

ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

**Chichester Range Iron Ore Mines or Chichester
Hub Operation**

Fortescue Metals Group Ltd., Australia

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>

Chichester Range Iron Ore Mines or Chichester Hub Operation

Iron ore

General information 	
Indicator or criteria	Description and values
Name of mine	Chichester Range Iron Ore Mines or Chichester Hub Operation
Description of mining area	Chichester Hub comprises two open-pit iron ore mines in the Chichester Ranges, called Cloudbreak and Christmas Creek. The whole deposit (Cloudbreak and Christmas Creek) is 80 km long and 5 to 9 km wide. 10 km long interruption due to significant eroded by drainages. Banded Iron Formation (BIF) deposit type (MDO 2019).
Surface extension	217.87km ² 217.87 km ² (Image date: 03.12.2018; Viewing height: 14.78 km) (Google Earth)
In operation since	2009 2009 (Mining Technology 2019)
Operator	Fortescue Metals Group Ltd.
Owner	Fortescue Metals Group Ltd.
Closest town	Both deposits are located 110 km north of Newman, in the east Pilbara region of Western Australia, and extend between 250 km and 325 km southeast of Port Hedland (Mining Technology 2019).
Province	Western Australia (Mining Technology 2019)
Country	Australia
Longitude	119.396942°
Latitude	-22.323978°
Altitude	440 m a.s.l. Approximately 440 m a.s.l. (Google Earth)
Main product and by-products	Iron ore (MDO 2019; Mining Technology 2019)

On-site processing stages	Processing at Cloudbreak Mine, semi-mobile crushing station since 2018 (Fortescue 2019).
Annual production	168.8 Mt in 2017
Proven Reserves	572 Mt proved reserves which refers to the complete Chichester Ore Reserve, which includes the Cloudbreak, Christmas Creek and Kutayi BID deposits (Fortescue 2018a).
Probable Reserves	804 Mt probable reserves. The reserves refer to the complete Chichester Ore Reserve, which includes the Cloudbreak, Christmas Creek and Kutayi BID deposits (Fortescue 2018a; b).

Geology

Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	The Australian EPA determined the potential for acid drainage for a proposed mine expansion from the oxidation of potentially acid forming from tailings, waste storage and open pit walls which could affect water quality. EPA reports also, that the risk in relation to AMD is low (Government of Western Australia 2016).	According to Goldschmidt-Classification, iron is a siderophile element. The Chichester deposit type BIF (banded iron formation) is a marine sedimentary reduction deposit with iron oxide bands. Based on the measurement instructions for siderophile elements, the environmental hazard potential (EHP) is evaluated as medium.	Medium	A = high, can be derived directly from available data
Paragenesis with heavy metals	Banded iron ore is often associated with heavy metals such as lead, zinc, copper, arsenic.	Mining of metals generally poses a certain risk with regards to paragenesis with heavy metals. Accordingly, the EHP is evaluated as medium.	Medium	B2 = medium, classified according to measurement instructions

Paragenesis with radioactive components	No indication of paragenesis with thorium and uranium could be determined.	In accordance with the measurement instructions, iron ore deposits are evaluated with a medium EHP, if no other information is available.	Medium	B2 = medium, classified according to measurement instructions
Deposit size	1,376 Mt reserves (Fortescue 2018a)	Considering the ore grade, the mine lies within the category of "gigantic mine" after Petrow classification. The measurement instructions indicate a high EHP.	High	A = high, can be derived directly from available data
Ore grade	56.4 % grade (Fortescue 2018a)	According to Priester et al. (2019) this corresponds to an average grade for Fe-mining (from 30 to 60 % grade)	Medium	A = high, can be derived directly from available data

Technology



Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Mine type	The iron ore is extracted by hard rock open pit mining. (Mining Data Online 2019; Mining Technology 2019).	The measurement instructions indicate an evaluation of solid rock open pit mining with a medium EHP.	Medium	A = high, can be derived directly from available data
Use of auxiliary substances	Instead of drilling, blasting and excavating, the Cloudbreak deposit was mined with Continuous Surface Miners (continuously	The measure guidance suggests a high EHP since the process includes flotation,	High	A = high, can be derived directly

	operating open pit mining machine, the rock is extracted with a milling machine). Crushing and screening operations, to separate mined materials into lump and fines iron ore. Further iron process includes flotation and magnetic separation (Mining Technology 2019).	which are commonly associated with toxically chemicals.		from available data
Mining waste	The Company has produced a total of 21.4 Mt of tailings in 2018. (Fortescue 2018). Approximately 4 Mt p. a. of tailings is currently produced at Christmas Creek Mine (Fortescue 2015). No information was obtained with regard to size and composition of the tailings at Chichester Mines together. A low risk of acid drainage through geochemical characterisation has been identified. Chichester demonstrated minimised impacts to groundwater due to adequate TSF management (Government of Western Australia 2015)	Waste management plans and closure plannings are in place. According to the Department of Environment Regulation, Fortescue has a good management for tailings.	Low	A = high, can be derived directly from available data
Remediation measures	Fortescue runs a rehabilitation monitoring program at Cloudbreak and Christmas Creek. Mine closure plan in place (Fortescue 2015).	Due to the existing monitoring and rehabilitation plans a low EHP is given for industrial mining companies in countries with good law enforcement.	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
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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.	Environmental hazard potentials (EHP) for earthquake and tropical storm hazard are "medium", all other sub-indicators show a medium EHP	Medium	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.	The water stress around the mine is low but the mine is located within a desert climate.	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 is not close to protected areas as define in the ÖkoRes evaluation method.	Low	B2 = medium, classified according to measurement instructions

State Governance

Indicators	
WGI 1 -Voice and Accountability	94.58 ^{ooo}
WGI 2 -Political Stability and Absence of Violence/ Terrorism	77.62 ^{ooo}

WGI 3 - Government Effectiveness	92.31 ^{ooo}
WGI 4 -Regulatory Quality	98.08 ^{ooo}
WGI 5 - Rule of Law	93.27 ^{ooo}
WGI 6 -Control of Corruption	92.79 ^{ooo}
EPI (Environmental Performance Index)	74.12
EITI membership	Other (has announced its commitment to join the EITI)
International Agreements	
ILO 176	Not ratified
Others	OECD member
Legal framework	

<p>Areas of Law: Environment</p>	<p>All stages of mining require environmental authorization. Depending on the kind of operation, varying degrees of public consultation appeal. Projects involving environmental issues require an Environmental Impact Assessment. Projects or waste storage facilities that might have impact of national environmental significance might require approval under the Environmental Protection and Biodiversity Conservation Act (projects affecting, e.g. World Heritage, threatened species etc.). Projects with significant impact on water resources require the Commonwealth minister to get advice from the Independent Experts Scientific Committee before approving any proposal. Some states have specific legislation concerning mining waste; e. g. In Victoria, Western Australia and Queensland guidelines for the design and operation of TSFs have been issued. Holders of mining rights are liable for the rehabilitation of mining areas. Liability is only discharged once all obligations as stated in the mine closure plan have been fulfilled (Woods / Rifici 2018).</p>
<p>Areas of Law: Occupational Health and Safety (OHS)</p>	<p>Following the Work Health and Safety Act (WHS), most jurisdictions in Australia provide a balanced and nationally consistent framework to health and safety of workers at workplaces (Safe Work Australia 2018). New South Wales, Queensland and Western Australia have laws directly addressing the health and safety in the mining sector including penalties for non-compliance. WHS laws impose obligations on ensuring the safety of all persons working on site, this requires officers and directors of corporations to exercise due diligence to ensure compliance with WHS laws (Woods / Rifici 2018).</p>

Corporate Social Responsibility (CSR)

Voluntary Standards	
Aluminium Stewardship Initiative (ASI): Is the mine owning company a member?	No No
Aluminium Stewardship Initiative (ASI): Is the mine certified?	No No (ASI 2018)
International Council of Mining & Metals (ICMM): Is the mine owning company a member?	No No (ICMM 2018)
Towards Sustainable Mining (TSM) Is the mine owning company a member of the Mining Association of Canada (MAC)?	Not applicable Not applicable
Towards Sustainable Mining (TSM) outside Canada: Are TSM standards implemented*?	Not applicable Not applicable
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?	Not rated Not rated
Responsible Mining Index Company indicator „Working conditions“	Not rated Not rated

Responsible Mining Index Company indicator „Environmental sustainability“	Not rated Not rated
Responsible Steel (RS): Is the mine owner a member of the RS?	No information obtained No information obtained
Responsible Steel (RS): Is the mine certified?	No information obtained No information obtained
Australian Steel Stewardship Forum (ASSF): Is the owner a member of the ASSF?	No No (ASSF 2018)
Australian Steel Stewardship Forum: Is the mine certified?	No No (ASSF 2018)
ISO and CSR reporting	
ISO 14001 (ISO 14004): Is the mine ISO 14001 certified?	No No (Fortescue 2017)
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?	Yes Yes (Australia)(OECD 2019)
ISO 26000: Does the mine implement ISO 26000?*	No information obtained No information obtained
Banking Standards	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	No information obtained No information obtained
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

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