

ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Carol Lake

Rio Tinto , Canada

ID: 23

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>

Carol Lake

Iron ore

General information 	
Indicator or criteria	Description and values
Name of mine	Carol Lake
Description of mining area	The iron ore deposits in the Labrador City area occur as specular hematite and magnetite, generally in the ratio of 65:35. The mineral reserve and mineral resource deposits, with an average grade of approximately 38% iron, occupy the middle iron unit of the Sokoman formation overlain by waste rock. The deposits are intricately folded and overturned. The iron ore mineral reserve and mineral resource deposits at the Mine are close to the surface thereby facilitating open pit mining (Labrador Iron Ore Royalty Corporation 2018).
Surface extension	211.94km ² 211.94 km ² (Image date: 25.09.2019; Viewing height: 8.39 km) (Google Earth)
In operation since	1962 1962 (Rio Tinto IOC 2018b)
Operator	Iron Ore Co. of Canada
Owner	Rio Tinto
Closest town	Labrador city, the mine and processing plant are within the municipal boundary of the city.
Province	Newfoundland and Labrador
Country	Canada
Longitude	-66.88244°
Latitude	52.972529°
Altitude	700 m a.s.l. 700 m a.s.l. (Google Earth)

Main product and by-products	Main Product: Iron Ore concentrate and pellets; by-product: none (Labrador Iron Ore Royalty Corporation 2018).
On-site processing stages	Stripping, drilling and blasting followed by hauling to processing unit with crushing and wet grinding mills. Followed by pelletizing or shipping the concentrate (Rio Tinto IOC 2018c)
Annual production	15.245 Mt iron ore (Rio Tinto 2019a)
Proven Reserves	244 Mt – 65 % Fe (Rio Tinto 2019a)
Probable Reserves	301 Mt – 65 % Fe (Rio Tinto 2019a)

Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	In 50 years of production no AMD has been reported since the deposits are low in sulphides. However, recent studies indicate that some intrusive formations contain ca 0.15 % S and limonitically altered iron formations ca. 0.04 % S (Rio Tinto IOC 2018a).	A medium EHP is given, based on the environmental assessment study of the project.	Medium	A = high, can be derived directly from available data
Paragenesis with heavy metals	No specific information on Carol obtained.	As there is no direct information on the paragenesis with heavy metals available, the measurement instructions are referred to. These indicate that oxidic iron ores can be associated with heavy metals such as lead, zinc, copper, chrome, and arsenic. Accordingly, heavy metals and arsenic may have a limited relevance in the	Medium	B2 = medium, classified according to measurement instructions

		extraction of oxidic iron ores, leading to a medium EHP (Dehoust et al. 2017b).		
Paragenesis with radioactive components	No specific information on Lake Carol obtained.	In line with the measurement instructions, with possible indication of Thorium and Uranium, a Medium EHP is assigned (Dehoust et al. 2017b).	Medium	B2 = medium, classified according to measurement instructions
Deposit size	Up until 2013 Carol Lake has produced more than 2 billion tonnes of iron ore (Canada Mining 2013). Assuming current production levels from 2013 until today some 75 Mt of iron ore come on top. Adding the reserves the deposit size is estimated to be ca. 2,600 Mt of iron ore. Adding up to ca. 1,690 of Fe – content (Rio Tinto 2019a)	According Petrow et al., Carol Lake is classified as a large project and is hence given a high EHP (Dehoust et al. 2017b).	High	A = high, can be derived directly from available data
Ore grade	65 % Fe (Rio Tinto 2019a)	Priester et al. (2019) categorize iron ore with grades above 60 % as high-grade deposits. Therefore, a Low EHP is awarded.	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 mining - including drilling, blasting and hauling of waste rock and ore (Labrador Iron Ore Royalty Corporation 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	An entirely mechanical process is employed at Carol Lake to separate the ore from the waste rock (Labrador Iron Ore Royalty Corporation 2018).	The processing steps do not include any auxiliary substances. Accordingly, the EHP is low.	Low	A = high, can be derived directly from available data
Mining waste	Until 2006 tailings have been stored within a designated portion of Wabush Lake, as per provincial authorizations causing the lake to turn red due to the iron content (IOC 2006). The storage volume amounts to 130.000.000 m ³ (Rio Tinto 2019b). The deposition into the lake is still ongoing; To prevent water from turning red the effluent is flocculated prior to deposition. Moreover, a tailings impoundment area is in place (IOC 2006).	Mine waste is stored within the naturally occurring valley, and tailings are deposited in areas of the Wabush Lake. Satellite images reflect that large parts of the lake are affected by the deposition of tailings. A high EHP rating is given based on the available information.	High	A = high, can be derived directly from available data
Remediation measures	In the environmental assessment for the extension of the mine it is stated that progressive rehabilitation is taking place where possible. (Rio Tinto IOC 2018a). On the company's website the importance of progressive remediation is underlined, in total 649 ha of land have been remediated so far (Rio Tinto IOC 2018d).	There are indications that progressive remediation is taking place. However no detailed remediation plan could be obtained. Accordingly a low EHP is awarded.	Low	B1 = Assessable 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 are low (earthquakes, landslide, tropical storm, arctic region) except for floods which is high leading to an overall high 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 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 mining area 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	96.1 ^{ooo}
WGI 2 -Political Stability and Absence of Violence/ Terrorism	88.6 ^{ooo}
WGI 3 - Government Effectiveness	97.1 ^{ooo}
WGI 4 -Regulatory Quality	97.6 ^{ooo}
WGI 5 - Rule of Law	95.7 ^{ooo}
WGI 6 -Control of Corruption	95.7 ^{ooo}
EPI (Environmental Performance Index)	72.18
EITI membership	No
International Agreements	
ILO 176	No

Others	No further information
Legal framework	
Areas of Law: Environment	<p>In Canada, provinces have jurisdiction over mining affairs and their own Mining Acts and industry related incentives or economic development programmes. However, the federal ministry, Natural Resources Canada (NRCan), is an important player in the mining field. Compliance with both, federal and provincial legislation, is mandatory. Relevant matters that specifically fall under federal jurisdiction include: nuclear energy (including uranium mining), federal land, environmental protection and conservation (shared with the provinces), and integrated management of ocean-related activities (pers. comm. Aarti Soerensen).</p> <p>Environmental Impact Assessments are required for every mining project, even though the specific process may differ across Canada (Abdel-Barr / MacMillan 2018). For closure and restoration, plans have to be approved by the provincial government prior to any mining activities (Abdel-Barr / MacMillan 2018).</p> <p>On a federal level, the Canada’s enhanced Corporate Social Responsibility (CSR) Strategy, “Doing Business the Canadian Way: A Strategy to Advance Corporate Social Responsibility in Canada’s Extractive Sector Abroad” (Global Affairs Canada n.y.) provides in-depth Guidelines on CSR for companies in the mining sector operating abroad.</p>

Areas of Law: Occupational Health and Safety (OHS)	Occupational health and safety (OHS) in Canada is part of provincial or territorial legislations and therefore not uniformly regulated. The provincial or territorial legislations set the framework for obligations on owners, supervisors and employees. Some provinces have regulations and legislations which directly apply to the mining industry (Abdel-Barr / MacMillan 2018). The regional government of Ontario, for example, has specifically developed recommendations for OHS in underground mines (Government of Ontario n.d.). A set of rules that the mining industry in Canada largely adheres to but which is not state-driven, was established by the Mining Association of Canada in the framework of the Towards Sustainable Mining (TSM) (MAC 2019a).
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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?	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)?	Yes Yes (MAC 2019b; Rio Tinto IOC 2018d)
Towards Sustainable Mining (TSM) outside Canada: Are TSM standards implemented*?	No information available No information obtained

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 0.570/1.00 (RMI 2018b)
Responsible Mining Index Company indicator „Environmental sustainability“	0.477 0.477 /1.00 (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?	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 information obtained No information obtained

CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	Yes Yes – UK
OECD Guidelines: Does the company have its headquarters in a signatory state?	Yes Yes – UK & Australia
ISO 26000: Does the mine implement ISO 26000?*	No information obtained Not indicated in company documents.
Banking Standards	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	No information obtained Not indicated in company documents.
Equator Principles (EP): Is the mine financed to a major extend by a bank adherent to the EP?	No information obtained Not indicated in company documents.

*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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German Environment Agency
Section III 2.2
PO Box 14 06
06813 Dessau-Rosslau, Germany
Tel: +49 340-2103-0
info@umweltbundesamt.de
www.umweltbundesamt.de

Contact:

Jan Kosmol – jan.kosmol@uba.de

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Contractor:

Projekt-Consult GmbH
Eulenkruogstrasse 82
22359 Hamburg, Germany
T +49 (40) 60306-740
F +49 (40) 60306-199
www.projekt-consult.de

Contact:

Dr. Aissa Rechlin – aissa.rechlin@projekt-consult.de
Christopher Demel – christopher.demel@projekt-consult.de

Project Partners:

- ifeu – Institut für Energie-und Umweltforschung Heidelberg gGmbH (Institute for Energy and Environmental Research)
- Öko-Institut e.V. (Institute for Applied Ecology)