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THE BŁĘDOWSKA AND STARCZYNOWSKA DESERTS AND OTHER AIRBORNE SAND AREAS IN OLKUSZ REGION AS AN EXAMPLE OF MEDIEVAL, RENAISSANCE AND MODERN ECOLOGICAL CATASTROPHE

Abstract: The most known desert in Poland is Błędów Desert ca. 32 km² but it is not the only area of sands near Olkusz town (NW from Kraków, about 40 km). The second one was Starczynowska Desert. There was another one called Ryczowska Desert (Babski Brzuch). Generally the desert area on the border of Silesian Highlands and Polish Jurassic Highland stretched for over 150 km². In the beginning of the 19th century one of the creators of Polish geology in modern times, priest Stanisław Staszic, mentioned Olkusz as the town encircled by unfinished sand sea. The phenomenon of mirages was occurring there.

The desert landscape was unique in whole Europe. The specific geological structure has been of a big importance to the origin of those deserts. The average thickness of the sand layer is about 40–70 meters, which has made fast and deep water drainage very easy. But during centuries there were forests on the top of sands layers. From early medieval period on forests were cut down for industrial purposes. It was when the releasing of sands started thus creating several desert areas between Sławków, Bolesław and Olkusz.

This situation has got very big influence on archaeological excavations. Some archaeological sites from medieval and modern times were covered by 3–4 m thick layer of sand. Interesting remains of medieval mining as pits and washers and also remains of smelting places are still preserved under the sands.

On the other hand, small flint tools, flakes and blades from Mesolithic period were taken from Mesolithic archaeological sites they originated and together with moving sand dunes they were collected in distant places.

From the beginning of the 1970s the deserts were liquidated by introducing special kind of trees from area of Caspian Sea. There are no more wide desert landscapes but recently the programme of partial reconstruction of Błędów Desert for touristic purposes has been started.

Keywords: Błędów desert, Starczynowska desert, Ryczowska desert, mining and smelting of lead and zinc ores, ecological disaster

Exceptional geomorphological situation connected with huge, previously dynamically moving areas of sand can be found along the borderline of Upper Silesia and Lesser Poland. The origin of these areas is a widely discussed subject among scientists. Two theories of the formation of sand deposits have been generally accepted. One of them

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is a fluvio-glacial theory – fluvial and glacial deposits connected with the discharge of glacial waters, and the other is a proluvial-glacial theory – deposits created at the mouth of valleys that were sporadically drained in the glacial period (Szczypek et al. 1994, 11–12). Large sand alluvial fans formed by an inflow of sandy material from the Kraków-Częstochowa Upland would therefore constitute the main part of the sand area. This Upland was a concave nunatak during the Wolstonian Stage. In the eastern part of the Błędownska Desert area, the accumulation of sand was caused by strong periodical inflows of sand-bearing rivers, deposited directly alongside the base of the Jura Cuesta, that is a strip of hills on the eastern borderline of the Błędownska Desert. The deposits of sand are estimated to reach about 205 billion m³.

Sand areas near Olkusz, including the Błędownska Desert, are situated in the south-eastern part of the so-called Silesia-Kraków Monocline. This Monocline consists of geological formations from the Triassic and Jurassic periods and, to a lesser extent, from the Cretaceous. The Monocline constitutes a vast geological area made of rock layers dipping in one direction. It dips at a small angle towards the north-east under Cretaceous formations of Niecka Nidziańska. The so-called Jura Cuesta is closely connected with the formation of the Silesia-Kraków Monocline. In the Klucze region, the Cuesta forms a steep ridge which, at some places, is several dozen metres high (Fig. 1).

The average thickness of the sand layer is about 40–70 meters, which has made fast and deep water drainage very easy (Fig. 2). But over the centuries, there were forests on the top of sand layers. Since the early medieval period forests were cut down for industrial purposes. It was the beginning of releasing sands and creating several desert areas between Sławków, Bolesław and Olkusz.

The last Polish King Stanisław August Poniatowski, after visiting the Olkusz region, gave a depressing account dated 3 July 1787, which is worth quoting here. (...) *Olkusz is the saddest image of rubble, ruins and poverty of burghers sitting over their wealth. Ancient traces of work and affluence of the country ruled by the Jagiellonians are barely visible today under floods of water and piles of wind-borne sand* (Słownik Geograficzny Królestwa Polskiego i innych krajów słowiańskich 1886, 490). In 1815, Stanisław Staszic wrote that Olkusz is surrounded by “*a boundless sea of sands*” (Staszic 1955, 35, 37).

These areas, one of the largest in Europe areas of airborne sands of approximately 150 km² (as measured at the beginning of the 20th century), are or have been separated by forests or fields. The biggest area of airborne sands was called the Błędownska Desert (Szczypek, et al. 1994, 17). Other smaller areas have the names of the Starczynowska Desert (Dziadowe Pole, Dziadowskie Morze) and the Ryczowska Desert (“Babski Brzuch”) (Fig. 3).

At present, the Starczynowska and Ryczowska Deserts are encroached. The Błędownska Desert has also been substantially encroached and this process is constantly being monitored and scientifically studied (Rahmonov 1999).

Apart from the above-mentioned historical airborne sand areas, new such areas are still coming into being. In the region of Bukowno and Bór Biskupi there are con-



Fig. 1. A view of the encroached Błędowska Desert from the Czubatka Hill in Klucze. Photo by D. Rozmus

Fig. 2. Thick layers of sand. Soil interbedding covered with wind-borne sand, visible in the upper part of the profile. Photo by D. Rozmus



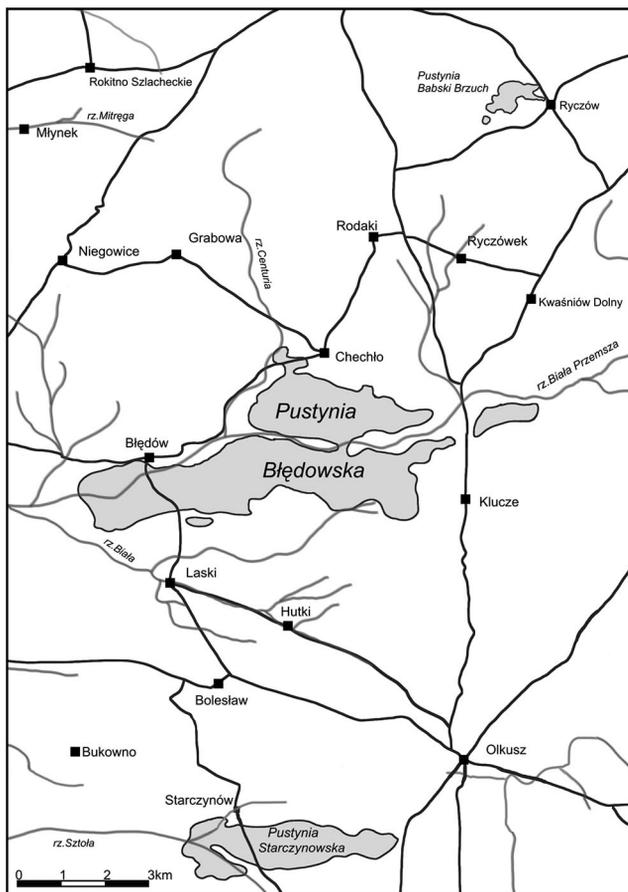


Fig. 3. The Błędowska Desert, the Starczynowska Desert and the Ryczowska Desert „Babski Brzuch” – their location (according to a fragment of a map of the Olkusz region from 1933)

temporary excavations created during the exploitation of sand that remind deserts (Fig. 4). This area has been anthropogenically changed to a great extent. The formation of artificial dunes stimulated a research of shifting of such dunes caused by winds (Szczypek, Snytko 1998; Szczypek, Wach 1991). Shifting sands in this area are currently covering new stretches of land.

The creation of wasteland has been generated not only by industrial exploitation of sand, but also by natural catastrophes such as forest fires (Fig. 5).

Sandy wastelands of the Błędowska Desert have been and still are used as military areas (Fig. 6). During several dozen years of military activities, big numbers of bombs and bullets have been left there.

Some of them are unexploded and constitute a serious problem for visitors, mushroom pickers or people living nearby (Fig. 7).



Fig. 4. The 20th century views of sand areas in the region between Bukowno, Bolesław and Bór Biskupi – western borders of the former Starczynowska Desert. Photo by D. Rozmus



Fig. 5. Stumps of burnt trees after a fire in the region of Bukowno in 2012. Photo by D. Rozmus



Fig. 6. Landing made in May 2012. Photo by D. Rozmus



Fig. 7. A pile of mortar missile parts collected while clearing the desert of explosives. Photo by D. Rozmus

Sand areas partly overlap with regions of ore-bearing dolomites. The dolomites contain ore of such metals as lead, silver, zinc and iron (Fig. 8).

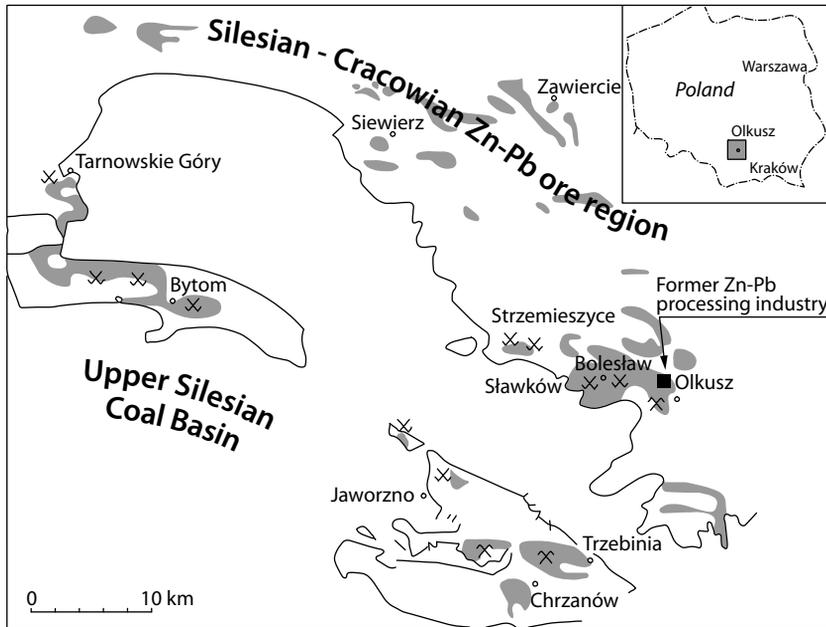


Fig. 8. A diagram of the biggest concentration of ore-bearing dolomites

Lead, silver and iron were important in the Middle Ages. Zinc ore started to be extracted on a larger scale only in the 19th century. The basic lead ore consists of chemical compounds called blue lead, galena or lead glance. These are lead sulfides (PbS). Other compounds that are the products of weathering and other chemical reactions that galena undergoes in nature, are also of some, however relatively small, importance. These are carbonate ore – cerussite ($PbCO_3$) and lead sulfate – anglesite ($PbSO_4$). According to T. Dziekoński, it can be assumed that metallurgy in the old times was mainly based on the processing of galena (Dziekoński 1963, 271). Another component – extremely desirable over the ages – accompanies lead ores as an impurity: silver. Up to 70% of lead could be obtained from the richest deposits, whereas waste and of course silver accounted for the rest. The assessment of the content of particular metals in the ore are varied and, depending on the quality of a given deposit, may fluctuate considerably. There are lead ores – sulfides, in which the content of lead substantially exceeds 80%. The content of silver in ores varies and may reach up to 2.5–2.7%. It is usually silver sulfide – argentite (silver glance – Ag_2S).

The occurrence of minerals that were so desirable caused the development of an industrial region focused on the production of silver and lead (figure no. 9) in the early Middle Ages (Bodnar, Rozmus 2004, 9–60; Karbowniczek, Suliga 2005, 135–143;

Bodnar, Rozmus 2004, 301–305; Rozmus 2006, 105–111; Rozmus 2007, 45–55; Rozmus, Szmoniewski 2008, 323–330; Rozmus 2014).

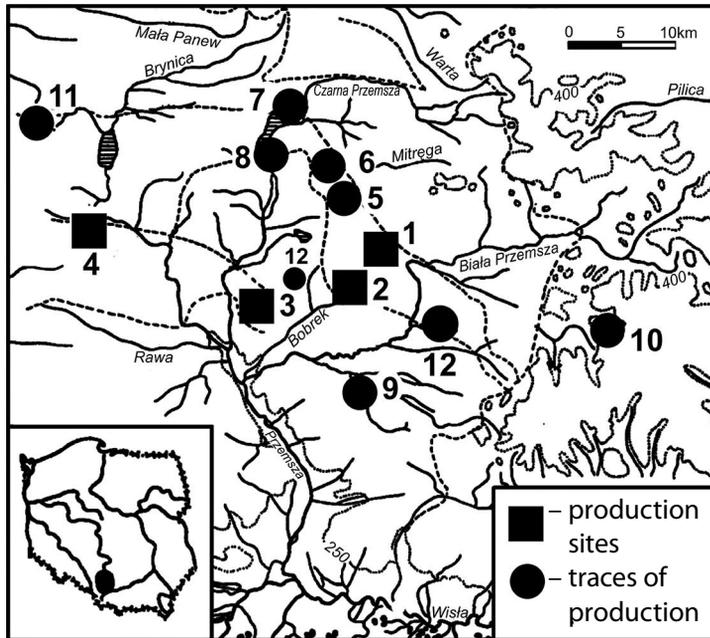


Fig. 9. Schematic marking of towns and places connected with smelting sites, traces of lead production and historical sources mentioning the production of silver and lead from the 11th to the 13th centuries. 1 – Dąbrowa Górnicza-Łosień st. 2 i 8; 2 – Dąbrowa Górnicza-Strzemieszyce Wielkie; 3 – Sosnowiec-Zagórze; 4 – Bytom; 5 – Dąbrowa Górnicza-Tuczna; 6 – Łazy-Chruszczobród; 7 – Siewierz; 8 – Przemyśl; 9 – Jaworzno; 10 – Olkusz; 11 – Tarnowskie Góry; 12 – Stare Bukowno

It is assumed that the process of deforestation on the territory of the Błędowska Desert and other sandy areas started in the 12th century. This chronology has also been accepted, although not universally, by geographers (Szczypek, Wika 1995, 167). The deforestation resulted in exposing vast areas of postglacial fields of gravel and sand deposits (Szczypek et al. 2001, 7, 11). Clearing forests for metallurgy (fuel) and mining (shaft lining) released airborne sands and led to the creation of sandy areas. Pasturage of livestock on the deforested areas might have considerably contributed to it as well. The largest forest clearing most likely took place in the 16th – 17th centuries. Several earlier sources mention the issues of acquiring wood (Molenda 1991, 449).

Summing up, we can assume that human activities lead to the degradation of soil formed on sands and to a lesser extent on loess after the last glaciations (Nowak 1978, 4). Wood was used in mines as shaft and heading lining, and then for the construction of drain adits (compare Fig. 10) and washers, whereas in smelting plants it was mainly used as fuel.

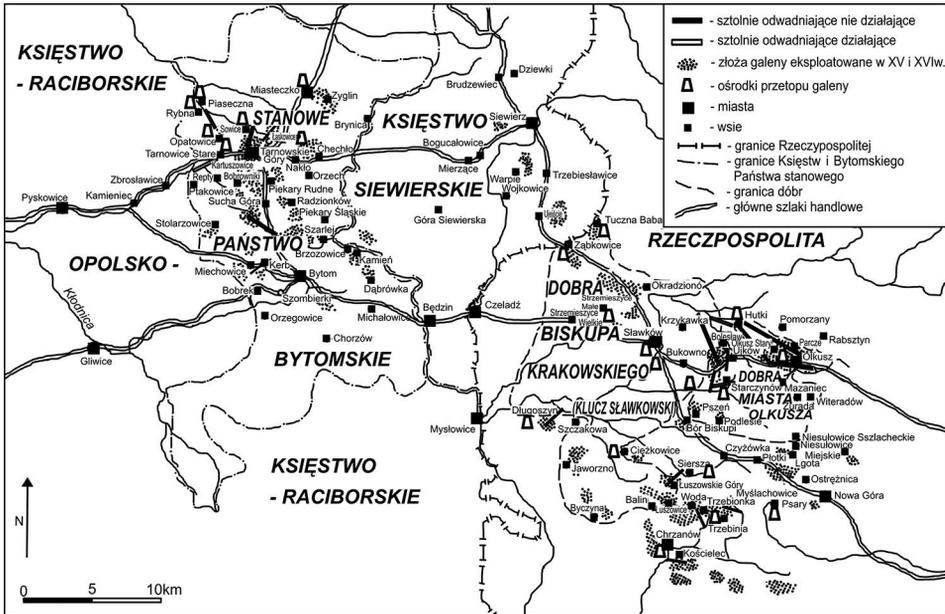


Fig. 10. Drain adits on the territory of Silesian and Kraków deposits in the 16th and 17th centuries (after D. Molenda 1978, 166)

Shortages in wood supplies were frequently the reason for stoppages and even slumps in the production of metals and building of new shafts. Wood was an expensive resource, therefore as early as in the Middle Ages, European mining authorities ensured miners free usage of forests belonging to the head of the mining industry in a given area (Molenda 1991, 445). It constituted one of the basic rights of coal miners. Of course, they did not obtain the right for free, they had to pay a duty for this (compare contemporary concession fees). Wood for mines and smelting plants could have also come from the forests of the current owner of the land where the deposit was mined. A small compensation was usually paid for it. Old-time coal miners from Olkusz, Sławków or Tarnowskie Góry used to have this right (Molenda 1963, 126). The wood was also obtained by way of trade from gentry forests, for example from Bolesław and from the estate of the Kraków bishop situated near Olkusz (Sławków dominion). We can say that vast forests near Olkusz fully met the demand of local mining and smelting... until finally the resources of wood were depleted. Historical sources also mention other hamlets that supplied wood, such as Błędów, Chechło, Okradzionów or Ryczów (Molenda 1991, 456). The latter town was surrounded by an area of airborne sands. Problems with wood supplies occurred in all medieval and contemporary mining centres in Europe. Wood trade was not only the issue of a local market, but it was also traded internationally (Molenda 1991, 519–525).

Such excessive exploitation of wood resources eventually lead to depletion and transformation of large areas into deserts. *Forests and groves are cut down as huge*

amounts of wood are needed for lining, machines and ore smelting. If forests and groves are cut down, birds and animals move out... as Georgius Agricola wrote in the 16th century (Agricola 2000, 15). And in view of all those facts, who can claim that ecological catastrophes happen only in the 20th-century economy?

Finally, in the vicinity of Olkusz alone, between areas that can be considered as deserts (the Błędownska Desert and the Starczynowska Desert) spread vast wasteland with the traces of mining exploitation (Fig. 11, 12).

Another consequence of the formation of sand areas is wind-borne sand movement in the form of strong sandstorms and dune movements.

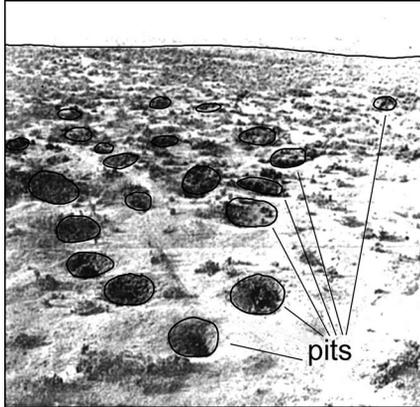


Fig. 11. Mining shaft holes west of Olkusz – according to a photograph from the 1960s. The edges of the holes in the foreground have been outlined (after *Dzieje Olkusza i regionu olkuskiego* 1978, 176)

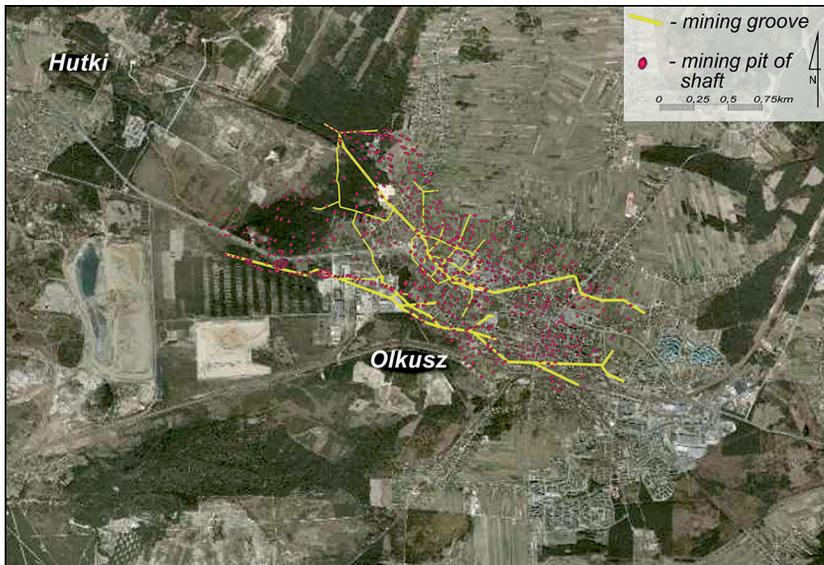


Fig. 12. Grooves system and pits of shafts near town Olkusz – compilation according to different publications (after Świć E., Chojnowski J.R., Niewdana J. 2014, map; Krygier *et al.* 1971, 107)

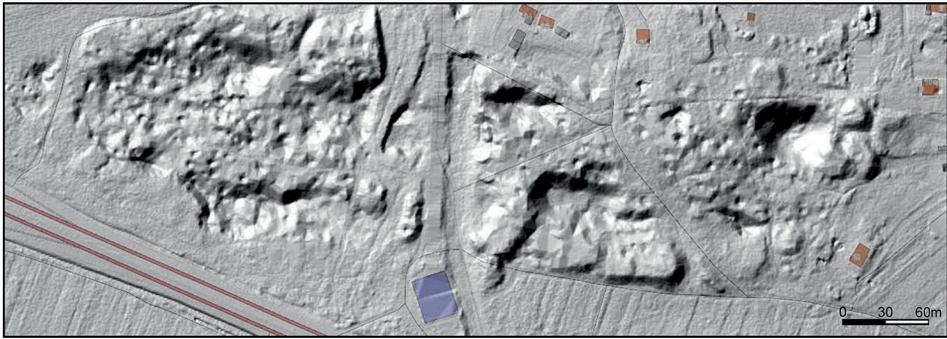


Fig. 13. Mining shaft holes – Strzemieszyce Wielkie (medieval and early modern time) and the mining Anna from (the end 19 century)

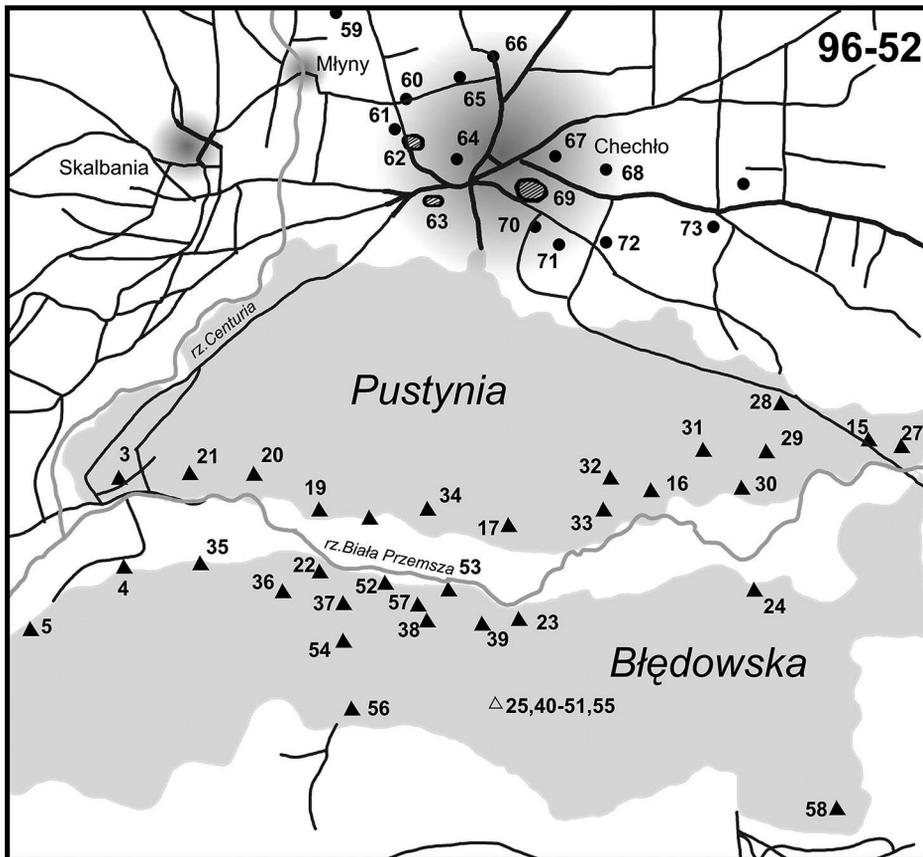


Fig. 14. A diagram showing the location of archaeological excavation sites in the channel of the Biała Przemsza (White Przemsza) River

The Błędowska Desert has aroused the interest of archaeologists over the past years. Leon Kozłowski and Bolesław Ginter were among those who made a reconnaissance, and Jacek Pieprzak and Emil Zaitz conducted AZP examination of the Błędowska Desert as well as nearby towns of Chechło and Błędów. On the territory of the Błędowska Desert itself, 51 archaeological excavation sites were found. They were situated in the immediate vicinity of the Biała Przemsza (White Przemsza) valley, in a strip of land of the width of 200–300 metres on both banks of the river. These were the sites where single flints that must have been worked by people were found, and also small deposits of flint artefacts. The chronology of these sites ranges from the late Paleolithic (11 sites), through the Mesolithic (25 sites) to the (5 sites) Neolithic (Roś 2007, 18–19). Some of the sites are probably traces of travelling hunters' camps that had been pitched on sandy dunes along the Biała Przemsza (White Przemsza) valley, which presumably constituted the axis of their routes (figure no. 14). Unfortunately, we are not sure that – especially in case of small flint artefacts – they are in situ and show the places where our old ancestors were staying. They may have been deposited in those places with moving dunes.

The situation of medieval and modern sites is even more complicated due to thick layers of wind-borne sands on top of layers from medieval and early modern periods. The thickness of the sand layer varies between 60 cm and 300 cm. (Rozmus, Roś 1999, 52; Rozmus 2011, 8–14). The soils covered by wind-borne sand were described in the literature on natural environment (Rahmonov 2007, photograph 15 on p. 101). Somewhere under the sands lies the hamlet Stary Olkusz (Old Olkusz) which in all likelihood is a different settlement than the burgh in Stary Olkusz (Old Olkusz).

Apart from abandoned villages and possibly cemeteries, sands also covered elements of medieval mining and smelting infrastructure (Fig. 15) and beams of unknown structures from early medieval period – 8/9th century (Fig. 17)¹ as well as marshes with elements of also unknown structures sunk in them in prehistoric times (Fig. 16). The beams visible in the photograph (Fig. 16), that were discovered during the reconnaissance by B. Szmoniewski i D. Rozmus, have two radiocarbon dates assessing their age at approximately 5000 years².

However paradoxical it sounds, the effects of anthropomorphic ecological catastrophe lasting for ages became an opportunity for modern archaeology.

At the beginning of the 21st century, an idea emerged to recreate at least part of the Błędowska Desert and this undertaking aimed at the development of tourism in Dąbrowa Górnicza region and in the Klucze commune. However, when taking such a decision, we must be aware of the consequences of the existence of airborne sands close to densely populated areas.

¹ Analyses were performed by M. Krąpiec – Hutki 2013/MKL – 22004, Laboratorium Datowań Bezwzględnych Cianowice, Skała.

² ¹⁴C test results have not been published yet and the author had access to them thanks to the courtesy of the person commissioning the testing.



Fig. 15. Hutki near Boleslaw and Olkusz. Parts of an industrial structure dated with the use of dendrochronological dating for the beginning of the 14th century, covered with a 1,5 - 3-metre layer of wind-borne sand. This discovery was possible thanks to the exploitation of a sand pit wall. Photo by D. Rozmus



Fig. 16. Beams made of trees that were cut down approximately 5000 years ago – according to two radiocarbon date. Hutki near Boleslaw and Olkusz. A part of a covered peat bog – a probe of 16m², condition as on the year 2011. Photo by D. Rozmus



Fig. 17. One of the beams made of trees that were cut down approximately 1300 years ago – according to two radiocarbon date (Krapiec 2013). Hutki near Boleslaw and Olkusz. Photo by D. Rozmus



Fig. 18. Hutki near Boleslaw and Olkusz. In this place there were found beams from ancient and early medieval period. Photo by F. Rozmus

Earlier accounts can be the best source to find out what to expect. “*Current wind activity causes the formation of dunes on forested edges of deserts or, in places where there are no trees, sands move without forming dunes and they are lifted to levels that are much higher than the original level of sand plains*” (Lewiński 1914, 39). According

to other accounts, big dunes and cones pile up under wide-stretching pines in the Starczynowska Desert, and raging sand storms form whirlwinds and clouds of sand. Until recently, strong sand storms called “kurzawki” covered fields and even railways with sand. A special group of railway workers cleaned railway tracks covered with sand after sand storms in order to prevent possible catastrophes. We have numerous descriptions of such situations both in local written sources and in novels (Szczygieł 1982, 219).

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