

ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Sar-Cheshmeh

**National Iranian Copper Industries Co. (NICICO) ,
Iran**

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>

Sar-Cheshmeh

Copper

General information 	
Indicator or criteria	Description and values
Name of mine	Sar-Cheshmeh
Description of mining area	The Sar-Cheshmeh mine complex is located in Kerman and is Iran's largest copper mine. It is located in the central Iranian volcano-plutonic copper belt. It is the most important open-pit copper mine in Iran (Monjezi et al. 2009; Tabasi et al. 2018). The mine is owned and operated by the state owned National Iranian Copper Industries Co. that is responsible for all copper mines in Iran (NICICO 2019). The major ores are pyrite, chalcopyrite, and chalcocite which appear at shallow depth, where siliceous veins are in contact with volcanic rocks (Riseh et al. 2017).
Surface extension	55.77km ² 55.77 km ² (Image date: 23.05.2018; Viewing height: 5.33 km) (Google Earth)
In operation since	1976 1976 (ME-Metals 2019)
Operator	National Iranian Copper Industries Co. (NICICO)
Owner	National Iranian Copper Industries Co. (NICICO)
Closest town	50 km south of Rafsanjan (Monjezi et al. 2009)
Province	Kerman
Country	Iran
Longitude	55.862343°
Latitude	29.964132°
Altitude	2600 m a.s.l. 2600 m a.s.l. (Google Earth)

Main product and by-products	Main product: Copper concentrate, copper cathodes, slabs, billets, 8mm wire rod; By-products: Molybdenum-concentrate (ME-Metals 2019)
On-site processing stages	Crushing, milling, flotation, refining, smelting (Parsapour et al. 2017).
Annual production	NICICO only publishes aggregated numbers for copper production. 14 Mt copper ore in 2014 (International Business Publications 2015)
Proven Reserves	826.5 Mt (International Business Publications 2015)
Probable Reserves	1200 Mt (International Business Publications 2015)

Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	Pyrite is the main sulphide mineral found in the tailings (Monjezi et al. 2009). The tailings have a high acid-producing potential in combination with a low acid-neutralising potential (Malakooti et al. 2014; See also Tonkaboni et al. 2011).	Preconditions for AMD are given. Sulphide minerals are present and copper is a chalcophile element. Accordingly, the EHP for acid mine drainage is high.	High	A = high, can be derived directly from available data
Paragenesis with heavy metals	Studies indicate that soil and plant samples show elevated levels of heavy metals (Malakooti et al. 2014; Monjezi et al. 2009).	The main product copper is defined as a heavy metal, also other heavy metals are present resulting in a high EHP for the indicator paragenesis with heavy metals.	High	A = high, can be derived directly from available data

Paragenesis with radioactive components	No information concerning the presence of radioactive components could be obtained.	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	Annual production from 2014 is ca. 14 Mt of copper ore. The mine opened in 1976 (ME-Metals 2019). Therefore, at current production levels a total of 602 Mt of copper ore could have been extracted. Adding the proven and probable reserves a total deposit size of approximately 2600 Mt of copper ore is estimated. Resulting in a copper content of approximately 23 Mt (at a grade of 0.9 % Cu)	According to Petrow et al the deposit is classified as very large. Therefore the EHP resulting from the deposit size is high.	High	C = low, no concrete information, no general specifications in the measuring
Ore grade	0.9 % Cu (Gholami et al. 2011)	Priester et al. (2019) analysed ore grades of different metals and indicate that copper grades between 0.5 and 3 % Cu can be characterized as average. Accordingly, the environmental hazard potential caused by the ore grade is medium.	Medium	B1 = medium, can be estimated on the basis of available information

Technology				
Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
				

Mine type	Open pit (Tabasi et al. 2018)	Open pit mines are usually limited to an area that is only slightly larger than the projection of the deposit body to the surface. Accordingly, the EHP resulting from the mining method is medium.	Medium	A = high, can be derived directly from available data
Use of auxiliary substances	After primary crushing, the ore is milled and goes through a flotation process (Parsapour et al. 2017).	The processing involves the use of auxiliary materials. The flotation circuit uses reagents; however no information could be obtained concerning their composition. Flotation reagents are often toxic. Accordingly the EHP for this indicator s high.	High	C = low, no concrete information, no general specifications in the measuring instructions, (expert) estimate
Mining waste	No information from official institutions or the owner concerning the TSF could be obtained. Analysis of satellite images indicates that a Tailings Storage Facility (TSF) of significant size is used for the deposition of tailings. Papers on topics surrounding the tailings management give very different information on the size of the TSF. Tabasi et al. (2018) indicate that the TSF's depth is 60 m and the area covered is 11 km ² , while Malakooti et al. (2014) indicate a height of 12 m and an area of 4 km ² . Comparing satellite images from different timeframes, it seems that either decant water or tailings are spilling over the dam covering large areas.	Analysis of satellite images shows that the TSF has a significant size. However the dimensions in the literature show a big variation. Depending on the reference the TSF can be defined as a Large Dam according to ICOLD (2011). Accordingly, the mining waste management poses a high EHP.	High	C = low, no concrete information, no general specifications in the measuring instructions, (expert) estimate

Remediation measures	No information concerning remediation measures could be obtained.	WGI indicators for Iran rank among the lowest. Therefore, it can be assumed that generally authorities have a low probability of scrutinizing mines properly. Therefore it can be assumed that companies are not putting as much effort into remediation as they would in a country with stricter control. Also the measuring instructions indicate that state owned mines usually perform worse when compared to privately owned mines.	High	C = low, no concrete information, no general specifications in the measuring instructions, (expert) estimate
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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 has a high EHP for earthquakes 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 availability at watershed level. Absolute water shortages in dry areas is	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	A = high, can be derived directly from available data

	supplemented by desert areas. The highest 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 site 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	12.81 ^{ooo}
WGI 2 -Political Stability and Absence of Violence/ Terrorism	15.71 ^{ooo}
WGI 3 - Government Effectiveness	45.19 ^{ooo}
WGI 4 -Regulatory Quality	10.1 ^{ooo}
WGI 5 - Rule of Law	25.96 ^{ooo}
WGI 6 -Control of Corruption	20.19 ^{ooo}

EPI (Environmental Performance Index)	58.16
EITI membership	No
International Agreements	
ILO 176	Not ratified
Others	No information obtained
Legal framework	

<p>Areas of Law: Environment</p>	<p>The Mining Law dates back to 17 May 1998. The original Act has been amended in 2011. The Ministry of Industry, Mine and Trade is responsible for issuing mining licenses (Ghaffari 2013; Nateq-Nouri 2018). Holders of mining licenses aiming at “optimal exploitation and conservation of mineral deposits by enhancing productivity, research, development and exploration and preservation of environment in their mines” can save up to twenty percent (20 %) from payment of royalties (Islamic Republic Iran, Ministry of Industry, Mine and Trade 2011).</p> <p>There is an Environmental Protection Law in place which dates back to 1974 and identifies four categories of protected natural areas: national parks, wildlife refuges, protected areas, and national nature monument (Wagner n.d.).</p> <p>IMIDRO (Iranian Mines & Mining Industries Development & Renovation) is responsible for the implementation of the mining framework and often serves as a joint venture partner, particularly for large mining projects (Al Barazi et al. 2016).</p> <p>No information concerning mine closure, rehabilitation or public consultations could be obtained or has been mentioned in the translated Mining Act (Islamic Republic Iran, Ministry of Industry, Mine and Trade 2011).</p>
<p>Areas of Law: Occupational Health and Safety (OHS)</p>	<p>Occupational Health and Safety is regulated by the Labour Law of 1990. Mining is not addressed specifically. Employers are required to address health and safety issues. The requirements are inspected by the Ministry of Health, the Ministry of Labour and the national insurance organization (Ghaffari 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 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 (MAC 2019)
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?	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 2018)
Responsible Mining Index Company indicator „Working conditions“	Not applicable Not applicable (RMI 2018)

Responsible Mining Index Company indicator „Environmental sustainability“	Not applicable Not applicable (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 No
CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	No No
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 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



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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