
Tarnowskie Góry (Poland) No 1539

Official name as proposed by the State Party

Tarnowskie Góry Lead-Silver-Zinc Mine and its Underground Water Management System

Location

Tarnowskie Góry Municipality
Zbrostawice Commune
District of Tarnowskie Góry
District of Bytom
Silesia Voivodeship
Poland

Brief description

Tarnowskie Góry Lead-Silver-Zinc Mine and its Underground Water Management System is located in Upper Silesia, in southern Poland, some 180km southeast of Wrocław. The nominated property includes the entire underground mine with its dewatering system, featuring 50km of main drainage tunnels and 150km of secondary drainage system, developed in the 15-16th centuries and further extended in the 18th-19th centuries. Above-ground the following elements, connected to the part below-ground via shafts, are included: Friedrich Mine Adit Portal and Ditch (Southern Adit System); God Help Adit Portal and Ditch (Northern Adit System); the Adolph Shaft Waterworks with remains of a 19th century steam-powered water-pumping station; the 19th century Mining Landscape featuring surface mining topography; the Silver Mountain and Washing Tip; the Original Site of Friedrich Mine; and finally the Municipal Park, exemplifying a post-mining recreational park designed for a previously-mined area. Overall the property is said to be the largest and most significant historic underground lead-silver-zinc mine in Poland.

Category of property

In terms of categories of cultural property set out in Article I of the 1972 World Heritage Convention, this is a *site*.

It does include in its area three confined landscapes but the property as a whole is not nominated as a cultural landscape in the sense of the *Operational Guidelines for the Implementation of the World Heritage Convention*.

1 Basic data

Included in the Tentative List

1 February 2013

International Assistance from the World Heritage Fund for preparing the Nomination

None

Date received by the World Heritage Centre

28 January 2016

Background

This is a new nomination.

Consultations

ICOMOS has consulted TICCIH and several independent experts.

Technical Evaluation Mission

An ICOMOS technical evaluation mission visited the property from 29 August to 4 September 2016.

Additional information received by ICOMOS

ICOMOS sent a letter to the State Party on 14 October 2016 requesting additional information on the rationale for the nomination, the boundaries, the legal protection, the development project and the progress on the management system and plan.

The State Party responded on 14 November 2016 with additional information and it has been incorporated into the relevant sections of this evaluation report.

An interim report was sent to the State Party on 20 December 2016, requesting additional information on the justification for inscription, the comparative analysis, the documentation and the protection of the property.

The State Party replied on 22 February 2017 providing substantial additional information that has been incorporated into the relevant parts of this report.

Date of ICOMOS approval of this report

10 March 2017

2 The property

Description

The nominated property is located in Silesia, one of the main central European mining regions, with a long mining tradition based on coal, which is still extracted from the basin near Katowice, and the mining of non-ferrous minerals, at Tarnowskie Góry.

The nominated property comprises the whole underground system of the mine with its adits, shafts and galleries as well as the water management system. The largest part of the property is located underground, while above ground only a few surviving structures and features have been included in the nomination. The nominated property is formed of eight elements – Underground workings, Friedrich Mine Adit Portal and Ditch, God Help Adit Portal and Ditch, Adolph Shaft Waterworks, Mining landscape, Silver Mountain and Washing Tip, Original site of Friedrich Mine, and the Municipal Park.

ICOMOS has requested additional information on whether the nomination needs to be considered a series or one single site, due to the way in which it has been presented.

The State Party responded on 14 November 2016, stating that the property needs to be understood as one single property, the underground system being completed by the above-ground mining topography highlighted by characteristic areas. These areas are described below.

In October 2016, ICOMOS also requested the State Party to provide some 3D models in order to understand the whole system of the underground portion of the property.

The State Party provided some hand-drawn tri-dimensional sketches that allowed for some visualisation of the underground system.

The mining region

The mining basin covers some 50sqkm, featuring a relatively low deep stratigraphy (10-50m) and horizontal orientation. The minerals were abundant and with high concentrations of metal. The mineralogical forms are lead and silver sulphide, with 85% lead in content, and zinc carbonate. The ore lodes are embedded in calcareous soil, made of dolomite strata interspersed with clay strata. Due to the geological structure of the region, ore lodes occur and extend horizontally rather than vertically. These geological features give rise to relatively superficial underground aquifers and a tendency to retain water.

These factors have facilitated the exploitation of the more superficial strata of the lodes through small vertical and superficial shafts but have made difficult the deepening of the mining extraction once the superficial lodes were exhausted. No deep adits were required, anyway, and, in any case, they could not have been built, due to the insufficient slope gradient between the mines and the discharge water-streams (this aspect is detailed in the historic development section).

Underground area (A1)

The underground area is comprised of the Friedrich Mine and its main drainage system as well as an extensive network of ore extraction workings, that was located more superficially and was exploited in the first phase of the mining exploitation (16th-17th centuries).

The water management system is formed of individual adits that were opened in different eras at increasing depths, that were later connected by the 'Friedrich Deep' and the 'Central system'. This is formed of two main systems: the Southern Adit System, which discharges water into the Drama River through the Friedrich Deep Adit; and the Northern Adit System that discharges water into the Stola River through the God Help Adit. These two main adits also serve as entrance/exit points for the system. Overall, the length of the Friedrich Mine reaches 50km in total.

The adits opened in the 18th-19th centuries were larger in section and longer. Their drainage during construction and

operation was achieved by steam engines that were initially imported from the UK. None of these survive.

The Friedrich Mine Northern (Central) Adit System

The system comprises adits and levels that intersect the ground at a more superficial level than the Southern Adit System. This was created between 1785 and 1807 to respond to the need for a more efficient drainage system, based on gravity rather than on horse-driven mills, which proved insufficient due to the depth of the ore lodes to be exploited (30-50m). The creation of this system required much energy to pump up the underground water and could be achieved only by using eight steam engines (adapted from the Newcomen and Boulton & Watt engines). These were moved from shaft to shaft and during operation were protected by temporary wooden shelters, no traces of which survive to this day.

The water drained through pumping in the Northern Adit System was channelled to be used for fire prevention purposes, from 1797 from the Reden and Machine shafts and from 1835 from the Kaehler Shaft, which is still in use. Surface features associated with the underground drainage system are Angel, Viper, God Bless, Heinritz, Reden, Kaehler and Frederike shafts, and God Help Adit with its Portal and ditch.

The Friedrich Mine Southern Adit System

It was built between 1821-1834 and was the deepest drainage for the mine. The main adit is 17km in length. The system was built by digging a series of vertical shafts that were connected at the bottom by progressive excavation in both directions away from the shaft. This system facilitated pumping and speeded the formation of the tunnel system. Steam engines were moved from one shaft to another as required. The key element of the Southern Adit System was the Friedrich Mine Deep Adit that connected the Adolph Shaft with the Drama River. This adit was further extended by creating a second drainage system built throughout the 1860's and completed in the 1880's.

Features of this drainage system include: Peace Shaft; Bohr Shaft, which connects with the above-ground feature Bohr Shaft mound; Adolph and Machine Shafts, which still contain pumping works and are connected with the surface feature Adolph Shaft Waterworks; Help Happiness Shaft, which emerges at the surface in the homonymous mound; and four additional adit shafts (Adit engine shaft n. 22, n.17, n.13 and n. 5), identified as surface attributes within the surface part of the property.

The major surface elements of this drainage system include the Friedrich Mine Adit and Ditch, and Adolph Shaft Waterworks.

Surface areas

Friedrich Mine Adit Portal and Ditch (A2)

The Friedrich Mine Adit Portal is the main discharge point (50,000 cubic m per day) for the main Friedrich Mine Deep Adit and discharges water into the homonymous Ditch. The architecture of the portal, built in limestone and

marble, exhibits Prussian neoclassical features and character.

The Friedrich Mine Adit Ditch was excavated in 1821 to carry the water discharged by the Adit into the Drama River. This has a very shallow river gradient, therefore, to ensure that this watercourse could receive the water from the mine, the ditch runs parallel to the river for around one kilometre in order to create a sufficient surface flow for the water and to discharge also in winter, when the river usually freezes.

God Help Adit Portal and Ditch (A3)

The Portal is located in the north-western part of the property; it discharged water pumped by a steam engine. The external architecture of the portal is a reconstruction dating back to 2000, but inside there is a stretch of masonry wall built in 1652 when the initial adit was constructed, and then extended as a parallel structure in the late 18th century. The Portal discharged water into the homonymous ditch, which channelled water into the Stola River after a 500m run.

Adolph Shaft Waterworks (A4)

This facility includes the structures built in the 1870's to supply water from the Friedrich Mine Deep Adit to the Upper Silesian Industrial Region (24km south of Tarnowskie Góry). Machine halls and water pumping infrastructure, including stationary steam pumping engines, cast iron pipelines, and a brick-lined steam condensation cistern survive. On the surface, two Malakoff towers, the boiler house with a Lancashire-type boiler (out of nine), and coal railway survive as witness to this technological enterprise.

Mining Landscape (A5)

This feature comprises a shaft, mounds, and open earthworks featuring a topography shaped by humans attesting to the intense exploitation of silver and lead ores in the 16th century, and, later in the 19th century, for stone quarrying.

Silver Mountain and Washing Tip (A6)

This expansive surface area bears witness to the large exploitation of lead and silver superficial ore lodes in the late 15th-16th centuries and, later, of zinc ore, with a high density of hummocks and mounds or 'pingi' resulting from the mine spoil.

The Friedrich Mine Washing Tip is a large mining tailing heap created by the separation process of the silver, lead and zinc ores from the dolomitic bedrock. Its size bears witness to the scale of the Friedrich Mine operation and to the activity carried out at the Central Washer in which all washing activities were centralised by the Prussian State.

Original site of the Friedrich Mine (A7)

This site contains archaeological evidence of the early development of what was to become the Friedrich Mine under the state-led mining enterprise at the turn of the 18th-19th centuries: Rudolphine shaft; Abraham Machine

shaft, where the first British-imported steam engine was used (1788 – not surviving); Heinitz Machine shaft, where a British-imported Newcomen machine was employed (not surviving); Kunst shaft, where a horse-driven mill operated (1785); Antonia and Erdmann shafts; as well as water ditches.

Municipal Park (A8)

This urban park (22 ha) was created at the beginning of the 20th century by rearranging and beautifying an area characterised by hummocks, shaft mounds, and pits: an artificial lake was created and trees, shrubs and greenery planted. The main mound was turned into a landmark by positioning a gazebo on its top and other leisure facilities were added. The park has been subsequently enlarged to its present size.

History and development

The nomination dossier identifies two major phases of development of the property as a mining area.

In "Phase 1" (from around the mid 15th to early 17th century), Tarnowskie Góry became one of the richest ore-fields, principally for lead after the discovery of massive lead-silver deposits in the late 15th century. In terms of lead output, Tarnowskie Góry dwarfed its nearest rivals as deposits at Tarnowskie Góry-Bytom yielded, within some five levels of production, more than those in Goslar by 8-10 times. At that time, an almost insatiable demand for lead had been triggered by an invention in the chemical extraction of silver from copper ores, that required lead as a smelting agent. This breakthrough in the latter part of the fifteenth century brought European silver output over the next century to unprecedented levels; at the same time, Polish lead was used in the smelting of lead-deficient silver deposits of 'New Spain', prior to mercury-based amalgamation that had almost wholly superseded it by the early 1560's. This phase of mining activity at Tarnowskie Góry gave an important impetus to the general economic and social development of Europe in the 16th century. Then, by the early 17th century, the mining activity stagnated as the ore field became exhausted and deeper ore lodes were difficult to exploit, and definitively ceased during the Thirty Years War (1618-48).

The "Phase II" of mining (from 1784 to 1910) covers the period corresponding with the Prussian state-led industrialisation process that began in the second half of the 18th century. A strategic support to this process was given by the production of zinc: Tarnowskie Góry, along with other Silesian mines, came to dominate world output throughout much of the 19th century until the closure of the mine, in 1933.

Upon ICOMOS' request, in February 2017 the State Party provided additional information, particularly on the water supply system.

The establishment of the Royal Friedrich Mine and the opening of the Northern Drainage System caused the lowering of the water table and dried up the wells (36)

used in the town. In 1797 a system was put in place integrating one mining shaft (Reden Shaft) with a Boulton & Watt steam-engine. This was further adapted in subsequent years following the modifications to the mining and water management system throughout the 19th century, with subsequent relocation and replacement of steam-engine machines. In 1903 the steam-engine was supplanted by gas works to operate the waterworks.

Since then, conservation efforts have been undertaken locally to ensure that the mining heritage is protected, preserved and known about.

The water supply system has been upgraded over the course of the 20th century; the Staszic Waterworks continued to supply water to Upper Silesia until 2001.

3 Justification for inscription, integrity and authenticity

Comparative analysis

The comparative analysis has been carried out by comparing the nominated property with 20 properties already on the World Heritage List and related to mining throughout the world, with 11 properties inscribed at the time on the Tentative Lists, with 6 other properties not included on the Tentative Lists, and finally with 8 mining properties within Poland.

The comparison is based on the following factors: geo-cultural region, theme, minerals, period key values and attributes, similarities, and differences, and is carried out through an analysis of the features of each example.

The comparison concludes that the nominated property stands out due to its vast and extremely accessible underground water management system applied in an unusually challenging environment, which combined the dewatering purpose with the supply of potable and industrial water to the towns and productive districts in the vicinity; the system was to become one of the largest public water supplies.

ICOMOS considers that the comparative analysis could have been limited to the properties, inscribed or not on the World Heritage List, that were relevant for the nominated property on the basis of the values and attributes they express.

ICOMOS considers that the comparative analysis does not point towards the exceptionality of Tarnowskie Góry in respect to its comparators already inscribed on the World Heritage List. With regard to the water management system, other regions exhibit highly developed adit systems in which the length of single adits is comparable with the length of the totality of the network in the nominated property: the Ernst August Adit in Mines of Rammelsberg, Historic Town of Golsar and Upper Harz Water Management System, Germany (1992, extension in 2010, criteria (i), (ii), (iii) and (iv)), is 35km long; the Great County Adit in Cornwall and West Devon Mining

Landscape, United Kingdom (2006, criteria (ii), (iii) and (iv)), is 61km long and drains 50 copper and tin mines; the Freiberg Adit in the Mining Cultural Landscape Erzgebirge/Krušnohoří, Tentative List of Germany/Czech Republic, exhibits important similarities that would have merited discussion.

With regards to the mining site, the comparative analysis could have included additional sites, not included on the World Heritage List nor on the Tentative Lists, e.g. Derbyshire Soughs and other lead mining areas in the United Kingdom (Yorkshire, Durham, Scotland – Killhope, Wanlockhead, Leadhills) that, although smaller-scale, preserve extensive remains above and below ground.

ICOMOS notes that the aspect of water supply, and the claimed innovative nature of the system conceived in Tarnowskie Góry, has not been addressed by the comparison and therefore its potential global significance has remained unspecified. In this regard, the comparative analysis should look at properties encompassing attributes such as networks of water towers, steam engines and other pumping systems, filtration plants, reservoirs, dams, aqueducts, in order to establish whether the nominated property would justify consideration as an outstanding example, in terms of conception, technology used and surviving tangible evidence, of a public water supply system set up to exploit drained water.

In its Interim Report, ICOMOS asked the State Party to provide an augmented comparative analysis that considers also the aspects of the water supply and the adaptation of the steam engine system.

The State Party supplemented the comparative analysis by examining waterworks and related pumping systems.

The expanded comparative analysis examines briefly traditional water supply systems, concluding that they are not relevant comparators. It then examines waterworks based on steam-powered pumping stations and affirms that no steam-powered waterworks integrated into a mining context have been identified in the world. On the other hand, pumping stations were in use in Britain, Germany, Poland and the United States, and much less commonly in France.

The State Party provides specific comparisons with: Ir.D.F. Woudagemaal - D.F. Wouda Steam Pumping Station (Netherlands, 1998, (i), (ii) and (iv)) built in 1920 to prevent flooding in Firesland; Hydraulic Engineering and Hydropower, Drinking and Decorative Fountains in Augsburg (Germany, Tentative List), developed between the 15th and 20th centuries, and the Cruquius Pumping Station in Amsterdam, a 19th century pumping station used to drain the Haarlemmermeer Lake.

The State Party recognises that examples of first generation pumping-stations are confined to Britain, whilst second generation pumping stations can be found in several European cities and one also survives in Poland – the Zawada Historic Waterworks Station, Karchowice.

This is said to support the interpretation of Tarnowskie Góry under this perspective.

However, the State Party claims that no property has been found that was planned and used by combining mineral extraction, dewatering and water supply by the use of steam engines.

ICOMOS notes that the comparative analysis shows that the use of the steam-engine in mining contexts was frequent in Britain but also in France (e.g. Anzin) as well as for water supply, both in Britain and Paris (Gros Caillou and Chaillot, 1781). The comparative analysis shows also that for the second-generation steam pumping engines, these were rather widespread, although not in use. Therefore ICOMOS considers that a further search could be done to reach more conclusive results.

With regard to the purported uniqueness of the combination of a steam-powered pumping station in a mining and water supply context, ICOMOS considers that determining uniqueness is not the aim of a comparative analysis, which rather should determine whether a property is exceptional in relation to other comparable ones, and also in relation to their level of integrity and authenticity.

So far, the comparative analysis has not succeeded in demonstrating that Tarnowskie Góry could be said to be exceptional as an example of a dewatering system, the use of now-disappeared steam-engines, and a water supply system.

ICOMOS considers that the comparative analysis does not justify consideration of this property for the World Heritage List at this stage.

Justification of Outstanding Universal Value

The nominated property is considered by the State Party to be of Outstanding Universal Value as a cultural property for the following reasons:

- Tarnowskie Góry made a significant contribution to global lead and zinc production. The lead extracted in the mines of the nominated property dominated the world supply and, before mercury-based technology was developed, it was used for the extraction and processing of silver in the mines of 'New Spain'. In the 19th century until the 1930's Tarnowskie Góry mine became a key supplier of zinc;
- The underground hydraulic system is a masterpiece of human genius as it reflects a consistent and 3-centuries-long pursuit of dewatering the underground mining spaces. The system of channels was further improved by the transfer and adaptation of steam engines to pump water during construction and operation of the tunnels and subsequently to supply potable and industrial water to support city life and Prussian industrial development;
- Four years after the closure of the mining (1933), efforts to conserve the water management system were initiated and continue today.

ICOMOS considers that this justification could be only partially applicable to the nominated property, particularly when it concerns the first period of exploitation of the mine (15th – 17th centuries) of which no evidence is documented and presented by the nomination dossier or the additional information. The claims, therefore, are not supported by sufficient tangible evidence. Additionally, the comparative analysis has highlighted the similarity of Tarnowskie Góry with other mining properties and regions. With regards to the development of the water management system, ICOMOS notes that all mining properties had to face the problem; however, the specific geomorphological conditions of an almost flat mining area and a rather superficial water table, caused substantial technical challenges for the mining and triggered inventive solutions, initially based on the gravity system and later improved with the use of the steam engine.

The use of the steam engine could also be important from an historical perspective. However, very little physical evidence of this use survives; additionally, further information and comparison are necessary on this aspect of the nomination to assess the potential of the nominated property to justify consideration for the World Heritage List.

ICOMOS has requested additional information in this regard in its December 2016 Interim Report. The State Party replied providing a detailed description of the machines used, their location and relocation, but it remains a fact that none of these machines survive, with the exception of the early 20th century steam-engine at Adolph Shaft.

The conservation efforts, although worthy of praise, cannot be considered unique or exceptional in a global perspective.

The exploitation of the dewatering network to supply water to the towns and the industrial district of Upper Silesia is a specificity of the nominated property that could potentially deserve consideration, but only on the grounds of the results of an augmented comparative analysis based on additional research and additional information, and a photogrammetric survey and 3D modelling, which can provide further information.

ICOMOS requested additional information on the above in the Interim Report. The State Party replied providing an augmented comparative analysis which has been discussed in the previous section and explaining that 3D modelling has been ongoing since 2015, although no draft of this work has been presented and only a few schematic sections of the Adolph Shaft have been provided. However, they do not contribute to clarifying how the whole dewatering and water supply system worked and what survives of it to this day.

Integrity and authenticity

Integrity

ICOMOS considers that overall the nominated property contains all the elements that are necessary to express its significance as an historic mining site. For the most part, it does not suffer from uncontrolled threats, although the lack of knowledge of the underground system dating back to the first phase (16th-17th century) does not allow for an assessment of the integrity of this part. On the other hand, the 19th-20th century portion is known for the most part and its integrity may be considered acceptable. The pumping station and related facilities at Adolph Shaft express their function and significance.

However, for the purpose of the nomination, ICOMOS considers that an expanded explanation and illustration of its different elements and how they work appears necessary to assess whether those attributes adequately express the proposed justification for inscription.

In its first letter sent in October 2016, ICOMOS requested that 3D illustrations be provided in order to ensure the clear representation of the nominated property and its functioning, especially in its underground part.

The State Party responded in November 2016, providing 3D illustrations that were helpful in clarifying the relationships among the different elements and the rationale for the definition of the nominated property.

The surface features, on the other hand, present an uneven degree of integrity but mostly survive as archaeological remains or landscape features. Only through systematic archaeological investigations could these vestiges be able to convey their significance.

Authenticity

The nomination dossier states that the cultural value of the nominated property is reliably conveyed by the following aspects: form and design of the mining features below and above ground, exhibiting the interchange and adaptation in technology; material and workmanship demonstrating the evolution of the technology, as well as the use and function, based on reliable sources of information, including archival documentation; location and setting, expressed by the flat landscape, and the reciprocal location of the above-ground features.

ICOMOS considers that only a few of the surviving attributes of the nominated property can support the proposed justification for inscription and these do not appear sufficient, at this stage, to justify consideration of this property for the World Heritage List. The lack of archaeological investigations prevents the use of the surviving vestiges as reliable sources of information on the claimed values; in some cases, the justification for inscription refers to earlier periods (e.g. in the case of the water supply system) but the surviving attributes date to a later era.

Overall, the features presented in the nomination dossier can be considered generally authentic in terms of location, function, materials, workmanship and form, but the lack of investigation on their substance, construction phase, and specific roles, limits their potential to support the claimed justification for inscription and of the selected criteria.

In its Interim Report, ICOMOS requested additional information on what survives from the two most relevant phases of the nominated property.

The State Party responded in February 2017 clarifying that the mining underground system dating back to the 15th – 17th centuries poses serious challenges in terms of documentation due to safety reasons and therefore the key attributes of the property include the underground and above-ground mining/water management technical structures dating from the 18th to the 20th centuries.

ICOMOS notes that the underground mining and water management system combined with the water supply system developed in the second phase of use of the mine appear to be key to supporting the proposed justification for inscription because the surface and technological structures do not appear to have survived to an adequate level of integrity.

In conclusion, ICOMOS considers that the conditions of integrity and authenticity have not been met in terms of their ability to express adequately and credibly the proposed justification for inscription. However, careful documentation and investigation may increase their capacity to demonstrate at least some aspects of the proposed justification.

Criteria under which inscription is proposed

The property is nominated on the basis of cultural criteria (i), (ii), (iii) and (iv).

Criterion (i): represent a masterpiece of human creative genius;

This criterion is justified by the State Party on the grounds that the lead-silver-zinc mine and its underground water management system represents a masterpiece of mid-16th to mid-19th century underground hydraulic engineering, as an outstanding solution to two major problems related to mining: removing the water from mining chambers and tunnels; and overcoming depletion of the aquifers and the lowering of the water table caused by permanent subtraction of underground waters. Initially based on technology established in Saxony and Bohemia relying on animal power, the dewatering process was improved through the importation from Great Britain of steam engines in the late 18th century, later adapted locally. The system demonstrates human creative genius in turning the unwanted presence of water in the mines into an opportunity to supply water to towns and industries.

ICOMOS considers that the challenge of dewatering underground mines has to be faced everywhere and strategies to solve these problems have been developed in all mining regions, as a number of properties related to mining and already inscribed on the World Heritage List demonstrates. The results of the undertaking to overcome specific geomorphological conditions do not suffice, in ICOMOS' view, to justify the use of this criterion in this case.

The transfer of British steam engine technology to the region is interesting but does not demonstrate *per se* human creative genius, in that the technology was invented elsewhere and only transferred and later adapted to be used in Upper Silesia and Tarnowskie Góry. The use of these machines was limited to the dewatering during the construction operation. Finally, no original steam engines or other structures related to their use survive from that era.

While the use of drained water to supply towns and industrial districts appears an interesting aspect of the property, the comparative analysis has not considered other public water supply systems for civic or industrial purposes, therefore has not demonstrated that this represents a masterpiece of human creative genius in technology development.

Finally, the nominated property does not exhibit any monumental landmark that could justify the reference to this criterion.

ICOMOS considers that this criterion has not been demonstrated.

Criterion (ii): *exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;*

This criterion is justified by the State Party on the grounds that the nominated property exhibits key and pioneering technical interchanges between this region, continental Europe and Great Britain. Huge amounts of lead were yielded each year by the mines in Tarnowskie Góry and this was exported as far as Thuringia, Hungary, Tyrol, the Erzgebirge and even to New Spain (Mexico), before the technology based on mercury was invented. The lead from Tarnowskie Góry boosted the revitalisation of silver ore processing and thus contributed to the economic development of Europe and the export of silver to China. Later, the discovery of zinc in ore lodes in the region, made Germany the most important producer of this metal.

Technologies were transferred from Saxony, Bohemia, Hungary and Great Britain to Silesia. The steam engines available at the time were first imported and then imitated and this led to the establishment of the German steam engine manufacturing industry, which made an important contribution to mining.

ICOMOS notes that this justification is based on two major strands: the contribution of the nominated property to the global economy of silver and, later, of zinc; and the importation and adaptation of steam engine technology for improved dewatering of mines and supply of water to towns and industries.

ICOMOS considers that, although the historical arguments proposed in relation to the role played by Tarnowskie Góry in the European and global metal trade cannot be denied, only a little tangible evidence survives within the nominated property attesting to the technological transfer and adaptation of the mining and dewatering techniques from other regions in the underground network of tunnels, chambers, and adits, and no mining-related technological facility or machine survives from any of the main mining periods. The relics of the earlier phase (15th-16th centuries) consist of thousands of pits, now mostly overgrown by forests, and of some adits incorporated and reworked into the system built during the second phase of operation of the mine (late 18th-19th century); the superficial underground network is said to be little known, awaiting a comprehensive archaeological study. No physical evidence of the steam-engine technology transfer survives from the 18th or early 19th century period.

The machinery that still exists in Adolph Shaft Waterworks relates to the water supply and dates back to a later period (late 19th and early 20th century). In the absence of a comparative analysis that examines this system in relation to earlier and contemporary systems built elsewhere, this complex cannot be seen as an outstanding testimony to an important interchange of human values.

The additional comparative analysis provided by the State Party in February 2017 does not appear conclusive at this stage.

ICOMOS considers that this criterion not has been justified at this stage.

Criterion (iii): *bear a unique or at least exceptional testimony to a cultural tradition or to a civilization, which is living or which has disappeared;*

This criterion is justified by the State Party on the grounds that the nominated property bears witness to the wider technological and industrial culture of Silesia and of the 500-year-old multicultural mining tradition of the area.

In the 19th and early 20th centuries, at the peak of Tarnowskie Góry's contribution to the global production of zinc and lead, several commemorative and recreational parks were created by adapting post-mining areas and at the same time preserving their features. Pride for the mining past still influences the culture of the region and nurtures the commitment for its conservation and communication.

ICOMOS considers that little evidence overall seems to survive of the past mining operation at the nominated property. Almost no mining, processing or washing facilities can be found, the water management system is preserved in the underground shafts, chambers and tunnel network, the central Washery does not survive and only the tailing heap gives the sense of the scale of the operation. With such little tangible evidence, it is difficult to maintain that the property reflects in a unique or exceptional way a mining cultural tradition.

ICOMOS notes that the nomination dossier cites the 1528 Polish mining law that stipulated three official languages and the existence of a distinct mining culture, but it does not demonstrate how it could be unique or exceptional.

ICOMOS also notes that the nomination dossier refers to the long-standing dedication to conserving the property. It is debatable that heritage practices could be considered a cultural tradition; however, its application in this case does not appear to be unique and it cannot be said to be of Outstanding Universal Value.

ICOMOS considers that this criterion has not been demonstrated.

Criterion (iv): be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;

This criterion is justified by the State Party on the grounds that Tarnowskie Góry is a unique technical complex that combines mining operations and water supply development in the Silesian context between the 16th and the early 20th centuries, attested by a network of 50km of main drainage tunnels and 150km of a secondary drainage system of tunnels, shafts, extensive mined chambers, integrated with substantial remains of a public water supply system. The site demonstrates a significant achievement in responding to the geomorphological environment and creating a permanent gravitational free flow. The technological transfer and adaptation of pumping systems from Saxony and Bohemia and later from Great Britain allowed for the development of an extremely effective system for dewatering the underground areas and on its subsequent adaptation to supply water for civic and industrial purposes.

ICOMOS considers that the comparative analysis has highlighted similarities with other properties on the World Heritage List with regards to the water management system and has not succeeded at this stage to demonstrate how the nominated property could be considered an outstanding example of a water management system in a Central European mining environment. On the other hand, the specificity of the adaptation of the dewatering system to create a public water supply, and of its surviving features, requires

further exploration in terms of comparative analysis as well as in terms of careful documentation and illustration.

The Interim Report by ICOMOS pointed out the above difficulties and requested additional information and an augmented comparative analysis.

The response provided in February 2017 by the State Party has been discussed in previous sections and, although very informative, has not been conclusive in supporting the justification of this criterion.

ICOMOS considers that this criterion has not been justified at this stage.

In conclusion, ICOMOS does not consider that the criteria have been justified at this stage.

4 Factors affecting the property

The nomination dossier reports that potential threats may derive from urbanisation pressures, given that the area is densely populated (the nominated property includes only 10 inhabitants but 61,000 people live in the buffer zone). Tarnowskie Góry is still an important railway hub and this causes pressures in terms of transportation infrastructure upgrading. Other threats mentioned by the nomination dossier relevant for the nominated property are related to localised structural instabilities and fractures of the bedrock, the risk of flooding, and the lack of ventilation (relevant to visitation).

A risk preparedness strategy has been prepared for the nominated property and the planning system incorporates measures that are meant to prevent development pressures. However, due to the possible changes of land uses and provisions, the proponents have envisaged an additional layer of protection.

ICOMOS requested additional information on development projects. The State Party replied in November 2016 explaining that the property is not threatened by any large-scale projects.

ICOMOS considers that the main threats to the property are the structural weaknesses of the bedrock for the underground part, and urbanisation and development pressures for the above-ground areas.

5 Protection, conservation and management

Boundaries of the nominated property and buffer zone

The boundary of the nominated property (area A1), of which underground structures are 1,330.70 ha, the surface of 342.06 ha, giving a total of 1,672.76 ha, coincides with the limits of the underground part as it is

shown on the map of its proclamation as a "National Historic Monument" (2004). The area of the buffer zone is 2,774.35 ha.

The underground part is completed by two surface areas extending beyond the exit gates of the drainage systems, namely the two junction channels with the part of the associated river (areas A2, Friedrich Mine Adit and A3, God Help Adit).

The other five areas proposed on the surface (A4, A5, A6, A7 and A8) are directly related to the underground part and within its surface projection (A1).

ICOMOS requested some clarification on the rationale for the development of the boundaries and the State Party responded in November 2016 explaining that these are based on: spatial distribution of attributes and their conditions, legal protection in place and land-use regulations, and land ownership division.

ICOMOS considers that overall the boundaries of the nominated property are acceptable, with possible expansion to be considered for area A5 that could be joined to area A4.

However, the additional information provided by the State Party on the above-ground mining topography being included within the boundaries of the property may require the need for some clarification.

In conclusion, ICOMOS considers that the boundaries of the nominated property and of its buffer zone are adequate, although some clarification may be necessary with regards to the above-ground part of the property. The buffer zone is adequate for the purpose.

Ownership

The underground system is owned by the State Treasury and is managed partly by the Tarnowskie Góry Land Lovers Association since 1954 and partly under the responsibility of the Silesian Voivodeship Board.

Above-ground structures and land are in different ownership: state, private and mixed (public and private).

The buffer zone has different owners.

Protection

The legal basis for the protection of the underground and above-ground features of the nominated property are the Act on the Protection of Monuments and Guardianship of Monuments (2003), under the Register of Monuments (1955, 1966) and later as a National Historic Monument, and under the Nature Conservation Act (2004).

According to the nomination dossier and the draft management plan, the majority of areas and buildings of the property are legally protected but not all of them enjoy legal protection yet.

A procedure for entry onto the Register of Monuments was opened for the Adolph Shaft Waterworks (item 3.1) in 2015 and for the municipal park (item 3.6) in 2013. It is planned to establish formal legal protection for the following attributes: the mining landscape of Silver Mountain (3.3) and Mining landscape (19th century, 3.2), the original site of the Friedrich Mine (3.5), and the Friedrich Mine Adit Portal and Ditch (1.9,1.10) and God Bless Adit Portal and Ditch (2.9). The documentation needed to activate the protection process has been prepared. Several buildings and areas are listed on the Municipal Inventory of Historic Monuments: this is not a form of legal protection, but it is an important element of the overall monument protection system.

ICOMOS requested additional information on the state of legal protection and the State Party replied in November 2016 explaining that for areas A2 and A3, procedures to establish protection have been put in place, while for areas A5 and A7, they are expected to begin in the near future and will be finalised by early 2018.

Minerals and mine workings are legally administered on the basis of the Geological and Mining Law (Act 196/2015, as amended). Since January 2015, tourist tours of the Historic Silver Mine and Black Trout Adit in Tarnowskie Góry are subject to mining supervisory authorities due to the entry into force of a new Geological and Mining Law and Act.

The buffer zone is currently covered by the protection of a Natura 2000 designation, although the additional information submitted in November 2016 clarifies that the buffer zone does not coincide precisely with the Natura 2000 designation.

ICOMOS requested further clarification on the above in its December 2016 Interim Report.

The State Party responded in February 2017 by providing the details of the provisions of the Natura 2000 designations, which appear to be adequate to provide the required added layer of protection.

An additional level of protection is envisaged for each surface feature in order to protect the landscape values of the property due to the natural variability of planning documents and increasing development pressures and urbanisation. Their objectives are: maintaining valuable view interconnections and views to and from the monument; preserving sites with high scientific and research potential and areas in which use is significant to the nominated property and its protection; selecting elements of post-mining landscape and sites which bear strong community and symbolic significance and which are important to the local community.

In its additional information provided in November 2016, the State Party explained that the additional layer of protection is based on local regulations and control of the use of the land (no development is allowed in these zones).

ICOMOS in its Interim Report asked for some clarification and more detailed information on the nature and provisions of the additional level of protection and when it will enter into force.

The State Party responded that these protective measures will be integrated into the planning system as soon as the property is inscribed on the World Heritage List.

ICOMOS does not consider this response to be satisfactory, as it does not clarify what mechanisms are in place that will ensure the implementation of these measures into the planning instruments. Additionally, ICOMOS recalls that protection mechanisms for a buffer zone should be in place at the moment the property is inscribed.

ICOMOS considers that all attributes and associated elements within the nominated property or located in the buffer zone should enjoy legal protection at the national level. In this regard, ICOMOS considers that it would be helpful if the State Party could provide additional information on the progress made in warranting legal protection to all attributes.

ICOMOS has requested updated information in this respect in its Interim Report.

The State Party responded that progress is being made with regards to the legal protection of the attributes not yet covered by legal protection.

With regard to the effectiveness of protective measures, ICOMOS considers that the system in place in Poland is conceived to ensure that protection and conservation of protected monuments is achieved.

Considering that not all the relevant features of the nominated property are currently legally protected, ICOMOS considers that the protective measures will be effective when all will be covered by legal protection at the national level.

In conclusion, ICOMOS considers that the legal protection in place is not fully adequate as not all features included in the nomination are covered by legal protection. ICOMOS considers that all features that are proposed as attributes expressing the proposed Outstanding Universal Value must be protected according to the national law in force. ICOMOS considers that the protective measures for the property will be effective when all features relevant to express the significance of the property will be covered by legal protection at the national level. Protective mechanisms for the buffer zone not covered by the Natura 2000 designations need to be clarified and implemented.

Conservation

The nomination dossier gives a descriptive account of the state of conservation of the property attribute by attribute. These descriptions are then summarised in tables. The

property is said to be in a satisfactory state of conservation, apart from a few elements in poor condition which are the object of a conservation programme.

A synthetic but comprehensive account of previous conservation actions has been provided in the nomination dossier.

The state of conservation of the underground parts of the property, as regards the 19th and 20th centuries (A1), is generally good and even excellent (large drainage galleries, wells, etc.).

The landscape areas of the nominated property appear to be in a stable condition, partly as remains of heaps and abandoned wells preserved and protected without subsequent intervention (A5, A6 Washing Tip, A6 Segiet forest and quarry), partly as vestiges of restructured mining landscapes for symbolic and/or use purposes as a recreational park (A7 and A8).

ICOMOS considers that overall the state of conservation of the property can be considered acceptable. However, ICOMOS notes that a substantial part of the underground property, dating back to the first phase of operation, is not documented or well known. Therefore, ICOMOS considers that a thorough and systematic programme of archaeological investigations and of tri-dimensional geometric survey is indispensable, both for documentation and conservation purposes. This should extend also to the second phase of operation of the mining, dewatering and water supply system, as an essential knowledge base to understand the values and attributes of the system and to ensure its proper management.

In conclusion, ICOMOS considers that a systematic campaign of 3D documentation of the underground system is needed for scientific but also conservation purposes. Additionally, a comprehensive programme of archaeological research is necessary, also with regard to the articulation of the values of the nominated property, currently not sufficiently illustrated and related to the surviving features of the property.

Management

Management structures and processes, including traditional management processes

A group of partners facilitated the nomination; this includes the Tarnowskie Góry Land Lovers Association (TGLL Association) which is the manager of the two underground heritage sites of the Angel Shaft and Black Trout Adit and their provisions for tourists. It owns and manages the Museum associated with the underground complex. This association is in the process of taking over the ownership of the Adolph well pumping station, managing its old machines and making it a space accessible to visitors. Another partner is the Municipality of Tarnowskie Góry, which maintains the park sites (Municipal Park, Kunszt Park and Washing Tip Cultural Park) and accompanies the TGLL Association. There is

also the National Heritage Office, the World Heritage Directorate as well as the Water Company. The group also involves other municipalities concerned, public management bodies such as the Forest Service and the Conservancy of natural areas, as well as various academics, in a personal capacity. The Voivodeship seems to have been only recently linked to the project.

ICOMOS was informed that a Steering Committee bringing together all partners involved in the management and conservation of the property is being set up. A project to develop a co-management or engagement charter, to be signed by all partners as a commitment to the conservation and enhancement of the property while respecting its heritage values, in case of inscription, is also underway.

ICOMOS requested additional information about the status of the management plan and of the management system. The State Party responded that a property management plan coordination team has been set up involving the municipality of Tarnowskie Góry and the president of the Association TGLL. The management plan was formally adopted by all relevant parties on 7 November 2016.

A Steering Committee is envisaged and includes 12 key stakeholders. It has a consultative-advisory nature and it is planned that it will meet once per year to take strategic decisions where needed and to supervise the implementation of the management plan.

ICOMOS observes that the Association TGLL has been carrying out remarkable work for the conservation and valorisation of the nominated property for 40 years. This work has been crucial for the preservation of the nominated property.

ICOMOS however also considers that the steering structure being set up will certainly assist the coordination among all the actors involved and the management of the property as part of a wider territory and will be a key factor in promoting sustainable development.

ICOMOS further considers that the idea of a co-management charter is very interesting, even beyond World Heritage, as coordination and partnership are crucial elements for any successful and site-based development and promotion, and encourages the partners to take this path as soon as possible.

ICOMOS finally notes that despite the involvement of individual scholars, a solid and systematic research programme needs to be developed and carried out, including a rigorous 3D survey and archaeological investigations.

The management system envisages a risk preparedness strategy articulated into two strands: risk preparedness in time of peace and in time of war.

Policy framework: management plans and arrangements, including visitor management and presentation

The management plan (2016-2020) in preparation, as declared in the nomination dossier, is provided in draft form in an annex to the nomination dossier. It is structured in three parts: Conservation Management Plan (CMP), Interpretation and Tourist Access Strategy (Plan), and Risk Preparedness Strategy. The CMP determines the Positive and negative factors that have affected the property in the past, distilled into Issues that are each accompanied by strategic policies. The Conservation Management Plan defines an Action Plan in which Strategic objectives are displayed in Actions, with lead co-ordinator, and time frame. For monitoring purposes, it defines quantitative and qualitative indicators.

The additional information provided in November 2016 includes the finalised version of the Management Plan, which was adopted on 7 November 2016, when the cooperation agreement among all parties involved was also signed, formally establishing the Steering Committee.

Involvement of the local communities

Local communities seem to be deeply involved in the nomination through the Association TGLL.

ICOMOS considers that the management system set up appears adequate, although establishing a scientific committee advising the Steering Committee would greatly assist in developing the necessary research programme of the archaeological mining features and landscape. The Management Plan has been adopted and integrates a comprehensive risk preparedness strategy.

6 Monitoring

The conservation of the property is monitored by the Pumping and Water Management Company for the drainage system and by the Management Association (TGLLA) for parts open to the public under the control of the Municipality of Tarnowskie Góry (delegation of public property) and technical services of the Silesian region (Mines, Conservation of Historic Monuments, Environment). Monitoring is carried out by the Regional Forest Services and the Municipality of Byton for Segiet, and by the municipality of Tarnowskie Góry for the others.

A comprehensive monitoring system has been prepared within the Management Plan, submitted in its finalised version in November 2016.

ICOMOS considers that the monitoring system could be considered overall adequate but should also include indicators to measure the effectiveness of management.

ICOMOS considers that the monitoring system could be considered adequate but it would benefit from the inclusion of indicators for the assessment of management effectiveness.

7 Conclusions

The main focus of this nomination is the underground area of the Lead-Silver-Zinc Mine of Tarnowskie Góry, and its water management system. The property is located in Upper Silesia, some 25km north of Katowice and 180km southeast of Wrocław. It includes elements connected with the mining underground: shafts and a large network of levels and excavation chambers; elements connected with the dewatering network: adits and shafts; elements connected with the water supply system: Adolph Shaft Waterworks and other underground and surface workings.

The nomination is proposed as one single property, the unifying element being the underground network of tunnels and adits that connects the above-ground individual features.

The property is located in one of the three major historic mining regions in Central Europe – Upper Silesia, the Harz and the Erzgebirge – all sharing notable reciprocal similarities in terms of geology and abundance of non-ferrous ores, the use of extensive hydraulic systems to drain the mines, and a common history of technological, social and cultural exchanges.

The main aspect underlying this nomination, according to the State Party, is represented by the constant technical challenge encountered throughout the historic development of lead-silver-zinc mining in Upper Silesia; that is, the fight against water. This constant threat predominated over all the other technical problems and was won by a strategy consistently pursued at Tarnowskie Góry for some 300 years, through constant innovation and adaptation of the latest European mining technology and skills, not only from Central European mining centres, but from Britain too. This prolonged effort led to the foundation, between the late 18th and early 19th century, of a public water supply system. This is said to be a rare combination representing an exceptional example of how mining provided the technology for the development of a large-scale public water supply system based on the steam-powered pumping of groundwater.

While this justification is interesting, ICOMOS observes that the physical evidence supporting such an important interplay is scanty in comparison with other similar properties, also when the water management system is considered. The past history of mining activity at a heritage site may be reflected by several examples of spoil heaps, pit heads, adits or pumped shafts, pumping and winding machinery, chimneys/engine houses, surface dressing/sorting/washing plants for the minerals,

provision of baths for the miners, housing (of higher or lower quality), miners' libraries and institutes, industries that use the mineral, or clays, and other related activities.

At Tarnowskie Góry, it seems that almost no above-ground structure, machinery or other mining devices survive from any of the mining phases, the mining heritage being limited to the network of tunnels, chambers, shafts and adits, the only exception being represented by Adolf Shaft Works where elements of the technical pumping system dating back to the early 20th century survives in situ.

The documentation in the nomination dossier is essentially formed by historic drawings but no geometric survey or tri-dimensional model of the actual extent of the underground system is presented to support the proposed arguments.

Documentation in this regard has been requested from the State Party, who responded on 14 November 2016 by submitting useful hand-drawn sketches to illustrate the underground mining system.

The dossier itself admits that little is known about the underground mining system related to the 16th century; however, ICOMOS notes that not much is presented either for the 19th century underground system.

Additionally, the comparative analysis, extensive with regard to the mining properties included and fair in its assessment, fails to demonstrate how Tarnowskie Góry would justify consideration for the World Heritage List as a mining site with its mining water management system.

The adaptation of the water management system with its pumping devices to supply water to the towns and the industrial district of Upper Silesia, and its role in boosting the Prussian industrial revolution in the late 18th-early 19th centuries, is today represented by the structures at Adolph Shaft and its Waterworks, which date back to the late 19th and early 20th centuries, so somewhat later than the period of significance (late 18th-early 19th centuries).

No comparative analysis was initially carried out with regard to this aspect of the property; however, the State Party provided an augmented comparison in February 2017, which has been found incomplete and not conclusive. Therefore, although interesting, the potential of the nominated property for inscription on the World Heritage List remains at this stage unclear.

The property has been presented under four criteria (i), (ii), (iii) and (iv). At this stage, none of the criteria appear demonstrated, and for some the property does not seem to exhibit the potential for future justification. Some aspects of the nominated property might warrant future exploration through a deepened description and documentation and an augmented comparative analysis, to assess whether and how the property can be seen to be an outstanding example of a mining site for non-

ferrous material that could be exploited thanks to an ingenious water management system which was also used for water supply purposes.

In terms of protection, not all features included in the nominated property enjoy legal protection, although procedures are underway to warrant protection status to a number of them.

Management has been carried out for several decades mainly by the Association TGLL and by the body responsible for the water supply (today the Veolia company). A steering committee was established on 7 November 2016 to ensure coordinated management through a World Heritage management plan approved on the same date.

ICOMOS considers further work is needed in order to demonstrate whether this property may justify consideration for the World Heritage List.

8 Recommendations

Recommendations with respect to inscription

ICOMOS recommends that the examination of the nomination of Tarnowskie Góry Lead-Silver-Zinc Mine and its Underground Water Management System, Poland, to the World Heritage List be **deferred** in order to allow the State Party, with the advice of ICOMOS and the World Heritage Centre, if requested, to:

- a) Re-scope the nomination by focussing on the underground mining and water management system and water supply, and by considering the potential of other attributes, currently outside the nominated property, to make a robust case for World Heritage Listing,
- b) Deepen the description of the nominated property and of its attributes, particularly those illustrating the integration of dewatering with supplying water, also through 3D drawings based on rigorous survey,
- c) Expand the comparative analysis to verify what other properties survive of early water supply based on the steam engine. Such a comparison needs to consider the surviving attributes in the comparators;

Any revised nomination should be visited by a mission to the site.

Additional recommendations

ICOMOS further recommends that the State Party gives consideration to the following:

- a) Finalising and implementing the legal protection of all the structures above and below ground within the boundaries of the nominated property as well as those that, although in the buffer zone, are said to support the value of the nominated property,

- b) Setting up a multidisciplinary scientific committee as an advisory body to the Steering Committee, to assist in scientific and research programmes,
- c) Confirming that the change of ownership of the pumping station at Adolph Shaft will not alter in the medium- to long-term the quality and regularity of the extraction of the water necessary to conserve the underground chambers,
- d) Developing a complete scientific programme of 3D laser-scanning and modelling of the accessible part of the underground network, including the pumping station at Adolph Shaft with its underground ensemble,
- e) Developing an archaeological investigation programme with a focus on the underground element of phase I, to the extent this is possible, and of phase II, with a particular focus on the mining landscape,
- f) Considering the extension of area A5 to join area A4;



Map showing the boundaries of the nominated property



Friedrich Mine Washing Tip



'Black trout' route



Single wooden pole supports



Adolph Shafts