

## Oblast Konin

Adam Bajcar, Jacek Szczepiński, Barbara Rogosz, Marta Resak, Kamil Piróg

„Poltegor – Institute“ Institute of Open-cast Mining, Department of Mining, Parkowa 25, 51-616 Wrocław, Poland

Přijato: 3. 7. 2020, recenzováno: 25. 8. 2020, 3. 9. 2020

### Abstrakt

Pouze jedna společnost těžící hnědé uhlí má v Polsku zkušenosti se vznikem jezer v těžních jámách, je to společnost KWB Konin ve středním Polsku. Ostatní těžební společnosti těžící hnědé uhlí v současné době využívají svá ložiska a vznik jezer v jámách po těžbě plánují. V pávni Konin byla těžba hnědého uhlí zahájena ve 40. letech 20. století. Do dnešního dne bylo vytěženo a zaplaveno sedm povrchových dolů, dva jsou právě napouštěny a po dokončení těžby hnědého uhlí se plánuje zatopení dalších tří. Dále je uveden krátký popis všech současných zbytkových jezer v oblasti Konin a jejich užitečnost pro projekt RAFF.

### Konin area

In Poland only one opencast lignite mining company have experience in creating pit lakes, KWB Konin in central Poland. Other lignite mining companies are currently exploiting their deposits and plan to create pit lakes in final pits. In the Konin Basin exploitation of lignite started in the 1940s. Up to the date seven final pits have been completed and flooded, two are during flooding and three more are planned to be flooded after completion of lignite excavation. Short description of all present pit lakes in the Konin area and their usefulness for the RAFF project is presented below.

### Gebiet Konin

Lediglich eine braunkohlefördernde Gesellschaft in Polen verfügt über Erfahrungen mit der Entstehung von Restlochseen, es ist die Gesellschaft KWB Konin im mittleren Polen. Sonstige braunkohlefördernde Gesellschaften nutzen gegenwärtig ihre Lagerstätte und die Entstehung der Seen in Restlöchern nach dem Einstellen des Kohleabbaus planen. Im Becken Konin wurde die Braunkohleförderung in 40er Jahren des 20-ten Jahrhunderts angefangen. Bis zum heutigen Tag wurde sieben Tagebaue ausgekohlt und geflutet, zwei werden geradezu gefüllt und nach der Einstellung des Braunkohleabbaus wird geplant, weitere drei Tagebaue zu befluten. Weiter werden alle gegenwärtige Restlochseen im Gebiet Konin und ihre Nützlichkeit für das Projekt RAFF kurz beschrieben.

Klíčová slova: jezera po ukončení těžby, oblast Konin, povrchová těžba, Polsko.

Key words: post exploitation lakes, Konin area, open-pit mining, Poland.

### **1 Morzysław open-pit**

Lignite from the Morzysław open-pit was already extracted during the Second World War, but the exploitation of the deposit at an industrial scale began in 1945. Initially, the raw material was sold to the local population, from 1946 briquettes were

produced from it. Lignite was also used to produce electricity for the needs of the mine and city. The open-pit operated until 1953, it extracted 1 million tons of lignite. At the site of the former excavation there is today a 700-year anniversary park with recreational areas and a sports centre. Difficulties with



Fig. 1: Morzysław open-pit during lignite exploitation (KWB Konin).



Fig. 2: Flooded Morzysław pit.

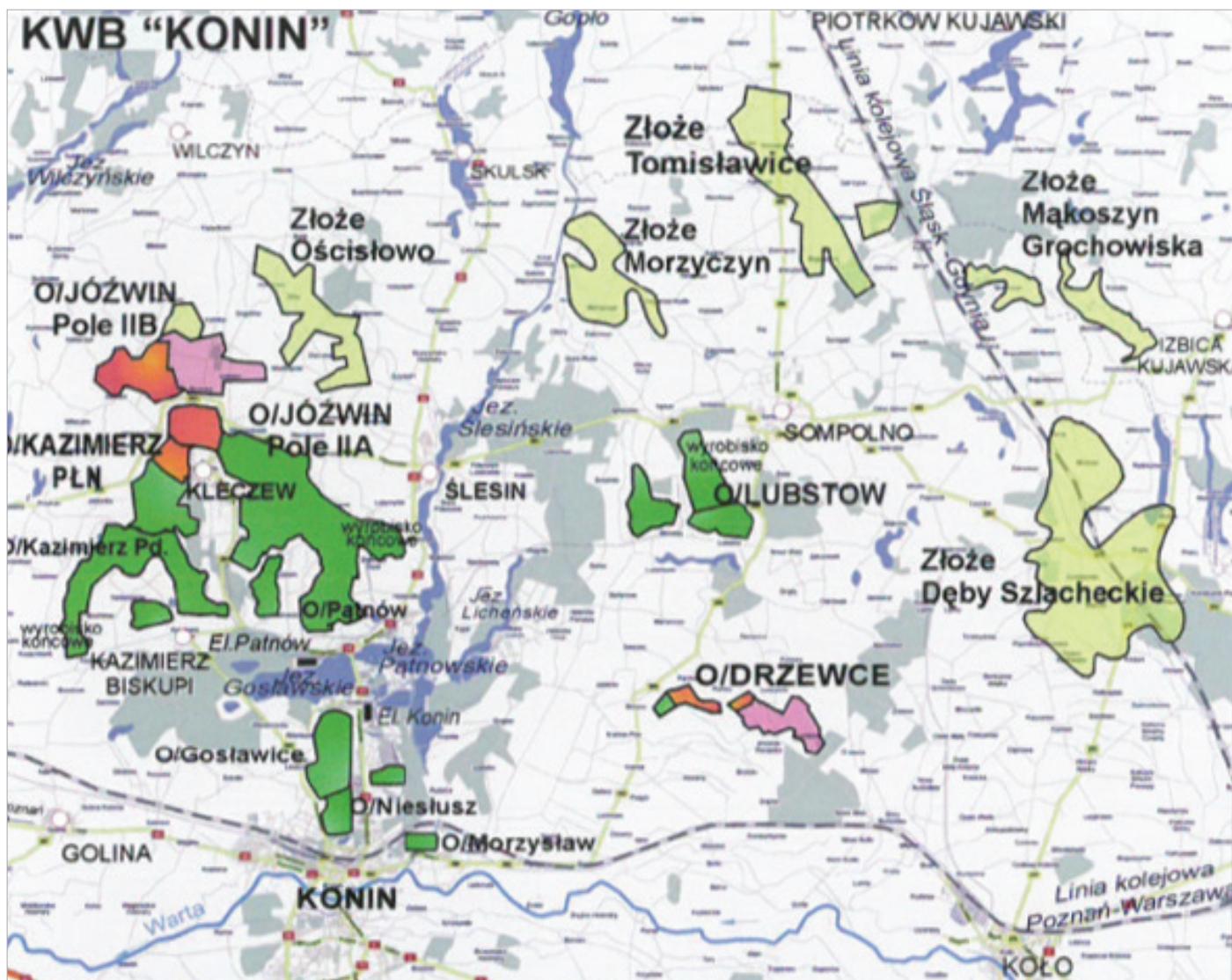


Fig. 3: Open-pits in Konin area (Kasztelewicz, 2010).

obtaining data according to the processes of mining and later on flooding exclude this site from being considered in later stages of the RAFF project.

## 2 Niesłusz open-pit

The resources of the small deposit Morzyśląw quickly ran out, then the exploitation of the second open-pit began - Niesłusz. It operated in the years 1953-1961, during which 4 million tons of lignite was extracted.

Starting the open-pit required drying of Niesłusz Lake and cleaning its bottom of silt.

After the end of lignite mining at the excavation site, the mine prepared a basin, which was initially intended to be used to build a sports field. However, eventually, the Zatorze Lake was created at a similar size as the former reservoir (18.5 ha). The lake's surroundings have been interestingly developed - there are walking paths, bicycle paths and playgrounds. The former mining area has been reclaimed and is an attractive recreational area for the residents of the Zatorze estate. A shopping complex and allotments were also built in the area.

Difficulties with obtaining data according to the processes of mining and later on flooding exclude this site from being considered in later stages of the RAFF project.



Fig. 4: Niesłusz open pit during exploitation (KWB Konin).



Fig. 5: Flooded Niesłusz open-pit.

### 3 Gosławice open-pit

The Gosławice open-pits operated in the years 1957-1974, almost 39 million tons of lignite was extracted from it. It was the first Konin open-pit to use modern machines at that time - large-scale excavators and stackers with high efficiency, and the transport of raw materials was also modernized.

In one final pit, the Czarna Woda Lake with an area of 32.5 ha was created. The area around the reservoir was aligned and planted with trees and bushes. The reservoir and its surroundings are a popular recreational place for the inhabitants of Konin city. Next to the Czarna Woda lake there is also a smaller reservoir (3.8 ha), created in a place of the industrial water settler from the briquetting plant. In the final pit in the north part of Gosławice field storage of industrial wastes was created. These wastes were collected from aluminium smelter (aluminium oxides) and neighbouring Pątnów power plant (furnace ashes). This lake is forbidden to swim and other non-industrial activities. The deposition of industrial wastes in this pit lake exclude it from later stages of the RAFF project.

### 4 Pątnów open-pit

After the construction of the Konin Power Plant in 1958 and the Pątnów Power Plant in 1967-69, there was a clear increase in demand for lignite. It was necessary to launch further open-pits. The first was Pątnów open-pit, which began mining in 1962, ended it in 2001. At that time, almost 130 million tons of lignite was extracted.

In order to meet the needs of the power plant and increase production, new machines were purchased: Rs 400 and D 1120 excavators and the As 1120 stacker. Underground drainage operated until 1996, the longest in all KWB Konin's mines. Four main shafts 38-69 m deep operated at this site. Underground drainage pavements in Pątnów were 102 km long.

The area of the Pątnów open-pit was subjected to forest and agricultural reclamation. A water reservoir with an area of 360 ha was created in the final pit.

During flooding of the Pątnów open-pit unwanted phenomena occurred (2005). The landslide on the extensive section



Fig. 6: Gosławice pit lake partially filled with industrial wastes (Google Maps).

of the final slope of the „Pątnów” open-pit was initiated by local suffusion-erosive washings. The landslide developed after cessation of drainage of the section where the final slope crossed the unrecognized extensive erosion trough. After limiting the deep drainage, concentrated outflows appeared on the slope in the eastern and western parts of the section corresponding to the erosion troughs. On the eastern slope they led to the creation of a landslide threatening the areas adjacent to the excavation.

The formation of weakening zones in the slope caused by washout of the soil led to the formation of hydraulic punctures in the lower part of the slope intensifying the process of lifting material from the slope.

Continuous removal of the material from the slope led to changes in its geometric conditions. Caverns after reaching critical sizes led to the detachment of the material above them. The detached block of soil by cohesive forces also led to the tearing out of adjacent masses.

The first signal of a global change in the stability conditions of the slope was a surface lowering due to the subsidence of the

layers in places from which the material was previously removed by the water flowing into the final pit (Fig. 8).

The next stage of slope degradation was the dislocation of the slope fragment towards the excavation (Fig. 7) continued by landslides resulting from the outflow of material into a landslide covering the entire eastern slope region of the Pątnów final pit (Fig. 9).

The whole process of exploitation, final pit preparation and phenomena occurred during the flooding is very good documented but in 2014 the flooded pit lake was sold and now it is a private property. Due to this fact it is impossible to perform bathymetry. This exclude this pit lake as a research site in the RAFF project, but knowledge gathered from the data will be helpful during later stages of the project.

## 5 Kazimierz open-pits

Mining activities in the Kazimierz open-pit continued from 1965 to 2011. The open-pit was exploiting the Pątnów III deposit, from which 131 million tons of raw material was extracted. The area was divided into two fields: Kazimierz Południe, where the mining was completed in 1997, and Kazimierz Północ, which operated until 2011.

In the Kazimierz open-pit, as the first among the KWB Konin mines, an ECT technological system (excavator - conveyor - stacker) was used for overburden and lignite transportation. The new technology increased the working time of excavators and stackers, reduced the cost of maintaining railway tracks, reduced electricity consumption and significantly reduced transport time. Later, it was introduced at other open casts.

Tab. 1: Basic characteristics of Konin area post exploitation lakes. Years of exploitation are given in brackets after the name of the open-pit.

<b>Morzyław (1945-1953)</b>	
Pond in the park	2.5 ha
<b>Niesłusz (1953-1961)</b>	
Zatorze Lake	18.3 ha
<b>Gosławice (1957-1974)</b>	
Czarna Woda Lake	32.5 ha
<b>Pątnów (1962-2001)</b>	
Pątnów Lake	360 ha
<b>Kazimierz (1965-2011)</b>	
Południe	65 ha
Północ	520 ha*
<b>Józwin (since 1976, still active)</b>	
Malta Bis Lake	9 ha
<b>Drzewce (since 2005, still active)</b>	
Bilczew Lake	33 ha
<b>Lubstów (1982-2009)</b>	
Lubstów Lake	480 ha*

\* flooding not-finished



Fig. 7: Lowering of the slope surface (Bajcar 2007).

The reclaimed area of Kazimierz Południe pit occupies 110 ha. A water reservoir of 65 ha was created there, divided into two parts, whose slopes were reinforced with geotextile and geogrid. In the area of the reclaimed internal dump there is the airfield of Konin Aero Club. According to the land development plan, in the area of the Kazimierz Północ open-pit, a 520 ha water reservoir will be created in its final pit.

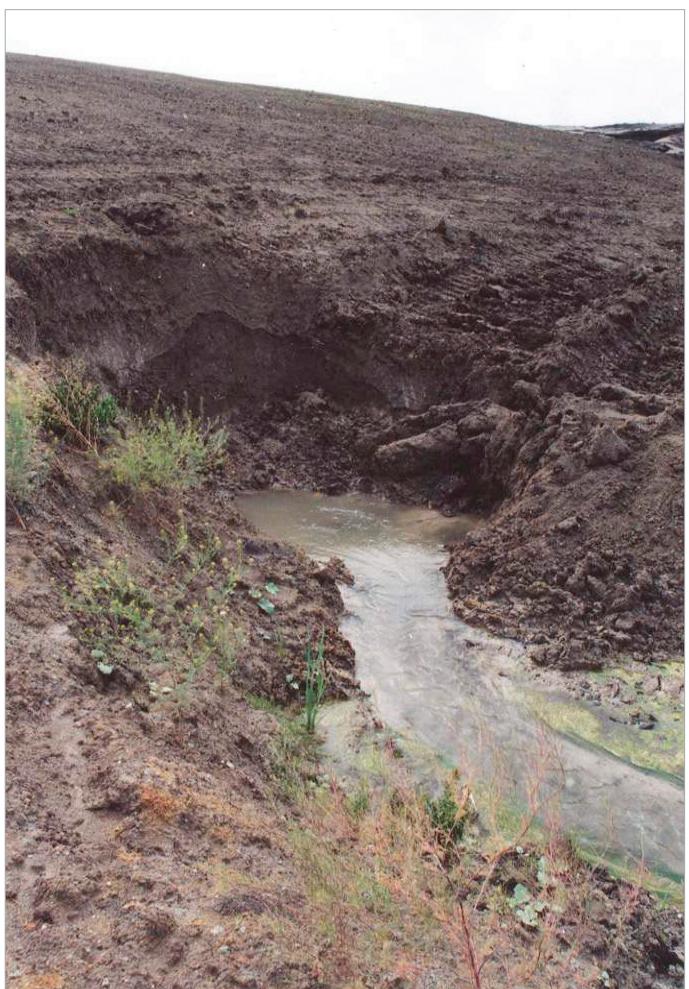


Fig. 8: Watercourse at the intersection of the slope plane with the erosion trough (Bajcar 2007).



Fig. 9: General view of the landslide (Bajcar, 2007).



Fig. 10: Reclaimed area of the Kazimierz open-pit. (Kasztelewicz, 2010)

Although mining and reclamation works from the 1980's and later are quite well documented, there is lack of data regarding the earlier activities and thus this site will be treated as an auxiliary test site in the RAFF project.

## 6 Józwin open-pits

Lignite from the Józwin open-pit has been mined since 1971, so it is currently the oldest active KWB Konin open-pit. Initially, lignite production was carried out in Józwin I pit from the Pątnów II deposit, then in Józwin II A pit in the northern part of the Pątnów III deposit. Mining from the Pątnów IV deposit has been ongoing since 1999, at the Józwin II B open-pit. Operation will continue until 2020. When removing the overburden,

the excavation works, among others, the largest excavators in Konin mines- two machines of SRs 1800 type.

The area of the Józwin II A open-pit was reclaimed in the recreation and sports direction - with use of the EU funds a Recreation and Physical Activity Park was created there. The recreational complex, called by miners „Malta Bis” includes a water reservoir with a beach, floating platforms, a water equipment rental store, an amphitheatre and numerous walking and cycling paths, a rope park, quad bike routes, a children's playground, a sandy playground and a grill hut. The „Kleczewska Malta” Hostel with 25 beds has been opened in the former dispatch building nearby.

The Józwin open-pits are either already reclaimed or active pits, so there is no possibility to perform there all activities foreseen in the RAFF project. However, taking into consideration that the final mining activities (preparation of the final pit) in one of the pits will start soon, it should be possible to obtain new information about this process.

## 7 Drzewce open-pits

The Drzewce open pit opened in 2005 and it consists of three fields: Bilczew Field, Drzewce A and B Fields. Until the end



Fig. 11: The Józwin open-pit during mining operations (KWB Konin).



Fig. 12: Reclaimed area of the Józwin open-pit (Recreation and Physical Activity Park) (KWB Konin).



Fig. 13: View of the Bilczew Field of the Drzewce open-pit with the recently formed lake ([www.geoportal.gov.pl](http://www.geoportal.gov.pl)).

of 2019 29 million Mg of lignite was extracted there. Excavation in two out of three fields is already finished. The reclamation of the Bilczew Field is already completed and the reclamation of the Field A (forest planting) is in progress. The Field B remains an active pit since 2015. Almost from the beginning of the Drzewce open pit's operations, reclamation works have been carried out – trees such as pine, birch and black locust were planted. The western area of the Bilczew Field is therefore reclaimed as forest. However, at a request of the local municipality of Kramsk, the further reclamation was partly changed from forest planting to creation of water reservoir. The water reservoir is located in the eastern part of the Bilczew Field and has an area of 33 ha. Its filling with water took several years.

According to the reclamation plans of the Drzewce pit, there will be one more water reservoir – in the final pit of the still active Field B.

## 8 Lubstów open-pit

The Lubstów open-pit operated from 1982 to 2009 and during this time 107 million tons of lignite was mined. At the end of the 20th century 40% of Konin lignite came from this area. The Lubstów deposit was characterized by the thickest lignite seam in the Konin Basin, the thickness of the seam reached up to 90 m. In 1990 it was the deepest lignite mine in Poland, reaching –55 m asl at +103 m asl.

All processes regarding mining, reclamation, ongoing flooding are very well documented. The area is a property of KWB Konin, thus this site will be considered as a primary study area in the Konin Basin, and most of the RAFF project activities in Poland are to be carried out there.

More detailed description of the Lubstów site is given in a following subchapter.

## Acknowledgments

This research was supported by Research Fund for Coal and Steel (RFCS) and Polish Ministry of Science and Higher Education, project 847299 RAFF - Risk Assessment of Final pits during Flooding.

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