2001. Ljubljana, Založba ZRC, ZRC SAZU.
13. Slovenija na vojaškem zemljevidu 1763-1787. 2000. Zv. 6. [Kartografsko gradivo] : karte = Josephinische Landesaufnahme 1763-1787 für das Gebiet der Republik Slowenien. Bd. 6. Karten. Ur. Rajšp, Vincenc. Ljubljana : Znanstveno raziskovalni center SAZU : Arhiv republike Slovenije.
14. Vodnik po fondih in zbirkah Zgodovinskega arhiva na Ptuj, 2009. Ptuj, Zgodovinski arhiv na Ptuj.
15. Šamperl-Purg, 1987. *Trgovina*. V: Kulturne dragotine Slovenije, Zakladi, pričevanja Ptuja in Ormoža.
16. Cankarjev dom – kulturni in kongresni center Ljubljana, razstavišče Arkade, Ljubljana. str. 36 in 37.

Electronic books

17. Baš, Franjo: Raisp, Ferdinand (1818–1898). *Slovenska biografija*. Slovenska akademija znanosti in umetnosti, Znanstvenoraziskovalni center SAZU. [online]. Dostopno na: <http://www.slovenska-biografija.si/oseba/sbi482054/#slovenski-biografski-leksikon> [10th February 2020].
18. Čevelj (0,316 m). *Fran, slovarji Inštituta za slovenski jezik Frana Ramovša ZRC SAZU*, 2014, različica 6.0. [online]. Dostopno na: www.fran.si [24th February 2020].
19. Glazer, Janko: Povoden, Simon (1753–1841). *Slovenska biografija*. Slovenska akademija znanosti in umetnosti, Znanstvenoraziskovalni center SAZU. [online]. Dostopno na: <http://www.slovenska-biografija.si/oseba/sbi453467/#slovenski-biografski-leksikon> [10th February 2020].
20. Glosar za statistiko transporta. Statistični urad Republike Slovenije, Ljubljana, 2004. [online]. Dostopno na: https://www.stat.si/doc/pub/glosar_transport.pdf [2nd March 2020].
21. Krajevni leksikon Dravske banovine (1937). [online]. Dostopno na: URN:NBN:SI:DOC-IHXHRWQE from <http://www.dlib.si> [27th February 2020].
22. Ogris, Darko, 1996. Podnebni tipi v Sloveniji. Digitalna knjižnica Slovenije. [online]. Dostopno na: *Geografski vestnik*, letnik 68, številka 1. URN:NBN:SI:doc-UW4TG97F from <http://www.dlib.si> [10th August 2020].
23. Šalamun, Anton (Šalamun, O. H.) (1896). Ptuj (Krajepisno-zgodovinska črtica). *Dom in svet (Ljubljana)*, letnik 9, številka 10. [online]. Dostopno na: URN:NBN:SI:doc-KM46DBL7 from <http://www.dlib.si> [18th February 2020].

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Mailing addresses / Adresa uredništva:

Hrvoje Petrić (editor/urednik)
Odsjek za povijest, Filozofski fakultet
Ivana Lučića 3, HR-10000 Zagreb
e-mail: hrvoje.petric@ffzg.hr
ili Vinka Vošickog 5, HR-48000 Koprivnica

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