

ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Weipa bauxite mine

Rio Tinto , Australia

ID: 78

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>

Weipa bauxite mine

Bauxite

General information 	
Indicator or criteria	Description and values
Name of mine	Weipa bauxite mine
Description of mining area	<p>Weipa operation consists of two mining operations at East Weipa and Andoom. Additionally, there are two beneficiation plants. The bauxite is transported via railway to the port area. Weipa bauxite mine is located near Weipa City on the Western Cape York Peninsula in Queensland, Australia (Rio Tinto 2018). The Weipa Bauxite deposit is found on the Weipa Plateau, a relic of the Cretaceous regression surface at the western parts of the Cape York Peninsula. Weipa Plateau is located at different altitudes, from the nearby sea level in the west to about 80 m to the east (Taylor / Eggleton 2004).</p> <p>In the future, the Rio Tinto mining project Amrun will replace the production from the depleting East Weipa mine. However, there is no timeline available from the company (Rio Tinto 2017a).</p>
Surface extension	169.54km ² 169.54 km ² (Image date: 10.10.2018; Viewing height: 24.46 km) (Google Earth)
In operation since	1961 1961 (Rio Tinto 2019)
Operator	Rio Tinto
Owner	Rio Tinto
Closest town	Weipa Town (population 3,300)
Province	Cape York Peninsula in Far North Queensland, State of Queensland
Country	Australia
Longitude	141.865367°
Latitude	-12.657453°

Altitude	50 m a.s.l. Approx. 10 to 50 m.a.s.l.
Main product and by-products	Bauxite
On-site processing stages	Most part of Weipa bauxite is sent to Rio Tinto's Yarwun refinery in Gladstone (runs with 100 per cent Weipa bauxite). Other recipients are Queensland Alumina Limited refinery in Gladstone and exports (Rio Tinto 2015)
Annual production	In 2017, Rio Tinto announced a record production of 30.4 Mt bauxite (Rio Tinto 2019)
Proven Reserves	163 Mt (Al ₂ O ₃ 50.5 %) (Rio Tinto 2019)
Probable Reserves	-

Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	According to the Goldschmidt classification, aluminium (and thus also bauxite as Al ore) is a lithophile element and is mostly oxidic. No indication of acid mine drainage risks.	As Al is a lithophile element and bauxite forms oxidic ore deposits, bauxite mining and beneficiation the environmental hazard potential (EHP) for AMD is low.	Low	A = high, can be derived directly from available data
Paragenesis with heavy metals	No indication of paragenesis with heavy metals.	According to the measurement instructions, aluminium ores may be associated with zinc, copper and chrome. Based on the findings of (IEC 2018) and data from (Kotschoubey et al. 2005), the release of As, Pb and Cd on-site cannot be ruled out and the EHP is classified as medium in consequence.	Medium	B1 = medium, can be estimated on the basis of available information

Paragenesis with radioactive components	No indication of paragenesis with radioactive components.	Bauxites formed by lateritic weathering of very different silicate rocks (among others granite, gneiss, clay) are evaluated with a medium EHP, if no further information indicates otherwise. This class division is based on average thorium and uranium activity levels in Chinese bauxite deposits (Hua 2011),(USGS 2015). For comparison: Carbonate bauxites would be evaluated with a low EHP.	Medium	B2 = medium, classified according to measurement instructions
Deposit size	By considering statistical data, a total production of approx. 299.5 Mt Al ₂ O ₃ between 1975 and 2018 was estimated (own calculation). Adding the current reserves of 2018 (82.3 Mt Al ₂ O ₃), the total deposit size is approx. 381.8 Mt Al ₂ O ₃ .	The deposit can be considered as large (>100 Mt ores) according to the measurement instructions. The measure guidance suggests a high EHP.	High	A = high, can be derived directly from available data
Ore grade	Grade given for proven reserve is 50.5 % Al ₂ O ₃ (Geoscience Australia / Geoscience Australia 2017)	Considering other top bauxite deposits, Weipa with an average grade of 50.5 % can be considered a rich bauxite deposit with reference to undisclosed data.	Low	A = high, can be derived directly from available data

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

Mine type	Bauxite at Weipa is mined via open pit mining with truck & shovel. As characteristic for open pit mining, the topsoils get removed, for Weipa in depth from one to ten metres. Front-end loaders use open-cut technique to extract and load the bauxite into trucks (Mining Data Online 2019)	The superficial stripping of the weathered bauxite horizon leads to a high surface consumption of the mining operation and is consequently evaluated with a high EHP.	High	A = high, can be derived directly from available data
Use of auxiliary substances	The bauxite transported via conveyors and railroad to the beneficiation plant. The ore gets screened, washed and placed into stockpiles (Australian Aluminium Council Ltd n.d.). Rio Tinto operates two diesel power stations (26 and 10 megawatts at Lorim Point and Andoom) which are supplying the mine and the Weipa town (Rio Tinto 2015).	The measurement instruction is focused on the on-site processes (Dehoust et al. 2017b). On-site no auxiliary substances are used (with the exception of water) for ore processing.	Low	A = high, can be derived directly from available data
Mining waste	According to a governmental permit for Weipa, the biggest TSF in East Weipa are designed for approx. 104 and 116 million m ³ maximum volume of tailings. The hazard category was set to high and significant by the Government. For South of Embley, the TSF are designed for 240 and 260 million m ³ maximum volume. For both, the hazard category was set to significant by the Government (Queensland Government, Department of Environment and Heritage Protection 2015)	According to the definition of the (ICOLD 2018) at least one of the tailings storage facilities is very likely to be large. Accordingly the EHP resulting from waste management is high.	High	A = high, can be derived directly from available data
Remediation measures	In 2013, Weipa set up a Rehabilitation Advisory Panel to deal with environmental risks associated with rehabilitation through planning and technical advice (Rio Tinto	There are detailed plans for mine closure in place, moreover the mine closure is approached progressively	Low	B1 = medium, can be estimated on the basis of

	2017a). In 2017, a total of 735 hectares of land was rehabilitated in parallel to mine production (Rio Tinto 2017a).	while the mine is still in production. Accordingly, the EHP is low.		available information
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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). 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 floods is high which determines the evaluation result. Additionally, the mine has a medium EHP for landslides. All 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 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	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	No
International Agreements	
ILO 176	Not ratified

Others	OECD member since 1971
Legal framework	
Areas of Law: Environment	<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>
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Corporate Social Responsibility (CSR)

Voluntary Standards	
Aluminium Stewardship Initiative (ASI): Is the mine owning company a member?	Yes Yes (ASI 2019)
Aluminium Stewardship Initiative (ASI): Is the mine certified?	No No (ASI 2019)
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)?	Yes Yes, Rio Tinto Canada (MAC 2019) (Rio Tinto recently announced that its Montreal office, currently the global headquarters for the aluminum business, would also serve as a global hub for Rio Tinto operation)
Towards Sustainable Mining (TSM) outside Canada: Are TSM standards implemented*?	No information available Not specifically mentioned

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?	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?	Yes Yes (Rio Tinto 2017b)

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
ISO 26000: Does the mine implement ISO 26000?*	No information obtained No information available
Banking Standards	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	Not mentioned, but IFC's Indigenous Peoples Performance Standard and Performance Standards on Environmental and Social Sustainability Not mentioned, but IFC's Indigenous Peoples Performance Standard and Performance Standards on Environmental and Social Sustainability
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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