

# ÖkoRess III

## Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

**Cobre Panamá**

**First Quantum Minerals, Panama**

ID: 77

## 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”<sup>1</sup> (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.

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

# Cobre Panamá

## Copper

General information 	
Indicator or criteria	Description and values
Name of mine	Cobre Panamá
Description of mining area	<p>Cobre Panamá is a porphyry copper development project in Panama. The topography in the concession area is low elevation (less than 300 m) but rugged with considerable local relief covered by dense rainforest. (FQM 2019). Porphyry style mineralisation occurs in granodiorite, feldspar-quartz hornblende and adjacent lying andesitic volcanics. (Mining-Technology n.y.). The orebody is mineralised with bornite, chalcopyrite, molybdenite and pyrite (USGS n.y.).</p> <p>During the [1st quarter 2019], project pre-strip was completed, engineering were essentially completed, and the tailings management facility earthworks advanced to 87 % completion (FQM 2019).</p> <p>Ore from the Botija, Colina, and Valle Grande pits will be treated in a large concentrator using current technology to produce a copper concentrate and a molybdenum concentrate for sale on the world market. The concentrator will initially treat a nominal 150,000 t/d of ore supplied from the Botija pit; later, ore will be received from the Colina and Valle Grande pits. From Year 10, the concentrator ore throughput will be increased by 50%, to a nominal 225,000 t/d (MPSA Feed Study, 2010). The project has a 40+ year mine life (IM-Mining, May 2018).</p>
Surface extension	14.62km <sup>2</sup> 14.62 km <sup>2</sup> (Image date: 15.6.2017; Viewing height: 4.78 km) (Google Earth)
In operation since	2019 Discovered 1968, first ore throughput Feb 2019 at reduced capacity of 4,000 t/d (Mining Journal, Feb 2019).
Operator	Minera Panamá, S.A.
Owner	First Quantum Minerals
Closest town	The concession is located 120 kilometres west of Panama City and 20 kilometres from the Caribbean Sea coast, in the district of Donoso, Republic of Panamá. Access via Pan-American Highway from Panama City to

	Penonome, surfaced all-weather roads to Llano Grande, and gravel roads via the town of Coclecito to mine sit (FQM 2019).
Province	Colón
Country	Panama
Longitude	-80.64912°
Latitude	8.84381°
Altitude	180 m a.s.l. 140 m-180 m a.s.l. (GoogleEarth 2018)
Main product and by-products	Main product: Copper (Cu); by-products: Molybdenum (Mo), gold (Au) and silver (Ag) (FQM 2019)
On-site processing stages	Crushing, grinding, bulk rougher flotation to produce copper and molybdenum concentrates, The copper concentrate is pumped through a 30 km pipeline to a filter plant at a port site on the Caribbean coast (Mining Data Online n.y.)
Annual production	No commercial production as yet (2019), planned production of 150,000 t/d of copper concentrates to start in 2020 (FQM 2019).
Proven Reserves	Mineral Resource on December 31, 2018 using a 0.15% Cu cut-off grade: Total Measured and Indicated: 3,587 Mt with 0.37 % Cu, 0.006 % Mo, 0.07 g/t Au and 1.33 g/t Ag (FQM Reserves and Resources March 29, 2019)
Probable Reserves	Mineral Resource on December 31, 2018 using a 0.15% Cu cut-off grade: Total Measured and Indicated: 3,587 Mt with 0.37 % Cu, 0.006 % Mo, 0.07 g/t Au and 1.33 g/t Ag (FQM Reserves and Resources March 29, 2019)

## Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
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Preconditions for acid mine drainage (AMD)	Presence of copper sulphide mineralization in waste rock and mill tailings (USGS n.y.).	The mined ore will be mainly sulphidic, moreover copper is a chalcophile element. Overall preconditions for generating acid mine drainage are given. According to the measurement instructions, the Environmental Hazard Potential (EHP) resulting from AMD potential is high.	High	A = high, can be derived directly from available data
Paragenesis with heavy metals	Mineralization is associated with the heavy metal copper (USGS n.y.).	Since copper itself is considered to be a harmful metal to the ecosystem and human health, the measurement instructions suggest a high EHP.	High	A = high, can be derived directly from available data
Paragenesis with radioactive components	No indication of paragenesis with thorium (Th) and uranium (U) could be determined.	In accordance with the measurement instructions, copper ore deposits are evaluated with a medium EHP, if no other information is available (USGS 2015).	Medium	B2 = medium, classified according to measurement instructions
Deposit size	Measured and Indicated 3,587 Mt @ 0.37 % Cu (FQM Reserves and Resources March 29, 2019) = 13.727 Mt Cu (own calculation)	With over 13 Mt of contained Cu metal, the Cobre Panamá mine is classified as a very large copper deposit (>10 Mt Cu). Except mine development and trial mining, no material has been extracted to-date. According to measurement instructions based on Petrow et al. (2008), a very large copper deposit results in a high EHP as very large deposits potentially have a higher expected total impact on the natural environment.	High	A = high, can be derived directly from available data

Ore grade	0.37 % Cu (FQM Reserves and Resources March 29, 2019)	The Cobre Panamá mine has a low range grade of 0.37 % Cu (0.5-3.0 %), which according to the measurement instructions based on Priester et al. (2019) indicates a high EHP.	Medium	A = high, can be derived directly from available data
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## Technology



Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Mine type	Conventional hard rock open pit mining (FQM 2019)	Conventional hard rock open pit mining is evaluated with a medium EHP. Mining is restricted to the horizontal and vertical extension of the ore body/mineralized zone, leading to a medium EHP in the evaluation result. 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	Mining: Drill & blast, loading & hauling, crushing and grinding operations (FQM 2019). Processing: Bulk concentrate is thickened in a conventional thickener (no flocculant) and, if there is sufficient Mo grade, pumped to a differential flotation plant, where copper minerals are depressed and molybdenite floated into a Mo concentrate. (Mining Data Online n.y.).	Since the proposed process includes flotation, which is commonly associated with potentially harmful reagents, the measurement instructions suggest a high EHP.	High	A = high, can be derived directly from available data

Mining waste	Investor information forms 2015, 2018 make no reference of mining waste or waste management. Strip ratio waste to ore of 1:1 (IM-Mining n.y.).	In absence of any published mining waste documentation, the indicated EHP is medium.	Medium	B2 = medium, classified according to measurement instructions
Remediation measures	The Cobre Panamá ESIA was approved in 2011 exceeding IFC guidelines, ongoing activities include: Environmental 10,475 ha reforestation (agroforestry projects) Conservation (eagles, turtles, amphibians) Water management Development impact Project development area: 5900 ha Concession area: 13600ha Reforestation: 10475 ha Conservation & protection Donoso Protected Area Harpy eagles Sea turtles Amphibians Biodiversity Invasive plants (FCM investor site visit 2018)	Approved ESIA (2011) performed by Golder Associates 2011 (scribd.com). Closure/post-closure measures starting in 2045: Planning for closure will continue progressively throughout the life of the Project, starting with the conceptual closure plan outlined in the Environmental Recovery and Closure/Post-closure Plan (FQM Investor Annual Information Form 2018, not publicly disclosed). The plan was to be reviewed and updated in 2017 (not published). Due to lack of disclosed information, a medium EHP is assigned to this indicator.	Medium	B2 = medium, classified according to measurement 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. 2017). Metrics are directly taken from the given risk assessment. The indicator total is determined by the highest hazard level of the sub-indicators.	The Cobre Panama mine has a high EHP for landslides, which determines the result. Additionally, it has a medium EHP for earthquakes. 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 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.	The water stress for the mining area is low and it 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).	The mine is situated in a protected area which determines a medium EHP.	Medium	A = high, can be derived directly from available data

## State Governance

### Indicators

WGI 1 -Voice and Accountability	65.02 <sup>ooo</sup>
WGI 2 -Political Stability and Absence of Violence/ Terrorism	61.43 <sup>ooo</sup>
WGI 3 - Government Effectiveness	53.37 <sup>ooo</sup>
WGI 4 -Regulatory Quality	66.35 <sup>ooo</sup>
WGI 5 - Rule of Law	54.33 <sup>ooo</sup>
WGI 6 -Control of Corruption	35.1 <sup>ooo</sup>
EPI (Environmental Performance Index)	62.71
EITI membership	No
<b>International Agreements</b>	
ILO 176	No
Others	<ul style="list-style-type: none"> <li>• Signatory to the Minamata Convention 2013, ratified 2015 (UNEP n.y.)</li> <li>• Signatory to the Paris Agreement, which was signed by Panama on Apr 22, 2016 and ratified on Sep 21, 2016 (UN Treaty Collection n.y.)</li> </ul>
<b>Legal framework</b>	

<p>Areas of Law: Environment</p>	<p>Whilst Panama has designated nearly 25% of its landmass as a protected area, deforestation continues to be a challenge. This is mostly due to agriculture and fisheries (particularly shrimp ponds), but road construction, timber operations and industrial growth are also factors. Farmers and cattle ranchers face little opposition to clearance activities. Panama's attitude to development is quite different from other countries in the region, such as El Salvador and Costa Rica. Its attitude is reflected in the approval of First Quantum's massive Minera Cobre Panama (copper-gold) project, as well as its recent discovery of potential oil reserves.</p> <p><b>PRINCIPAL LEGISLATION AND REGULATOR</b></p> <p>The National Environmental Authority (ANAM), through the Environmental Assessment Department (DEA), is responsible for monitoring and implementing the environmental impact assessment (EIA) process. The General Environmental Law (41/1998) (GEL) and the Decree 123/2009 (EIA Regulation) are the main sources of environmental regulation in Panama.</p> <p><b>EIA PROCESS</b> The GEL recognises the concept of sustainable development in respect of natural resources (Art. 62) and requires all projects, works and activities that are anticipated to have an environmental impact be made the subject of an EIA process (Art. 23). Pursuant to Article 16 of the EIA Regulation, an EIA is required for:</p> <ul style="list-style-type: none"> <li>• Exploration: Metallic mineral exploration work involving mechanical drilling, dredging, major trenches, opening of roads and / or construction of camps; and</li> <li>• Mining: Extraction of metallic and non-metallic minerals, including quarries.</li> </ul> <p>The mining operator shall present before the ANAM an affidavit in the case of projects falling under Category I (low impact) or an Environmental Impact Study (EIS) in the case of Categories II and III. Category II projects include those that have a significant negative environmental impact, which can be eliminated or mitigated with known and easily applicable measures, in accordance with current environmental regulations. Category III projects are those</p>
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	<p>having potentially negative environmental impacts of indirect, cumulative and / or synergistic significance that merit substantive evaluation and consideration of appropriate mitigation measures. The EIA Regulation sets out in some detail the contents of the required information for all categories. As well as an EIS, where required, a mining operator must also submit an Environmental Plan. In preparing the EIS, the proponent must engage in community consultation, which must be outlined in the EIS. In addition, the community must be permitted to provide further feedback within a period of 15 or 20 days depending on whether the project is a Category II or Category III project, respectively (Art. 33, EIA Regulation). For Category III projects a public forum during the evaluation stage is mandatory, while it may be requested by ANAM or members of the community representing not less than 2% of said community for Category II projects (Art. 37, EIA Regulation) (Minehutte n.y.)</p>
<p>Areas of Law: Occupational Health and Safety (OHS)</p>	<p>General Regulations on OSH have been adopted in 2009; Specific Regulations on OSH in the Construction sector have been adopted in 2008 (implementing ILO Convention No. 167); the Labour Code contains a full Book on OSH and Occupational Hazards. The Social Security Fund (authority responsible for the enforcement of the General Regulations on OSH) issues technical guides containing technical measures to be taken in order to prevent occupational accidents and diseases (ILO.org/dyn/legosh Panama 2013).</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 n.y.)
Towards Sustainable Mining (TSM) Is the mine owning company a member of the Mining Association of Canada (MAC)?	Yes Yes , First Quantum Minerals Ltd. (MAC n.y.)
Towards Sustainable Mining (TSM) outside Canada: Are TSM standards implemented*?	No information available No information available, mine still under construction
Initiative for Responsible Mining Assurance (IRMA): Is the mine owning company a member?	No No (IRMA n.y.)
Initiative for Responsible Mining Assurance (IRMA): Is the mine certified?	No No (IRMA n.y.), mine still under construction
Responsible Copper (RC): Is the mine owning company a member of RC?	No information available No information available
Responsible Copper (RC): Is the mine certified?	No information available No information available
Responsible Mining Index (RMI): Has the mine been rated?	No No (RMI n.y.), mine still under construction
Responsible Mining Index Company indicator „Working conditions“	No No (RMI n.y.), mine still under construction

Responsible Mining Index Company indicator „Environmental sustainability“	No No (RMI n.y.), mine still under construction
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
<b>ISO and CSR reporting</b>	
ISO 14001 (ISO 14004): Is the mine ISO 14001 certified?	No information obtained No information available, mine still under construction
CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	No No, Vancouver, Canada (FQM n.y.)
OECD Guidelines: Does the company have its headquarters in a signatory state?	Yes Yes, Canada, OECD member country since 1962
ISO 26000: Does the mine implement ISO 26000?*	No information obtained No information available, mine still under construction
<b>Banking Standards</b>	
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.

## Sources

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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)