

ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Antamina

Glencore, Peru

ID: 34

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>

Antamina

Copper

General information



Indicator or criteria	Description and values
Name of mine	Antamina
Description of mining area	Antamina is situated in Peru, ca. 285 km north of Lima in the Ancash region. The mine is located in the Andes Mountains and part of a polymetallic skarn mineralisation in the western Andean Cordillera in central Peru (Porter GeoConsultancy 2016).
Surface extension	40.29km ² 40.29 km ² (Image date: 06.08.2019; Viewing height: 14.75 km) (Google Earth)
In operation since	2001 2001
Operator	Compañía Minera Antamina S.A
Owner	Glencore
Closest town	San Marcos, 10 km NW of the mine (Google Maps)
Province	Ancash (Google Maps)
Country	Peru
Longitude	-77.05°
Latitude	-9.533056°
Altitude	4300 m a.s.l. 4.300 m a. s. l. (Mining Technology n.d.)
Main product and by-products	Main Products: copper, zinc; by-products: silver, molybdenum, lead (Antamina 2018)
On-site processing stages	Blasting, Crushing, Milling, Flotation (Antamina 2018)

Annual production	Copper: 142.6 kt, Zinc: 128.1 kt, Silver: 6.579 koz (2017)(Glencore 2018)
Proven Reserves	n.d.
Probable Reserves	n.d.

Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	Copper and Zinc are chalcophilic elements. Both are obtained from sulphides in Antamina, which poses a particularly high risk for (Dehoust et al. 2017b; Mining Technology n.d.).	According to the ÖkoRess assessment scheme, chalcophilic elements have a high hazard potential with regard to AMD (red). This applies to copper and zinc.	High	B1 = medium, can be estimated on the basis of available information
Paragenesis with heavy metals	Within the green skarn mineralisation of the Antamina deposit, concentrations of lead and zinc occur which are naturally associated with copper (Porter GeoConsultancy 2016).	Copper is itself a heavy metal and both zinc and lead occur in the mineralisation at Antamina. With reference to the ÖkoRess assessment scheme, the extraction of heavy metals is assessed with a high EHP.	High	A = high, can be derived directly from available data
Paragenesis with radioactive components	No indication of paragenesis with thorium and uranium could be determined.	In accordance with the measurement instructions, copper ore deposits are evaluated with a medium EHP, if no other information is available.	Medium	B2 = medium, classified according to measurement instructions

Deposit size	The current total ore reserves amount 538 Mt ore with an average ore grade of 0.92 % Cu. (4.95 Mt) (Glencore 2017). The mine started production in 2001. Calculating with an average annual production of 666 kt (Cu,Zn,Ag average annual production from 2007-2016) (Antamina 2017) the mine has a total deposit size of roughly 15.6 Mt. of metal content.	According to the evaluation scheme, the deposit belongs to "very large deposits" leading to a high EHP.	High	B1 = medium, can be estimated on the basis of available information
Ore grade	0.92 % Cu (Reserves) (Glencore 2017)	The deposit provides an average grade for copper. Accordingly, the EHP is 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	Mining is done by conventional truck-and-shovel open pit mine (Teck Resources 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 is higher than in underground mining but less pronounced than in mining of alluvial or unconsolidated sediments.	Medium	A = high, can be derived directly from available data
Use of auxiliary substances	Drilling- and -blasting are the extraction methods at Antamina. The primary crushing product is transported concentrator facility. In	Generally, flotation is often conducted with the help of toxic additives such as	High	B1 = medium, can be estimated on the basis of

	this stage the concentrate is stacked, grinded and passing a flotation unit before it is sent to a pipeline (Antamina 2018).	organic hydrocarbons. Therefore, a high EHP exists here.		available information
Mining waste	The tailings are stored in a large impoundment facility with a height of 135 m and a capacity of 570 mio t. Located three kilometres from the concentrator plant, the dam is built to be structurally fault-free and retain its stability in earthquake events (Antamina 2019a).	For large-volume and high tailing facilities, the ÖkoRess scheme requires an assessment with high EHP.	High	B1 = medium, can be estimated on the basis of available information
Remediation measures	A reforestation plan was designed as part of a mine recultivation strategy. The strategy identifies the activities to be carried out during the progressive closure stage and the post closure. The plan has been implemented annually since 1999 (Antamina 2019a).	A process-accompanying recultivation strategy has been in place for years, leading to a low EHP.	Low	A = high, can be derived directly from available data

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.	With reference to the G-SHAP earthquake hazard map, Antamina is located in an area with a high earthquake risk. The EHP can therefore be rated as high.	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 availability 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.	Antamina is located in an area of low water stress (WSI 0 to < 0.15).	Low	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 is not located in any AZE-site or other protected area.	Low	B2 = medium, classified according to measurement instructions

State Governance

Indicators	
WGI 1 -Voice and Accountability	55.17 ^{ooo}
WGI 2 -Political Stability and Absence of Violence/ Terrorism	36.19 ^{ooo}
WGI 3 - Government Effectiveness	48.56 ^{ooo}
WGI 4 -Regulatory Quality	67.31 ^{ooo}
WGI 5 - Rule of Law	33.17 ^{ooo}

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	<p>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.</p> <p>Ratification of the Minamata Convention of Mercury in November 2015.</p> <p>Reaffirmation of commitment with the 2030 Agenda for Sustainable Development. (MDNP 2018)</p>
Legal framework	

<p>Areas of Law: Environment</p>	<p>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).</p> <p>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.).</p> <p>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.).</p>
<p>Areas of Law: Occupational Health and Safety (OHS)</p>	<p>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</p>

	Supervisor de la Inversión en Energía y Minería (Osinermin), the superintendencia nacional de fiscalización laboral (SUNAFIL) and the ministry of labour and employment.
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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?	Yes Yes (ICMM 2019)
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?	No No (RMI 2018a)
Responsible Mining Index Company indicator „Working conditions“	0.550 0.550 / 1.000 (RMI 2018a)
Responsible Mining Index Company indicator „Environmental sustainability“	0.480 0.480 / 1.000(RMI 2018a)
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?	Yes Yes (Antamina 2019b)

CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	No No (BHP n.d.)
OECD Guidelines: Does the company have its headquarters in a signatory state?	Yes Yes (OECD 2011)
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 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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