ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Stoilensky

NLMK, Russia

ID: 24

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

Stoilensky

Iron ore

General information

Indicator or criteria	Description and values
Name of mine	Stoilensky
Description of mining area	The Stoilensky Mining and Processing Plant, known as Stoilensky GOK, is an iron ore mine with a number of open pits in western Russia, near the border with Ukraine, approximately 490 km south of Moscow. Stoilensky GOK develops the deposit, which is located in one of the world's largest iron ore basins, in the central part of north-western strip of the Kursk Magnetic Anomaly mainly consists magnetite ore. Ferruginous quartzites of the Kursk Group of the Kursk Magnetic Anomaly (KMA) are typical representatives of banded iron formations (Zhabin / Sirotin 2009). In the region of Belgorod Oblast, the natural vegetation of deciduous forest and steppe has been almost wholly cleared for agriculture since intensive settlement began in the 17th century and now survives only as occasional oak groves along the rivers. Agriculture is highly developed, and the population is mostly rural (Encyclopedia Britannica 2019).
Surface extension	55.55km^2 55.55 km^2 (Image date: 15.10.2019; Viewing height: 11.51 km) (Google Earth)
In operation since	1961 1961 (NLMK 2019a)
Operator	OJSC Stoilensky GOK
Owner	NLMK
Closest town	Stary Oskol (Google Earth)
Province	Belgorod Oblast
Country	Russia
Longitude	37.72745°

Latitude	51.26411°
Altitude	200 m a.s.l. 200 m a.s.l (Google Earth)
Main product and by-products	Main-product: iron ore; by-products: no information was found
On-site processing stages	Drill and blast, crushing, and trommeling of high-grade ore to produce sinter ore whereas the beneficiation of ferruginous quartzites requires three stages of crushing including a closed-circuit final stage, three-stage reduction, magnetic separation, de-slurrying and dewatering in vacuum filters (NLMK Stoilensky, ed.). Stoilensky GOK's main products are iron ore concentrate (fines), sinter ore and iron ore pellets, which are primarily feeds NLMK' main steel production facility in Lipetsk located 250 km northeast (NLMK 2019a; b).
Annual production	In 2018: 18.4 Mt iron ore (NLMK 2019b)
Proven Reserves	No specific information was found
Probable Reserves	Unspecified reserves: 5,000 Mt iron ore (NLMK 2019b)

Geology

Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	Ferruginous quartzites are mined. They are composed of alternating thin layers of quartz and iron oxides with the absence of other minerals in notable amounts (Zhabin / Sirotin 2009). Iron is a siderophile element and can be mined in sulphidic ores as much as in oxidic ores. However, no indication was found that the deposit is associated with sulfidic ores.	Due to the obvious magnetic features it can be assumed that magnetite (an iron oxide) constitutes the main mineral phase of the ferruginous quartzites. There is no indication of the presence of sulphide minerals. Therefore the preconditions for AMD are not given and thus the EHP can be ranked as low.	Low	B2 = medium, classified according to measuring instructions

Paragenesis with heavy metals	No information about paragenesis with heavy metals was found.	The measurement instructions indicate that oxidic iron ores can be associated with heavy metals such as lead, zinc, copper, chrome, and arsenic, leading to a medium EHP.	Medium	B2 = medium, classified according to measurement instructions
Paragenesis with radioactive components	No indication of paragenesis with thorium (Th) and uranium (U) could be found	In accordance with the measurement instructions, iron ore deposits are evaluated with a medium EHP, if no specific information is available.	Medium	B2 = medium, classified according to measurement instructions
Deposit size	According to NLMK (2019b) the mine has unspecified reserves of 5,000 Mt iron ore. The annual production was 18.4 Mt iron ore in 2018.	The unspecified reserve amounts roughly to 5,000 Mt iron ore. The operation started in 1961. In 2018, the production was 18.4 Mt iron ore per year. Assuming that the annual production has been continuous since the start of operations, more than 1,000 Mt of iron ore would have been extracted so far. Hence, the deposit is classified as very large and, is consequently evaluated with a high EHP.	High	A = high, can be derived directly from available data
Ore grade	According to NLMK (2016) the ferruginous quartzite mined has a Fe content of 34.8 %. High-grade ore occurs as by-product. Its concentration ranges between 50-56 % Fe (Magazine cr2 2014).	Based on the grade classes for selected commodities in the updated measurement instructions (Dehoust et al. 2017b) based on Priester et al. (2019), the deposits' ore grade correspond to an 'average' ore grade (Fe in %: 30-60). The EHP is therefore evaluated as medium	Medium	A = high, can be derived directly from available data

Technology

Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Mine type	Hard rock open-pit mining (NLMK 2019a)	Conventional solid rock open pit mining is evaluated with a medium EHP. During open pit mining in solid rocks, the mining activities are restricted to the horizontal and vertical extension of the ore body/mineralized zone. The impact is higher than in underground mining but less pronounced then in mining of alluvial or unconsolidated sediments.	Medium	A = high, can be derived directly from available data
Use of auxiliary substances	The extraction of iron ore requires drilling and blasting operations. Ore beneficiation takes place at the refinery facilities on-site. The high-grade ore processing only comprises three stages of crushing and trommeling to produce sinter ore whereas the beneficiation of ferruginous quartzite requires three stages of crushing including a closed-circuit final stage, three-stage reduction, magnetic separation, desliming and dewatering in vacuum filters (NLMK 2016, 2019a).	Ore processing is restricted to comminution, reduction, magnetic separation, deslurrying and dewatering, thus allowing classification with a low EPH. In general, the use of explosive substances do not lead to a higher EHP.	Low	A = high, can be derived directly from available data
Mining waste	The mine has built a slurry dewatering unit and new water reuse and tailings transfer pipeline systems, thus adopting more efficient methods of processing gangue after beneficiation. There are two beneficiated	Due to the spatial area covered by tailing ponds and waste heaps; the lack of information on backfilling of waste material, treatment of toxic waste fraction, and very fine grained particles	High	B2 = medium, classified according to measuring instructions

	waste ore thickeners in operation. Thickeners process 37 Mt of material (2018). The thickened slurry is pumped to the tailings pond for storage, with 80% of the water used for their transportation re-used in the beneficiation process (Golutsky 2017). The tailings ponds and the waste heaps cover an area of 9.6 km^2 and 12 km^2, respectively. It appears that the tailing ponds are situated in shallow valley that is blocked by an approx. 27 m high dam (Google Earth). According to Pogoreltseva et al. (2019), at Stoilensky GOK there are no regional water-resistant layers at the base of the basing of the tailings dump which creates favourable conditions for the hydraulic connection of technogenic waters with natural aquifers. No information was found on backfilling of mining waste. No information was found about the special treatment of very fine grained particles caused by crushing and milling. According to NLMK Stoilensky (ed.), non-toxic waste particles are separated from the ore into tailings. However, no information was found how toxic waste is treated.	caused by crushing and milling; and an improperly constructed basing of a TSF, the EHP is evaluated as high.		
Remediation measures	The mine conducts dust control activities, implements reclamation of tailings dam levees and biological reclamation of loose overburden dump. Each year the company vegetates 18 hectares of the industrial territory in average. In the last 5 years the company has vegetated 73 hectares of the tailing storage facility's dam slopes. The mine implements forest protection technology to	The EHP is evaluated as low due to the recultivation and compensation activities concomitantly to the mining process.	Low	A = high, can be derived directly from available data

	reduce the impact on the environment. Around the plant's tailings storage facilities there are 7.5 meters wide forest strips planted with three rows of birch. At present, the total length of forest plantations is 5.6 thousand meters, and the total area is 4.23 ha (NLMK 2019a). There is no information in the web-based sources and company's annual report whether the mine has financial accruals for rehabilitation. The Russian legislation does not require the non-public (non-listed) companies to disclose this information to the public.			

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). Metrics are directly taken from the given risk assessment. The indicator total is determined by the highest hazard level of the sub-indicators.	The Stoilensky mine has a high EHP for floods which determines the evaluation result. The other sub-indicators have a low EHP.	High	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	Water Stress Index shows moderate values leading to medium EHP.	Medium	A = high, can be derived directly from available data

	hazard level of the sub-indicators determines the total result.			
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).	The mine is 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	19.21 °°°
WGI 2 -Political Stability and Absence of Violence/ Terrorism	29.05 °°°
WGI 3 - Government Effectiveness	50.96 °°°
WGI 4 -Regulatory Quality	31.73 °°°
WGI 5 - Rule of Law	20.67 °°°
WGI 6 -Control of Corruption	21.15 °°°

EPI (Environmental Performance Index)	63.79
EITI membership	No
International Agreements	
ILO 176	The Russian Federation has ratified the ILO Safety and Health in Mines Convention, 1995 (No. 176)
Others	Signatory to the Minamata Convention 2013, signed on 24/09/2014, ratification still pending (UNEP 2019). Paris Agreement on Climate Change, adopted in Paris, France, under the United Nations Framework Convention on Climate Change. Signed by the Russian Federation on 22 Apr 2016, Acceptance on 7 Oct 2019 (UNFCCC 2016).
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?	Not applicable Not applicable
Aluminium Stewardship Initiative (ASI): Is the mine certified?	Not applicable Not applicable
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 No
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 n/a
Responsible Copper (RC): Is the mine certified?	Not applicable n/a
Responsible Mining Index (RMI): Has the mine been rated?	No No (RMI 2018)
Responsible Mining Index Company indicator „Working conditions“	Not applicable n/a

Responsible Mining Index Company indicator „Environmental sustainability“	n.d. In 2016, NLMK Lipetsk won the “100 Best Companies in Russia. Ecology and Environmental Management” competition, its Managing Director was awarded the “Environmentalist of the Year 2016” badge of honour, and the facility was also awarded in the categories “Golden Branch of the Planet” and “For Achievements in Air Protection”. In addition, the Department of Industrial Ecology won the “Best Environmental Service” category (NLMK 2017 p. 88)
Responsible Steel (RS): Is the mine owner a member of the RS?	No No
Responsible Steel (RS): Is the mine certified?	No No
Australian Steel Stewardship Forum (ASSF): Is the owner a member of the ASSF?	No No
Australian Steel Stewardship Forum: Is the mine certified?	No No
ISO and CSR reporting	
ISO 14001 (ISO 14004): Is the mine ISO 14001 certified?	Yes Stoilensky’s Environmental Management System was awarded ISO 14001:2004 certification by Det Norske Veritas (Norway) certification authority in late 2007. In 2010, Stoilensky’s Environmental Management System passed a recertification audit, later on BSI carried out the certification audit in 2014 (NLMK 2017 p. 87)
CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	No No (NLMK 2019b)
OECD Guidelines: Does the company have its headquarters in a signatory state?	No No (OECD 2019)
ISO 26000: Does the mine implement ISO 26000?*	No No

Banking Standards	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	No No
Equator Principles (EP): Is the mine financed to a major extend by a bank adherent to the EP?	No No

*by companies own account.

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A Glossary

Table 1 Legend

Environmental hazard potential

 *low*	 *medium*	 *high*

Data quality

 *low*	 *medium*	 *high*
• 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.	• Assessable on the basis of available information. • Generalized classification according to measurement instructions.	• 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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- Öko-Institut e.V. (Institute for Applied Ecology)