ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Cuajone

Southern Copper (Grupo Mexico), Peru

ID: 57

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

Cuajone

Copper

General information

Indicator or criteria	Description and values
Name of mine	Cuajone
Description of mining area	The Cuajone mine site is located in a remote and high-altitude environment in the province of Moquegua in southern Peru. As part of the western flank of Cordillera Occidental, the porphyry deposit of Cuajone is situated in the southernmost part of the Peruvian Andes. Cuajone lies within a belt of Paleocene to early Eocene porphyry copper deposits in the Main Arc Domain of the Andes and next to an inactive string of Pliocene-Quaternary volcanoes. The deposit is composed of copper bearing minerals as chalcopyrite bornite, pyrite and chalcosine with additional presence of molybdenite (Southern Copper n.d.), (Porter GeoConsultancy 2003)
Surface extension	40.09km² 40.09 km² (Image date: 17.08.2019; Viewing height: 13.11 km) (Google Earth)
In operation since	1976 1976 (Southern Copper n.d.)
Operator	Southern Copper
Owner	Southern Copper (Grupo Mexico)
Closest town	Moquegua, 30 km south-east of the mine (Google Maps)
Province	Moquegua (Google Maps)
Country	Peru
Longitude	-70.709743°
Latitude	-17.041824°

Altitude	3650 m a.s.l. 3,650 m a.s.l. (Fluor n.d.)
Main product and by-products	Main product: copper; by-product: molybdenum (Southern Copper 2018 p. 6)
On-site processing stages	Crushing, grinding, flotation (Fluor n.d.)
Annual production	158,105t of copper in concentrates, 3,746t of molybdenum in concentrates (Southern Copper 2018 p. 6)
Proven Reserves	1,035,113 kt, 0.581% copper and 0.019% molybdenum (United States Securities and Exchange Commission 2018)
Probable Reserves	746,881 kt, 0.422% copper and 0.016% molybdenum (United States Securities and Exchange Commission 2018)

Geology

Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	Copper is a chalcophilic element. It is obtained from sulphides in Cuajone which pose a high risk for AMD (United States Securities and Exchange Commission 2018 p. 36) (Dehoust et al. 2017b pp. 13–15).	The extraction of sulphidic minerals has a high environmental hazard potential with regard to AMD.	High	B1 = medium, can be estimated on the basis of available information
Paragenesis with heavy metals	Copper is a heavy metal itself and moreover often associated with zinc, lead, nickel and arsen (Dehoust et al. 2017b p. 22)	Copper is a heavy metal itself. The extraction of copper is consequently always evaluated with a high environmental hazard potential (EHP)	High	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, copper ore deposits are evaluated with a medium EHP, if no other information is available.	Low	B2 = medium, classified according to measurement instructions
Deposit size	1,781,994 Mt with an average ore grade of 0,515% copper (United States Securities and Exchange Commission 2018 p. 58) leading to an metal content of 9.2 Mt of copper.	Calculating with an average annual production of ca. 173,500 t and 41 years of production, the total size of the deposit is roughly estimated to be 16,3 Mt (Annual reports 2003-2017, own calculation). A deposit of this size is very large, leading to a high EHP.	High	B2 = medium, classified according to measurement instructions
Ore grade	0.515 % Cu (United States Securities and Exchange Commission 2018 p. 58)	With a copper content of 0.515 %, the Cuajone deposit can be assessed as average grade deposit.	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 (Fluor n.d.)	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	Medium	A = high, can be derived directly from available data

		is higher than in underground mining but less pronounced then in mining of alluvial or unconsolidated sediments.		
Use of auxiliary substances	Mining is carried out by drilling and blasting and trucks and shovel methods (Southern Copper n.d.). The ore is primary crushed, and then sent to ball mills, where fine ore powder develops. This fine material is treated with water and a reagents solution before going through the flotation circuit. The concentrate is then sent by rail to the smelter at Ilo (United States Securities and Exchange Commission 2018 p. 36)	Flotation is often conducted with the help of toxic additives such as chemical solvents, leading to a high EHP in the evaluation result.	High	A = high, can be derived directly from available data
Mining waste	Wastewater is recovered and tailings are sent to the Quebrada Honda dam, which is the primary tailings facility for the operations of Southern Copper in Peru. Quebrada Honda has an ultimate height of 130 meters and a maximum capacity of approximately 530,000 cubic meters of tailings from the Cuajone and Toquepala mines (United States Securities and Exchange Commission 2018) (PEER 2001).	The disposal of waste in large-volume and large-scale tailing dams are evaluated with a high EHP	High	B2 = medium, classified according to measurement instructions
Remediation measures	A mine closure plan for Cuajone is in place and was updated in 2012. According to Southern Copper, remediation measures are conducted after the "process that created the disturbance is finished" (Southern Copper n.d. a)	The EHP is determined as low due to the ongoing recultivation and compensation activities concomitantly to the mining process.	Low	B1 = medium, can be estimated on the basis of available information

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 mine is located in a seismic active area (Andean Region) with a high EHP for earthquakes which determines the evaluation result. The other sub-indicators have a low EHP.	High	B2 = medium, classified according to measurement instructions
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 EHP for water stress is high and the mine is situated in a desert area. Both results alone already determine the high EHP result.	High	B2 = medium, classified according to measurement instructions
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 site is not situated in designated protected areas and AZE sites, which results in a low EHP.	Low	B2 = medium, classified according to measurement instructions

State Governance

Indicators	
WGI 1 -Voice and Accountability	55.17 °°°
WGI 2 -Political Stability and Absence of Violence/ Terrorism	36.19 °°°
WGI 3 - Government Effectiveness	48.56 °°°
WGI 4 -Regulatory Quality	67.31 °°°
WGI 5 - Rule of Law	33.17 °°°
WGI 6 -Control of Corruption	38.94 °°°
EPI (Environmental Performance Index)	61.92
EITI membership	Meaningful progress (EITI 2019)
International Agreements	
ILO 176	Yes

Others	Part of the UN Framework Convention on Climate Change (UNFCCC). Signature of the Paris Agreement on Climate Change and participation at COP 22. COP 20 held in Lima in 2014. Ratification of the Minamata Convention of Mercury in November 2015. Reaffirmation of commitment with the 2030 Agenda for Sustainable Development. (MDNP 2018)
Legal framework	
Areas of Law: Environment	Peru has a detailed and elaborate environmental legislation in the resource sector. Significant laws are the General Environmental Law (GEL), the Environmental Impact Assessment (EIA) Law and the Environmental Regulation for mining and exploration activities, among others (see MineHutte n.d.) for more information). An EIA needs to be carried out for all activities that may lead to significant impact on the environment. Activities are categorized, according to their foreseen impact. For activities with a middle to high environmental impact, detailed planning is required, including but not limited to management, abandonment, citizen participation and monitoring. Each stage of exploration and exploitation requires a specific type of consent, including environmental consent and public hearings (ibid.). The Ministry of Energy and Mines (MINEM) is the main competent authority for mining and mineral exploration – also for environmental matters. Nonetheless, several more state bodies play a role. Depending on the level of environmental impact, the competent authorities for the approval of an EIA may also be the National Environmental Certification Service for Sustainable Investments (SENACE), or the regional government, for instance (ibid.).

Areas of Law: Occupational Health and Safety (OHS)	Peru has ratified the ILO Convention 176 on Safety in Health on Mines in June 2008 and subsequently adopted the Supreme Decree No. 024-2016-MS for the Regulation of Occupational Safety and Health in Mining. The Decree applies to mining as much as activities related to the mining sector, such as civil constructions, machinery, equipment and mechanical maintenance (MDNP 2018). The legislation on occupational health and safety (OHS) concerns minimum wages, medical tests and occupational safety for miners (Elias 2018). The Ministerio de Energía y Minas (MINEM) is the competent authority for OHS matters (MDNP 2018). ICGL additionally names the Organismo Supervisor de la Inversión en Energía y Minerá (Osinergmin), the superintendencia nacional de fiscalización laboral (SUNAFIL) and the ministry of labour and employment.

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 2017)
Towards Sustainable Mining (TSM) Is the mine owning company a member of the Mining Association of Canada (MAC)?	Yes Yes (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?	0.00 / 6.00 0.00 (RMI 2018)
Responsible Mining Index Company indicator „Working conditions“	0.342 0.342 / 1.000 (Grupo Mexico) (RMI 2018)
Responsible Mining Index Company indicator „Environmental sustainability“	0.114 0.114 / 1.000 (Grupo Mexico) (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 (USA) (Southern Copper n.y. a)
OECD Guidelines: Does the company have its headquarters in a signatory state?	Yes Yes (USA) (Southern Copper n.y. a)
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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