ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

North Urals Bauxite Mine

RUSAL, Russia

ID: 97

German Environment Agency

Umwelt Bundesamt

Note

The qualitative assessment of Environmental Hazard Potentials (EHPs) in this factsheet was conducted according to the method developed in the precursor project ÖkoRess I "Discussion of the environmental limits of primary raw material extraction and development of a method for assessing the environmental availability of raw materials to further develop the criticality concept"[1] (Dehoust et al. 2017a). The measurement instructions applied here are described in Dehoust et al. 2017b. The method is tested and further developed within this project (ÖkoRess III).

The information in this factsheet refers exclusively to publicly available, designated sources that have been classified as serious by the authors. It is specifically pointed out that no statement is made about the implementation and quality of agreements or standards that are applied. The implementation of agreements through memberships, certifications, etc. is the responsibility of the companies.

The surface extension of each mine area has been estimated based on publically accessible satellite images as official land-use plans from the public authorities or mine operators are not consistently available. It therefore only corresponds to the apparent area where mining, processing facilities, heaps, etc. and related infrastructure are clearly identifiable.

The fact sheets make no claim to completeness of all relevant voluntary standards. Mentioning a membership in one of the listed voluntary standards does not imply an assessment of the suitability of the standard in itself, nor does it make any statement about the member's success in implementation.

[1]TEXTE 87/2017 https://www.umweltbundesamt.de/publikationen/discussion-of-the-environmental-limits-of-primary

North Urals Bauxite Mine

Bauxite

General information

Indicator or criteria	Description and values
Name of mine	North Urals Bauxite Mine
Description of mining area	The North Ural Bauxite Mine is located on the eastern slope of the North Urals northeast of Severouralsk. The mine includes the Krasnaya Shapochka, Kalyinsky, Novokalyinsky, and Cheryomukhovsky deposits that differ in occurrence depth, thickness of ore lodes, and other parameters. The deposits were discovered in 1934. The ores are mainly composed by diaspore–boehmite (Anfimov / Soroka 2015 p. 203). They occur in carbonate rocks and belong to "karst bauxites"(Bárdossy 1982). Ores are extracted by underground mining and further processed at the Bogoslovsk facility in Krasnoturyinsk (52 km southern of Severouralsk). In 2015 UC RUSAL started the first stage of Cheremukhovskaya-Glubokaya mining operation. It is the deepest bauxite mine in Russia at 1.550 metres depth and one of the five deepest bauxite mines in the world (Rusal 2019).
Surface extension	17.09km^2 17.09 km^2 (Image date: 14.07.2018; Viewing height: 7.30 km) (Google Earth)
In operation since	1934 1934 (Mines of the Urals 2018).
Operator	RUSAL
Owner	RUSAL
Closest town	Located in Severouralsk, 450 km from Yekaterinburg (Rusal 2019)
Province	Sverdlovsk Oblast
Country	Russia
Longitude	59.966667°
Latitude	60.15°

Altitude	200 m a.s.l. 200 m (city of Severouralsk)
Main product and by-products	Main-product: Bauxite; by-product: none
On-site processing stages	Room and pillar mining with corresponding processing steps such as drilling, crushing and sorting. The ore is then transported by an underground rail system and a lift to the surface (Mines of the Urals 2018).
Annual production	2,360 Mt Bauxite (Rusal 2017 p. 57)
Proven Reserves	Only resources are published in annual report (Rusal 2017 p. 26).
Probable Reserves	Only resources are published in annual report (Rusal 2017 p. 26).

Geology

Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	No indication was found, that the oxide ore is associated with sulfide ores. Aluminium, which is extracted from bauxite, is a lithophilic element. Litophilic elements are usually extracted from oxide deposits. In general, AMD requires the presence of sulphide minerals (Dehoust et al. 2017b).	According to the Goldschmidt classification in the measuring instructions, aluminium is a lithophilic element and is mostly mined in oxidic ore bodies.	Low	B2 = medium, classified according to measuring instructions
Paragenesis with heavy metals	No indication of paragenesis with heavy metals.	The main constituents of bauxite are Al hydroxides and Fe oxides (not heavy metals). The measuring instruction suggests in this case of uncertainty a medium EHP.	Medium	B2 = medium, classified according to measurement instructions

Paragenesis with radioactive components	No direct indication of paragenesis with thorium or urianium. But Anfimov and Soroka (2015) describe the source rocks of paragenesis which are mainly limestone (carbonates).	Bauxites formed by lateritic weathering of carbonate rocks are evaluated with a low EHP, if no further information indicates otherwise	Low	B2 = medium, classified according to measurement instructions
Deposit size	100 Mt Bauxite (Bogatyrev et al. 2009 p. 141)	The current reserves were not mentioned in the annual report from 2017. Only the resource were reported, which amount to total resources of 382.9 Mt bauxite. The stated reserves of 100 Mt. Bauxite by (Bogatyrev et al. 2009 p. 141) are considered to be the general reserve size. An estimation of historical mined ore is therefore not applied. The deposit can be considered as large (>100 Mt ores) according to the measurement instructions.	High	B2 = medium, classified according to measurement instructions
Ore grade	No direct information obtained. But the boehmite is only barely suitable for the Bayer process. It takes up to seven tonnes of North Urals bauxite to produce one tonne of aluminium, rather than the typical figure of five. (Fortescue 2008 p. 32f)	Based on the missing data base, no evaluation result can be derived.	Data base not sufficient for evaluation.	Data base not sufficient for evaluation.

Technology

Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Mine type	Underground mine (Rusal 2019)	Underground mines have compared to open-pit mines a smaller impact on land consumption. Accordingly, the EHP resulting from the mining method is low.	Low	A = high, can be derived directly from available data
Use of auxiliary substances	Drilling methods, trucks, shovels and loaders are used to extract the ore. There is no indication of using explosives underground (Mines of the Urals 2018). The material is crushed and transported by a underground rail system to the surface (Region Kostanay 2015). No further processing takes place at the site and therefore use of auxiliary sbstances.	The site-related ÖkoRess evaluation system is focused on the on-site processes. On-site no auxiliary substances are used (with the exception of water) for ore processing and draining of the underground mine.	Low	B1 = medium, can be estimated on the basis of available information
Mining waste	No reference to mining waste could be found.	The measurement instructions suggest a high EHP ranking in this case.	High	B2 = medium, classified according to measuring instructions
Remediation measures	No reference to remediation measures could be found.	The measurement instructions suggest a high EHP ranking in this case.	High	B2 = medium, classified according to measuring instructions

Framework conditions natural environment

Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Accident hazard due to floods, earthquake, storms, landslides	The rating system for the 4 sub-indicators uses georeferenced data from publicly available risk maps (see measurement instructions (Dehoust et al. 2017b)). Metrics are directly taken from the given risk assessment. The indicator total is determined by the highest hazard level of the sub-indicators.	The EHP for all sub-indicators (earthquakes, flood, landslide, tropical storm, arctic region) is low for all five sites of the mining area. It has to noted, that geodata for floods only cover the area between 60°N and 56°S latitude. The mining complex is located at 60.1° latitude and thus just outside the coverage.	Low	A = high, can be derived directly from available data
Water Stress Index (WSI) und desert areas	The WSI by Pfister et al. (2009) provides characterization factors on the relative water availablility at watershed level. Absolute water shortages in dry areas is supplemented by desert areas. The highest hazard level of the sub-indicators determines the total result.	The water stress for all five sites of the mining area is low and the complex is not situated in a desert area, which results in a low EHP.	Low	A = high, can be derived directly from available data
Protected areas and AZE sites	Georeferenced data for designated protected areas are used to assess hazards posed by mining extraction. The metric to evaluate EHPs corresponds to the method first described in the draft standard of the Initiative for Responsible Mining Assurance (IRMA 2014).	All five sites of the mining area are not situated in designated protected areas and AZE sites, which results in a low EHP.	Low	A = high, can be derived directly from available data

State Governance

Indicators	
WGI 1 -Voice and Accountability	18.72 °°°
WGI 2 -Political Stability and Absence of Violence/ Terrorism	21.43 °°°
WGI 3 - Government Effectiveness	50.48 °°°
WGI 4 -Regulatory Quality	32.69 °°°
WGI 5 - Rule of Law	22.12 °°°
WGI 6 -Control of Corruption	17.31 °°°
EPI (Environmental Performance Index)	63.79
EITI membership	n.d.
International Agreements	
ILO 176	ratified

Others	No information obtained
Legal framework	
Areas of Law: Environment	The state body "Rosprirodnadzor" (The Federal Supervisory Service for Nature Management) exercises control and supervision to the mining operations plan, following the Environmental legislation (Josefson / Rotar, 2018). Further approvals concerning deterioration of environmental media (e.g. air quality) are obtained by other legal offices. Public consultation is not mentioned. The mining operations plan has to consider all measures identified by the environmental impact assessment that is carried out at the Federal level. This addresses in particular storage of tailings, waste products, sanitary and epidemiological welfare. In case of closure of the mine site openings and drilled holes should be brought back into a condition guaranteeing life, health and safety of the environment and manmade infrastructure. The plan of mining operations must consider obligations and provisions of the zoning legislation (Posashkov / Mazurov, 2018). However, deposits and occurrences of minerals are referred to as industrial zones.

Areas of Law: Occupational Health and Safety (OHS)	The main requirements for compliance with health and safety regulations applicable to mining operations are the same as those generally applicable for operating hazardous industrial facilities. Virtually all major aspects of mining operations are considered by Russian law to be hazardous industrial operations and are, therefore, regulated by Federal Law "On Industrial Safety at Hazardous Industrial Facilities" (Josefson / Rotar, 2018). The law stipulates obligations in relation to occupational safety for both employers and employees. Violations to occupational safety requirements entail administrative and criminal sanctions according to the Criminal Code of the Russian Federation and the Administrative Offences Code (Posashkov / Mazurov, 2018).

Corporate Social Responsibility (CSR)

Voluntary Standards	
Aluminium Stewardship Initiative (ASI): Is the mine owning company a member?	No No (ASI 2019)
Aluminium Stewardship Initiative (ASI): Is the mine certified?	No No (ASI 2019)
International Council of Mining & Metals (ICMM): Is the mine owning company a member?	No No (ICMM 2019)
Towards Sustainable Mining (TSM) Is the mine owning company a member of the Mining Association of Canada (MAC)?	No No (MAC 2019)
Towards Sustainable Mining (TSM) outside Canada: Are TSM standards implemented*?	No information available No information available.

Initiative for Responsible Mining Assurance (IRMA): Is the mine owning company a member?	No No (IRMA 2018)
Initiative for Responsible Mining Assurance (IRMA): Is the mine certified?	No No (IRMA 2018)
Responsible Copper (RC): Is the mine owning company a member of RC?	Not applicable Not applicable
Responsible Copper (RC): Is the mine certified?	Not applicable Not applicable
Responsible Mining Index (RMI): Has the mine been rated?	No No
Responsible Mining Index Company indicator „Working conditions“	0.369 0.369 / 1.000 (RMI 2018)
Responsible Mining Index Company indicator „Environmental sustainability“	0.198 0.198 / 1.000 (RMI 2018)
Responsible Steel (RS): Is the mine owner a member of the RS?	Not applicable Not applicable
Responsible Steel (RS): Is the mine certified?	Not applicable Not applicable
Australian Steel Stewardship Forum (ASSF): Is the owner a member of the ASSF?	Not applicable Not applicable
Australian Steel Stewardship Forum: Is the mine certified?	Not applicable Not applicable
ISO and CSR reporting	
ISO 14001 (ISO 14004): Is the mine ISO 14001 certified?	No information obtained No information available

CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	No No (Rusal 2017)
OECD Guidelines: Does the company have its headquarters in a signatory state?	No No (Rusal 2017)
ISO 26000: Does the mine implement ISO 26000?*	No information obtained No information available
Banking Standards	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	No information obtained No information available
Equator Principles (EP): Is the mine financed to a major extend by a bank adherent to the EP?	No information obtained No information available

*by companies own account.

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A Glossary

Table 1 Legend

Environmental hazard potential

low

medium

high

Data quality

low

- No concrete information, no general specifications of the measurement instructions, expert estimation.
- Assessment not possible due to lack of data at the site, as there is also no evidence for an assessment and there are no generalized assessment rules.

medium

- Assessable on the basis of available information.
- Generalized classification according to measurement instructions.

high

- Can be derived directly from available data.

B Abbreviations

EHP	Environmental hazard potential
FY	Financial year
kt	Kilo tonnes
m a.s.l.	Meters above sea level
Mt	Million tonnes
OHS	Occupational Health and Safety
t	tonnes
TSF	Tailing Storage Facility
WGI	World Governance Indicators
WHS	Work Health and Safety

C Imprint

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