

# ÖkoRess III

## Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

**Guelb el Ghein Iron Ore Mine**

**SNIM , Mauretania**

ID: 18

## 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>

# Guelb el Gheïn Iron Ore Mine

## Iron ore

General information 	
Indicator or criteria	Description and values
Name of mine	Guelb el Gheïn Iron Ore Mine
Description of mining area	The mine is hosted in meta-ferruginous quartzite (banded magnetite iron formations), meta-nonferrous quartzite, gneiss, leptinite and amphibolite of the Mesoarchaeon Tiris group. The quartzites form a tableland 100 to 200 m above the surrounding desert, extending over a length of 5 to 10 km and 2 to 3 km in width. The about 100 m thick ore body comprises coarse-grained magnetite in leptinite with an average grade of 37% Fe (Porter GeoConsultancy 2019). The mine site comprises an older (1984) and a new (2015) iron ore concentration plant, latter denominated as Guelb II (Taib 2015 p. 29.3; Tecsum Aecom 2009 p. 8).
Surface extension	56.41km <sup>2</sup> 56.41 km <sup>2</sup> (Image date 09.07.2019; Viewing height: 6.69km) (Google Earth)
In operation since	1981 1981 (Mineralienatlas 2019), 1984 (SNIM 2019a)
Operator	SNIM
Owner	SNIM
Closest town	25 km Northeast of Zouérate
Province	Tiris-Zemmour Wilaya (District)
Country	Mauretania
Longitude	-12.321132°
Latitude	22.87851°
Altitude	350 m a.s.l. 350 m a.s.l (Google Earth)

Main product and by-products	Main-product: iron ore; by-products: none
On-site processing stages	Primary crushing and autogenous grinding followed by magnetic and gravity separation and dry magnetic separation (Mining Technology 2019; SNIM 2013).
Annual production	Annual production capacity of Guelb el Rhein Plant: 5 Mt (SNIM 2013), no further information regarding present annual production of this particular mine was obtained.
Proven Reserves	Only obtained unspecified class of reserves: 342 Mt with 37 % Fe in 2002 (OMRG 2019a) , cited and modified by (Porter GeoConsultancy 2019).
Probable Reserves	No information obtained

## Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	The deposit comprises oxidic iron ore minerals such as magnetite. No sulphides are reported. Limited geochemical preconditions for acid mine drainage are given. Gem	Iron is a siderophile element; therefore no preconditions for acid mine drainage for this ore type is given. According to the site-related Oekoress measurement instructions (Dehoust et al. 2017b), siderophile ore deposits are classified with a medium environmental hazard potential (EHP).	Medium	B1 = medium, can be estimated on the basis of available information
Paragenesis with heavy metals	No heavy metal paragenesis could be determined from Guelb el Rhein. According to (Wellmer / Hagelüken 2015) heavy metals and arsenic may have limited relevance for the extraction of oxidic iron ores.	According to the measurement instructions (Dehoust et al. 2017b), heavy metals like lead, zinc, copper, chrome and arsenic may potentially be associated to oxidic iron ores. The EHP is thus classified as medium.	Medium	B2 = medium, classified according to measurement instructions

Paragenesis with radioactive components	No indication of paragenesis with thorium and uranium or other radioactive components were determined.	In accordance with the measurement instructions (Dehoust et al. 2017b), iron ore deposits are evaluated with a medium EHP, if no further information is available. This class division is based on average thorium and uranium activity levels in Chinese iron ore deposits (Hua 2011; USGS 2015).	Medium	B2 = medium, classified according to measurement instructions
Deposit size	According older data obtained from SNIM and Geological Office of Mauretania (see above in "Proven Reserve") several million tons of proven reserves exist with 37 % of Fe. (OMRG 2019a; SNIM 2013).	Considering the reported reserves of about 340 Mt and adding the amount of iron ore extracted in the past (the mine is in operation since 1984 = 35 years) with an average of 5 Mt/year = 175 Mt; the total deposit size sums up to slightly more than 515 Mt. Assuming an average grade of 37 % Fe, the total Fe amounts to about 191Mt. According to the measurement instructions (Dehoust et al. 2017b) the complex is thus classified as medium size and evaluated with a medium EPH.	Medium	B1 = medium, can be estimated on the basis of available information
Ore grade	Average grade: 37% (SNIM 2013)	With 37 % average ore grade of reserves, the specific grade is considered medium grade in accordance with the measurement instructions (Dehoust et al. 2017b).	Medium	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 hardrock mine	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 (Dehoust et al. 2017b) 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. 2 major beneficiation plants (Guelb I and II) are in operation where primary crushing and autogenous grinding followed by low-intensity magnetic and gravity separation is carried out. Oxidized ores (upper layers of the deposit), meanwhile, are wet-processed using gravimetric separation (SNIM 2013).	The processing stages reported indicate that besides water no auxiliary substances that are classified as toxic are present. In accordance to the measurement instructions (Dehoust et al. 2017b) a low EHP is assigned.	Medium	B2 = medium, classified according to measurement instructions
Mining waste	In accordance to the information given (processing mainly by dry separation) and the satellite photo evidence, no major tailing ponds with considerable dam height (>15 m) are reported, expected nor observed. Mining waste is deposited in large fan structures on site (Google Earth image date 7/9/2019).	Since the occurrence of tailing ponds containing tailings from the wet gravimetric separation is restricted to flat areas without high tailing dams, no elevated EHP can be assigned. Waste piles are mostly derived from dry separation having a low relief which indicate stable conditions (Google Earth image 7/9/2019). For these reasons a	Medium	B2 = medium, classified according to measurement instructions

		medium EHP is assigned (Dehoust et al. 2017b).		
Remediation measures	No remediation measures are reported nor could be identified in the satellite image. Domestic and industrial wastewater are discharged in the environment without any treatment. Water retained in the concentrate and wet tailings are taken to the concentrate pile and tailings area in the northeast of the mine area (Tecsult Aecom 2009).	Since environmental issues are reported and additionally no provisions are foreseen for environmental mitigation an rehabilitation (SNIM 2019b p. 23), a high EHP is assigned in accordance to (Dehoust et al. 2017b).	High	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 EHP for all sub-indicators (earthquakes, flood, landslide, tropical storm, arctic region) is low for the mining area.	Low	k.A.
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	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	k.A.

	hazard level of the sub-indicators determines the total result.			
Protected areas and AZE sites	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 mine is not situated in designated protected areas and AZE sites, which results in a low EHP.	Low	k.A.

## State Governance

Indicators	
WGI 1 -Voice and Accountability	24.14 <sup>ooo</sup>
WGI 2 -Political Stability and Absence of Violence/ Terrorism	24.29 <sup>ooo</sup>
WGI 3 - Government Effectiveness	22.6 <sup>ooo</sup>
WGI 4 -Regulatory Quality	23.08 <sup>ooo</sup>
WGI 5 - Rule of Law	31.25 <sup>ooo</sup>
WGI 6 -Control of Corruption	23.08 <sup>ooo</sup>

EPI (Environmental Performance Index)	39.24
EITI membership	Meaningful progress
<b>International Agreements</b>	
ILO 176	Yes
Others	Ratification of Minamata Convention (UNEP 2015)
<b>Legal framework</b>	

<p>Areas of Law: Environment</p>	<p>The Environment Code ( Law No. 2000-45) and its implementing decrees including Environmental impact assessment (Laws 2007-105 and 2004-094) represent the most important legal instruments regarding environmental guidance and control of mining activities . The Department of Environmental Control is responsible for analyses of environmental impact studies (Tecsult Aecom 2009 p. 10). However missing implementation rules turn the above mentioned Decrees ruling provision and remediation obligations little effective (SNIM 2019b p. 23)</p> <p>The Ministère de l'Industrie et des Mines (Ministry of Industry and Mines) is the Government agency responsible for regulating the country's mining industry activity. The Mining Code (Law No. 2008-011) and related Decrees 2008-158, 2008-159 and 2009-051 (Dempsey 2019) as well as the decree 2012-12 (Model Mining Convention or New Mining Code)prescribe the rules applicable to mining exploration and exploitation, permits such as the compliance with environmental requirements related to the protection of the environment during and after mining operations, and the relationship between the title holder and the land owner (OMRG 2019b) . The Mining Code requires the title holder to rehabilitate the site after mining. Since 2001 the Mining Environment Department is responsible to develop the environmental impact assessment procedures for the mining sector and to update the environmental information and management system.</p> <p>The Water Code instituted by Law No. 2005-30 ilays down conditions for approving the use of surface or groundwater for non-domestic purposes (Tecsult Aecom 2009).</p>
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<p>Areas of Law: Occupational Health and Safety (OHS)</p>	<p>The following legislation governs health and safety and also theoretically applies on mining: The Labour Code (Law 2004-017) and the Public Health Code (Law 2010-42). With relevance to mining the Ordinance No. 89-146 which provides protection against particular hazards and disciplines the handling, transport and storage of radioactive and toxic materials can be mentioned (NATLEX ILO 1989).</p>
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## Corporate Social Responsibility (CSR)

Voluntary Standards	
<p>Aluminium Stewardship Initiative (ASI): Is the mine owning company a member?</p>	<p>Not applicable Not applicable</p>
<p>Aluminium Stewardship Initiative (ASI): Is the mine certified?</p>	<p>Not applicable Not applicable</p>
<p>International Council of Mining &amp; Metals (ICMM): Is the mine owning company a member?</p>	<p>No No (ICMM 2019)</p>
<p>Towards Sustainable Mining (TSM) Is the mine owning company a member of the Mining Association of Canada (MAC)?</p>	<p>No No (MAC 2019)</p>
<p>Towards Sustainable Mining (TSM) outside Canada: Are TSM standards implemented*?</p>	<p>No No</p>

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 2018)
Responsible Mining Index Company indicator „Working conditions“	No No (RMI 2018)
Responsible Mining Index Company indicator „Environmental sustainability“	No No (RMI 2018)
Responsible Steel (RS): Is the mine owner a member of the RS?	No No (Responsible Steel 2019)
Responsible Steel (RS): Is the mine certified?	No No (Responsible Steel 2019)
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?	Yes Yes (SNIM 2019b)

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
<b>Banking Standards</b>	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	Yes Yes, in the past (World Bank n.d.)
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

### **Publisher:**

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