

ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Hope Downs Iron Ore Mine

Rio Tinto , Australia

ID: 12

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>

Hope Downs Iron Ore Mine

Iron ore

General information 	
Indicator or criteria	Description and values
Name of mine	Hope Downs Iron Ore Mine
Description of mining area	<p>Hope Downs Joint Venture comprises mineralised zones Hope 1, Hope 2, Hope 3, Hope 4, Hope 5 and Hope 6. The joint venture is currently mining at Hope Downs 1 (Marra Mamba ore body) and Hope Downs 4 (Brockman ore body). Furthermore Baby Hope deposit is under development (Mining Technology 2019). In geological terms, the Hope Downs Mine is part of the Hamersley Group. The Banded Iron Formation (BIF) contains high-graded iron ore deposits with hematite and goethite, which show low impurities in the form of silica, phosphorus, carbonate, magnesia and chert (MDO 2019).</p> <p>The mining area is located in Pilbara, with over 500,000 km² a large, dry and thinly populated region in the north of Western Australia. Pilbara is well-known as a resource-rich area for iron ore, base metals and petroleum products (Regional Development Australia Pilbara 2014).</p>
Surface extension	104.83km ² 104.83km ² (Image date: 03.08.2018; Viewing height: 8.33 km) (Google Earth)
In operation since	2007 November 2007 (Hancock Prospecting PTY LTD n.d.)
Operator	Hope Downs Joint Venture
Owner	Rio Tinto
Closest town	Newman (100 km southeast of the mine)
Province	Pilbara region, Western Australia (MDO 2019)
Country	Australia
Longitude	119.1229306°

Latitude	-22.9469102°
Altitude	600 m a.s.l. approx. 600 m a.s.l. (Google Earth)
Main product and by-products	Main-product: iron ore; by-products: none (Rio Tinto 2019 p. 269)
On-site processing stages	On Site processing stages are crushing (primary crusher and secondary dry screening and crushing), and stockpiling. Afterwards load via railway and trains (MDO 2019).
Annual production	45.39 Mt iron ore in 2018 (total), 22.68 Mt iron ore (Rio Tinto share) (Rio Tinto 2019 p. 269)
Proven Reserves	157 Mt (for all shareholders) (Rio Tinto 2019 p. 273)
Probable Reserves	165 Mt (for all shareholders) (Rio Tinto 2019 p. 273)

Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	Due to the geology of the orebody, the material has little potential to generate acid mine drainage (Environmental Protection Authority 2001a).	AMD potential is seen as low, due to evaluation from local authorities.	Low	A = high, can be derived directly from available data
Paragenesis with heavy metals	No indication of paragenesis with heavy metals could be determined.	Mining of metals generally poses a certain risk to contamination with heavy metals, accordingly the EHP is medium.	Medium	B2 = medium, classified according to measurement instructions

Paragenesis with radioactive components	No indication of paragenesis with thorium (Th) and uranium (U) 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	Considering total reserves of about 322 Mt iron ore with an estimated average ore grade of 60 % Fe, adds up to approx. 193.2 Mt of iron content (Rio Tinto 2019 p. 273).	By adding 10 years of production with 30 Mt of ore per year to the reserves would equal to a total of 373.2 Mt iron content. According to the measurement instructions a deposit size of 373 Mt iron content is classified as medium-sized. In this case a medium EHP is assigned.	Medium	B2 = medium, classified according to measurement instructions
Ore grade	Approximately 60-64 %	Iron ore with grades over 60 % as high grade deposits (Priester et al. 2019). Accordingly, the EHP potential caused by the ore grade is low.	Low	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, hard rock mining (MDO 2019).	Open-pit mines are usually limited to an area that is only slightly larger than the projection of the deposit body to the	Medium	A = high, can be derived directly

		surface. Accordingly, the EHP resulting from the mining method is medium.		from available data
Use of auxiliary substances	Iron ore deposits are extracted using conventional open pit techniques. The plant has a primary crusher, secondary dry screening and crushing and gravity/magnetic separation systems (Mining Technology n.d.; MDO 2019).	Based on the evaluated literature it is unclear, whether processing at Hope Downs includes auxiliary substances. As a conservative estimate, a medium EHP is assigned according to the measurement instructions.	Medium	C = low, no concrete information, no general specifications in the measuring instructions, (expert) estimate
Mining waste	The area covered with waste rocks from Hope Downs are planned up to a total extent of 328 ha (North) and 368 ha (South) (Environmental Protection Authority 2001a). About 50 million m ³ of waste rock will remain on-site at the end of mining operations (Environmental Protection Authority 2001b). According to Rio Tinto, the planned tailings storage impoundment volume in 5 years will be 8 million m ³ , the current tailings storage impoundment amounts to 4.8 million m ³ (Rio Tinto 2020).	According to the definition of the ICOLD (2018) at least one of the waste dumps is very likely to be large, the tailings storage impoundments are large. Accordingly the EHP resulting from waste management is high.	High	B1 = medium, can be estimated on the basis of available information
Remediation measures	According to the Environmental Protection Authority, Rio Tinto has progressive rehabilitation plans consistent with best practice environmental management in Australian mining in place. The remediation measures will continue until 20 years after the mine closure and will cost approximately \$200 million (Environmental Protection Authority 2001b).	The EHP is evaluated with low due to the recultivation and compensation activities concomitantly to the mining process.	Low	B1 = medium, can be estimated on the basis of available information

	<p>At least five years before completion of the mine, the proponent shall prepare and submit a Final Closure and Decommissioning Plan, where technical information about final closure, decommissioning of all plants, rehabilitation of waste dumps will be provided (Environmental Protection Authority 2010). To obtain the permit for a mine expansion, a general mine closure plan for rehabilitation was obligatory. Also the company had to contribute to the conservation fund set up by the government to mitigate the effects of clearing 800 hectares of vegetation for the project (Australian Mining 2015)</p>			
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Framework conditions natural environment



Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
<p>Accident hazard due to floods, earthquake, storms, landslides</p>	<p>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.</p>	<p>For Hope Downs mine there is a medium EHP for tropical storms and earthquakes which determines the evaluation result. The EHP for the other sub-indicators is low.</p>	<p>Medium</p>	<p>A = high, can be derived directly from available data</p>
<p>Water Stress Index (WSI) und desert areas</p>	<p>The WSI by Pfister et al. (2009) provides characterization factors on the relative water availability at watershed level. Absolute</p>	<p>The mine is situated in a desert area which results in a high EHP.</p>	<p>High</p>	<p>A = high, can be derived directly</p>

	water shortages in dry areas is supplemented by desert areas. The highest hazard level of the sub-indicators determines the total result.			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 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	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?	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)?	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?	No No (RMI 2018a)
Responsible Mining Index Company indicator „Working conditions“	0.570 0.570 (RMI 2018b)

Responsible Mining Index Company indicator „Environmental sustainability“	0.447 0.447 (RMI 2018b)
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?	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 information obtained No information obtained
CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	Yes Yes (London and Melbourne)
OECD Guidelines: Does the company have its headquarters in a signatory state?	Yes Yes (World Population Review 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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