

ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Buenvista del Cobre

Grupo Mexico, Mexico

ID: 72

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.

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

Buenavista del Cobre

Copper

General information	
Indicator or criteria	Description and values
Name of mine	Buenavista del Cobre
Description of mining area	The Buenavista mining unit is an open-pit copper (and molybdenum) mine with two concentrators and three SX-EW plants. It lies on the southern part of the North American cordillera orogen within the “Basin and Range” metallogenic province. Geologically, the mineralization (bornite-chalcopyrite-molybdenite and chalcocite) is of the disseminated porphyry copper type, being overlain by a Palaeozoic calcareous sedimentary sequence and covered by volcanic rocks of Mesozoic age. Mineralization is extensive covering an area of approximately 30 square kilometres (SCC 2019a p. 44).
Surface extension	84.69km ² 84.69 km ² (Image date: 7.4.2018; Viewing height: 15.23 km) (Google Earth)
In operation since	1899 1899 (MDO 2019)
Operator	Minas e Instalaciones Mineras S.A.
Owner	Grupo Mexico
Closest town	100 kilometres northwest of La Caridad
Province	Sonora
Country	Mexico
Longitude	-110.322835°
Latitude	30.971821°
Altitude	1598 m a.s.l. 1598 m a.s.l. (Google Earth)



Main product and by-products	Main-product: copper (Cu); by-products: molybdenum (Mo), zinc (Zn) (latter in development, see SCC Annual Report 2018 (SCC 2019b p. 18) silver (Ag) (SCC 2019a p. 62), Gold is also reported from the Buenavista deposits (Valencia-Moreno et al. 2007).
On-site processing stages	Drilling, blasting and loading; waste rock is hauled to dump areas and leaching ore is hauled to leaching facilities (so called dumps) copper ore milling and recovery, copper concentrate production by floatation; leaching, solvent extraction and refined cathode electrowinning in SX-EW plant (SCC 2019a pp. 24–25).
Annual production	2018: 414.1 kt copper (SCC 2019a p. 73) 70.46 Mt tons of copper ore with 0.537 % Cu and 145.25 Mt of leach material with 0.242% Cu (SCC 2019a p. 44).
Proven Reserves	4,673 Mt (=1912.4 Mt leach+2760.6 Mt sulphide ore (SCC 2019a p. 58)
Probable Reserves	2081.2 Mt (=739.8 Mt leach+1341.4 Mt sulphide ore) (SCC 2019a p. 44)

Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	Acid drainage of copper sulphate solution in a large scale is reported from Buenavista Mine, due to breach of a pipeline of leachate basin (BBC 2014). The impacts are being mitigated (SCC 2019a p. 86). However legal procedures are pending against the Company (SCC 2019a p. 140)(see below Remediation measures)	In general, the extraction of sulphide minerals has a high environmental hazard potential with regard to AMD. In the case of Buenavista del Cobre, a leak of leachates already led to environmental impacts.	High	A = high, can be derived directly from available data
Paragenesis with heavy metals	Zinc (SCC 2019a p. 18) is reported as accessory exploitable heavy metal at Buenavista Copper Mine (SCC 2019a pp. 44–45)	According to the measurement instructions, mining for the targeted extraction of heavy metals such as lead, mercury, cadmium, chromium, copper, uranium and nickel should be	High	A = high, can be derived directly from available data

		evaluated as having a high environmental hazard potential.		
Paragenesis with radioactive components	No indication of paragenesis with thorium and uranium or other radioactive components could be determined.	In accordance with the measurement instructions (Dehoust et al. 2017b), copper ore deposits are evaluated with a medium EHP, if no further information is available.	Medium	B2 = medium, classified according to measurement instructions
Deposit size	According to SEC report (SCC 2019a p. 58) SCC calculated Cu-reserves for open-pit mine Buenavista as follows: (i) the product of sulfide ore reserves and the average copper grade proven plus (ii) the product of sulfide ore reserves and the average copper grade probable plus (iii) the product of in-pit leachable reserves and the average copper grade. On this calculation base SCC reports a total of copper reserves of 22.495 Mt of Cu.	Considering the total reserves of 22.495 Mt of Cu and adding the amount of copper ore extracted in the past (1899: 118 years) the total deposit size is classified according to Petrow et al. (2008, In: Dehoust et al. 2017b) as very large size and evaluated with a high EPH.	High	A = high, can be derived directly from available data
Ore grade	0.443 % Cu in sulphide ore and 0.163 % of Cu in SX-EW ore (SCC 2019a p. 58)	Considering a range of 0.163 to 0.443 % copper ore grade and a significant participation of almost 40 % of low grade leachable ore in the total reserves and in accordance with the updated measurement instructions (Dehoust et al. 2017b) based on Priester et al. (2019) the specific grade is classified as low and thus a high EHP is assigned .	High	A = high, can be derived directly from available data

Technology				
Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Mine type	Open pit hard rock mining (MDO 2019; SCC 2019a p. 24)	Mining is restricted to the horizontal and vertical extension of the ore body/mineralized zone; depleted pits are used for waste disposal. According to measurement instructions a medium EHP can be assigned.	Medium	B1 = medium, can be estimated on the basis of available information
Use of auxiliary substances	Mining by truck and shovel-loader; drilling and blasting. On site beneficiation plant in operation with standard primary crushing and conveying, milling in rotating drums and ball mills, ore transformation in slurry, ball milling, copper concentrate flotation, concentrate thickening, filtration steps and hauling of concentrates to smelter in La Caridad. Cu is extracted from pregnant leach solution (which is held in 11 dams), being processed with acids and solvents in three SX-EW plants (MDO 2019).	This indicator is evaluated with a high EHP due to the use of potentially toxic substances used in floating and in the SX-EW process.	High	B1 = medium, can be estimated on the basis of available information
Mining waste	Mine tailings (leachable ore) are stored on-site in a TSF, which includes tailings dam No. 3 of 90m height and the New Tailing Dam of 70 m , both with downstream construction method (SCC 2019a p. 34).	Due to the considerable height of the dams and the fine and ultrafine nature of the materials resulting from flotation and acidic drainage a high EHP is assigned.	High	B2 = medium, classification according to measurement instructions



<p>Remediation measures</p>	<p>The 2014 copper sulphate solution spill from a leaching pond of Buenavista's New SX-EW III plant contaminated the Bacanuchi River, a tributary of the Sonora River. Clean-up was assured by establishing a trust fund of approximately USD150 million to support remedial action and provide compensation to assets affected (SCC 2016 p. 44, 2019a p. 44). Reinforcement and maintenance of the containment walls of tailings dams is reported (Grupo México 2018 p. 121). Although mentioned for SCC's integral operation no further site-specific mitigation or remediation measures could be identified.</p>	<p>SCC states that all of its facilities in (Peru and) Mexico are in compliance with applicable environmental, mining and other laws and regulations. Environmental capital investments of 43.5 million US have been reported for Mexico in 2018 (SCC 2019a p. 137). Although mentioned for SCC's integral operation, no further site-specific Buenavista mitigation or remediation measures could be identified (SCC 2019a p. 111). For this reason, a high EHP is assigned.</p>	<p>High</p>	<p>B2 = medium, classification according to measurement instructions</p>
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Framework conditions natural environment



Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
<p>Accident hazard due to floods, earthquake, storms, landslides</p>	<p>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.</p>	<p>The EHP for all sub-indicators (earthquakes, flood, landslide, tropical storm, arctic region) is low for the mining area, resulting in a low EHP for Accident Hazard.</p>	<p>Low</p>	<p>A = high, can be derived directly from available data</p>
<p>Water Stress Index (WSI) und desert areas</p>	<p>The WSI by Pfister et al. (2009) provides characterization factors on the relative water availability at watershed level. Absolute</p>	<p>The EHP for water stress is high and the mine is situated in a desert area. Both</p>	<p>High</p>	<p>A = high, can be derived directly</p>

	water shortages in dry areas is supplemented by desert areas. The highest hazard level of the sub-indicators determines the total result.	results alone already determine the high EHP.		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).	The mining area overlaps with protected areas which results in a medium EHP.	Medium	A = high, can be derived directly from available data

State Governance

Indicators	
WGI 1 -Voice and Accountability	43.84 ^{ooo}
WGI 2 -Political Stability and Absence of Violence/ Terrorism	20 ^{ooo}
WGI 3 - Government Effectiveness	59.62 ^{ooo}
WGI 4 -Regulatory Quality	64.42 ^{ooo}
WGI 5 - Rule of Law	33.17 ^{ooo}
WGI 6 -Control of Corruption	23.08 ^{ooo}

EPI (Environmental Performance Index)	59.69
EITI membership	Yes
International Agreements	
ILO 176	Mexico is part of ILO 176
Others	<ul style="list-style-type: none"> • Signature of the Minamata Convention in 2013, ratification in September 2015 • Reaffirmation of commitment with the 2030 Agenda for Sustainable Development and submission of the Voluntary National Report in 2016 • Signature of the Paris Agreement on Climate Change and participation in COP 22 (MDNP 2019).
Legal framework	

<p>Areas of Law: Environment</p>	<p>While the Mining Law and its regulations are the key norms governing mining activities in Mexico, the following legislation addressing environmental matters is applicable to the sector (Law Reviews 2019). The design of environmental policies, laws and instruments lies with the Ministry of the Environment SEMARNAT (ICLG Mexico 2019). The General Law on Ecological Balance and Environmental Protection (LGEEPA) of 1988 and relevant Regulations and amendments are enforced by the Federal Attorney office of Environmental Protection PROFEPA who monitors compliance with environmental legislation and enforces Mexican environmental laws, regulations and official standards as well as promoting administrative proceedings against companies that violate environmental laws including shut down of operations and allowing public actions against activities with hazard potential (SCC 2019 p. 138).</p> <p>The Environmental Liability Federal Law from 2013 (EIA law) establishes general guidelines for actions to be considered to likely cause environmental harm which can result in obligations for environmental clean-up, remedial actions apt to restore environment or compensation measures (Environmental Impact Assessment EIA). Criminal penalties and monetary fines can be imposed under this law (SCC 2019 p. 138). The Federal Law of Waters of 1992 regulates water consumption together with CONAGUA (National Water Commission). Wastewater discharge is due to SEMARNAT norms and CONAGUA enforcement.</p> <p>General Law for the Prevention and Comprehensive Management of Waste and its Regulation (LGPGIR of 2003) regulates the subject of contaminated land with hazardous waste or materials being under the jurisdiction of SEMARNA and PROFEPA.</p> <p>The Federal Law of Environmental Responsibilities (LFRA, published 2013) enables both private and public parties to enforce environmental liability actions against parties which cause environmental damage, independent of property damage (Law Reviews 2019).</p> <p>Specific compliance regarding the mining sector are regulated in the Mexican Mining</p>
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	<p>Law from 1992 and article 27 of the Mexican Constitution. The application of the Mining Law and its Regulations is the responsibility of the Federal Executive (the President’s Office) through the Secretariat of Economy which grants mining concessions according to the EIA law (MineHutte 2019). The Mexican Mines Bureau administers the mining activities and related permits together with the environmental entities mentioned above (ICLG Mexico 2019).</p>
<p>Areas of Law: Occupational Health and Safety (OHS)</p>	<p>Mexico is part of the ILO Convention N° 161 on Occupational Health Services Convention and N° 155 Occupational Safety and Health Convention. National regulations: Federal Labour Law, Federal Social Security Law, Federal Regulations on Safety, Health and Work Environment, Official Regulation NOM-023-STPS-2012, Underground and Open Pit Mines – Safety and Health Conditions at Work, Official Regulation NOM-032STPS-2008, Security for underground coal mines. The main obligations fall on the operator of the mining project (MDNP 2019).</p>

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 information available No information obtained
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?	Yes Yes (RMI 2018)
Responsible Mining Index Company indicator „Working conditions“	0.342 0.342 (RMI 2018)

Responsible Mining Index Company indicator „Environmental sustainability“	0.114 0.114 (RMI 2018)
Responsible Steel (RS): Is the mine owner a member of the RS?	No information obtained No information obtained
Responsible Steel (RS): Is the mine certified?	No information obtained No information obtained
Australian Steel Stewardship Forum (ASSF): Is the owner a member of the ASSF?	No No (ASSF 2018)
Australian Steel Stewardship Forum: Is the mine certified?	No No (ASSF 2018)
ISO and CSR reporting	
ISO 14001 (ISO 14004): Is the mine ISO 14001 certified?	Yes Yes
CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	No No (Mexico) (RMI 2018)
OECD Guidelines: Does the company have its headquarters in a signatory state?	Yes Yes, in Mexico, a member country since 1994 (OECD 2019)
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 obtained
Equator Principles (EP): Is the mine financed to a major extend by a bank adherent to the EP?	No information obtained No information obtained

*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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