Wetland Conservation Center

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Impact of the planned coal mine exploiting the Sawin deposit on the underground and surface waters in the area of wetland complexes of Bagno Bubnów, Bagno Staw, and Krowie Bagno

– a summary

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Due to the plans of the new bituminous coal mine to be developed in the environmentally precious Polesie region of SE Poland (within the Sawin bituminous coal deposit), Wetlands Conservation Centre together with Wetlands International European Association and EURONATUR have commissioned an expert opinion on the possible impact of such mine on groundwater to assess its influence on wetland ecosystems in the area.

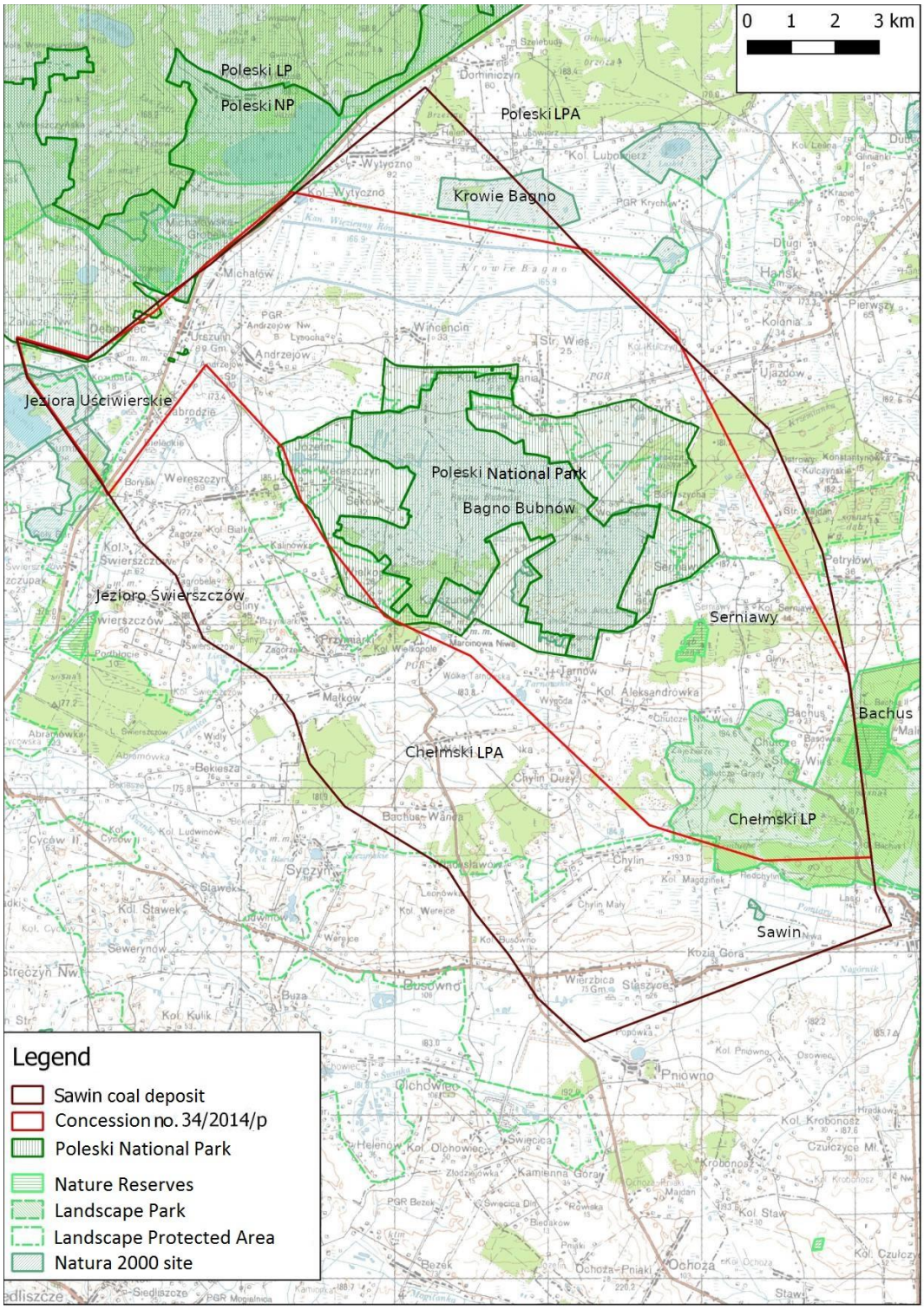
The Sawin bituminous coal deposit is located within the Lublin Coal Basin and has an area of 227.7 km^2. On 29 December 2014, the Minister of the Environment issued a concession no 34/2014/p for prospecting the Sawin bituminous coal deposit. Under this concession, four boreholes are planned to be drilled to the depth of 750 metres, borehole and laboratory tests are to be carried out, and geological documentation is to be prepared.

Bagno Bubnów. Photo by Andrzej Różycki, LTO

Ecological assets of the area

Many nature conservation areas with different levels of protection are found exclusively or partially within the borders of the deposit, including Poleski National Park, five Natura 2000 areas included in the Habitats Directive (Serniawy PLH060057, Bachus PLH060056, Krowie Bagno PLH060011, Sawin PLH060068, Jeziora Uściwierskie PLH060009), two Natura 2000 areas included in the Birds Directive (Bagno Bubnów PLB060001, Polesie PLB060019), two nature reserves (Sereniawy, Bachus), a landscape park (Chełmski Park Krajobrazowy) and a landscape protection area (Chełmski Obszar Chronionego Krajobrazu), as well as the West Polesie Transboundary Biosphere Reserve (Biosphere Reserve of the MAB UNESCO Programme). The main conservation objective of most of the abovementioned areas is the protection of ground- and surface water-related wetlands (fen mires, swampy forests, and lakes) and associated flora and fauna (including the largest Polish population of the globally threatened aquatic warbler *Acrocephalus paludicola* outside of the Biebrza Valley). High and stable groundwater levels in the area are crucial for the maintenance of favourable status of the abovementioned ecosystems and associated species, and any change in surface or sub-surface

hydrology would lead to their deterioration or even complete destruction (in case of severe water table drawdown or rise). Moreover, the whole area of the deposit is located within the borders of one of the nationally designated Main Groundwater Reservoirs (no 407 – the Chełm-Zamość Reservoir), having strategic importance for the country's water management.



Protected areas in the borders of Sawin bituminous coal deposit.

Geology

The area lies within the East European Platform with a series of sedimentary rocks lying flat one over another. Coal-bearing formations in the area are Upper Carboniferous rocks (mostly sandstones) overlaid directly by relatively thin (56.8-154.4 m) Middle and Late Jurassic sandstones and limestones above which are placed thick (406-563 m) Cretaceous deposits reaching the surface in many places within the area. Lower Cretaceous is represented by sands and sandstones, but most of the Cretaceous profile is built by Late Cretaceous limestones, marls, and chalk. Due to their porous structure with many cavities, those rocks constitute the main water-bearing formation in the area (designated as the abovementioned Main Groundwater Reservoir). This aquifer is isolated from below from the Lower Cretaceous sands but is often in contact with surface and subsurface waters of the Quaternary deposits. The youngest deposits in the area are mostly Quaternary ones (mostly Pleistocene fluvioglacial sands and lake silts with some glacial till, as well as Holocene peat) covering the Cretaceous limestones with a layer 0.4 to 43.4 m thick. Those deposits are bearing the uppermost groundwater deposits feeding the water-dependent ecosystems in the area, among them all the valuable and protected ones.

Threats resulting from coal mining in the area

Construction of a coal mine within the area would require drilling shafts, a groundwater abstraction from the Carboniferous strata, and its release to the surface waters, as well as demolition of the unused tunnels (after partial exploitation of the deposit), which could be left to collapse. It would also lead to oxidation of coal deposit around the mine, and thus to oxidation of the sulphur and subsequent acidification of the groundwater. All of the abovementioned activities can have a severe negative impact on the ground- and surface waters, and thus on all the water-dependent ecosystems, as well as on the groundwater deposits of the strategic Main Groundwater Reservoir no 407. Mine-associated drainage of the Carboniferous aquifer can lead to the ascendance of deeper waters of Devonian origin, which are highly mineralised (up to 81 g/dm^3) and rich in chlorides. This, coupled with the aggressiveness of acidified waters from around the mine, dissolving the mineral content of the surrounding rocks, may lead to severe salinization of the mine water released to the environment, and its enrichment in heavy metals (e.g. arsenic, cadmium, copper, lead, nickel, mercury) and radionuclides (e.g. uranium and thorium). An even greater threat to the water-dependent ecosystems is related to the changes in groundwater levels around the mine. Drainage of mine waters will result in the formation of a potentially massive cone of depression – for example, around the only coal mine functioning in the vicinity (in similar hydrogeological conditions), the Bogdanka mine, a cone of depression is estimated to cover 260 km^2. Drilling shafts through the sands of the Lower Cretaceous may result in their downflow along the shaft, thus creating depressions resulting in cracking of the Upper Cretaceous rocks. This will allow for a contact between the Upper Cretaceous aquifer and deeper waters, and thus will expose the former to the influence of the cone of depression created by the mine. Such cracks in overlying rocks can also result from the collapse of unused tunnels and enable further drainage of the uppermost (Quaternary and Cretaceous) aquifers, which are vital for wetland ecosystems. Moreover, the collapse of unused tunnels may lead to trough subsidence of the areas on the surface. This can lead to both, flooding of some areas (if the groundwater levels would remain high) or to increased drainage of other areas (if the subsidence occurs below the watercourses which then start to drain intensively the area above a through).

Conclusions

As evident from the above summary, the planned exploitation of the Sawin deposit will have a potentially severe negative impact on all wetland ecosystems in the area. Of all the abovementioned threats to the wetland habitats, the most influential seem to be the formation of the cone of depression expanding to the Cretaceous and surface waters through cracks in rocks, which will result in a large-scale water table drawdown. Additionally, ongoing subsidence will lead to changing and unstable hydrological conditions on the surface. Both can be terminal to the water-dependent ecosystems and associated species in the area: alkaline fens of Bagno Bubnów and Bagno Staw, covering the area of ca. 1500 ha, being breeding area for 3-4% world population of globally threatened aquatic warbler (*Acrocephalus paludicola*), as well as viable populations of several red-listed plant species, including *Pedicularis sceptrum-carolinum, Betula humilis* and 13 species of orchids. Destruction of mires will also lead to the loss of their ecosystem services, one of the most important being the carbon sequestration in peatlands.

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