

# ÖkoRess III

## Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

**Kindia Bauxite Mine**

**RUSAL, Guinea**

ID: 92

## 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>

# Kindia Bauxite Mine

## Bauxite

General information 	
Indicator or criteria	Description and values
Name of mine	Kindia Bauxite Mine
Description of mining area	The lateritic bauxite deposits of Guinea occur in low altitude (200 to 500 m a.s.l. MSL) in the flat-topped plateaus with practically negligible soil and overburden (Nandi 2017). Lateritic in-situ bauxites lie over Silurian agilites and sedimentary reworked bauxites are located at the border of plateaus (Sidibe, Mustafa Gurhan Yalcin 2019).
Surface extension	22.09km <sup>2</sup> 22.09 km <sup>2</sup> (Image date: 30.10.2019; Viewing height: 7.24 km) (Google Earth)
In operation since	1974 1974 (Wikimapia 2013)
Operator	Compagnie des Bauxites de Kindia
Owner	RUSAL
Closest town	Kindia, 38 km northeast of mine site
Province	Kindia Prefecture
Country	Guinea
Longitude	-13.14261°
Latitude	9.88254°
Altitude	500 m a.s.l. 500 m a.s.l.
Main product and by-products	Main product: bauxite; by-products: none

On-site processing stages	Drilling and blasting excavation (RUSAL 2019)
Annual production	3.4 Mt (2016) (RUSAL, 2018a); 3.2 Mt (RUSAL 2019)
Proven Reserves	153 Mt (Rüttinger et al. 2016)
Probable Reserves	Indicated mineral resources 16.7 Mt bauxite (RUSAL 2018 a)

## Geology



Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	Bauxite is a supergene enrichment of Al forming oxidic ore deposits. Aluminium (Al), which is extracted from bauxite, is a lithophilic element and primarily occurs in the form of gibbsite, which is a stable mineral under weathering conditions. It is, thus, stable under exposure to weathering in tailing ponds and waste piles. In general, AMD requires the presence of sulphide minerals.	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	B2 = medium, classified according to measurement instructions
Paragenesis with heavy metals	Bauxites of the Kindia region/Balaya Plateau have the following trace element composition: Titanium ranges from 10260 to 22200 ppm, Zirkon ranges from 356.5 to 925.5 ppm, while Vanadium ranges from 221 to 578 ppm and Chromium from 272 to 748 ppm respectively. Thorium ranges between 31.2–59.8 ppm (Sidibe / Yalcin	According to the measurement instructions, aluminium ores may be associated with zinc, copper and chrome. Following the research of Sidibe and Yalcin (2019) the release of Chromium and Vanadium due to elevated concentrations in Kindia region bauxites is a possibility depending on geochemical conditions,	Medium	B2 = medium, classified according to measurement instructions

	2019). However no Kindia deposit specific data are available.	and the EHP is classified as medium in consequence.		
Paragenesis with radioactive components	Th concentrations of max 59.8 ppm are reported (see above).	The analysed bauxites of Kindia region have Thorium contents of max 59.8 ppm. In accordance to the measurement instructions basing on average thorium and uranium activity levels in Chinese bauxite (Hua 2011; USGS 2015) the bauxites are classified as medium EHP.	Medium	B2 = medium, classified according to measurement instructions
Deposit size	153 Mt bauxite (Rüttinger et al. 2016)	The deposit size is estimated based on the total reserves of 153 Mt of bauxite, and a production since 1974 (44 years, 3 Mt bauxite /year) of about 132 Mt of bauxite. This sums up to around 285 Mt of bauxite with an average content of 45.3 % Al <sub>2</sub> O <sub>3</sub> . Thus, the deposit size in total is about 128.5 Mt Al <sub>2</sub> O <sub>3</sub> and it can be considered as large medium (>100 Mt ore) according to the measurement instructions.	High	B2 = medium, classified according to measurement instructions
Ore grade	49.7 – 61 % Al <sub>2</sub> O <sub>3</sub> , Kindia region (Sidibe / Yalcin 2019).	Considering other top bauxite deposits, Kindia with an average grade of 45.3 % can be considered a rich bauxite deposit with reference to undisclosed data.	Low	n.d.

Technology 				
Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Mine type	Open-pit mining of unconsolidated weathered material.	The superficial excavation of the weathered bauxite horizon leads to a high surface consumption of the mining operation and is consequently evaluated with a high EHP.	High	B2 = medium, classified according to measurement instructions
Use of auxiliary substances	RUSAL at their Kindia operation uses surface mining equipment (shovel and grinder, trucks) to directly produce <100mm bauxite, which is exported from Conakry port without drying. RUSAL uses drilling and blasting excavation and thin-layer technology. Milling and Bayer process of alumina recovery occurs off site (RUSAL 2019).	The still reported use of explosives for blasting represents use of auxiliary substances that are not classified as toxic leading to a low EHP for this indicator.	Low	B2 = medium, classified according to measurement instructions
Mining waste	The use of surface mining equipment in parts of the operations produces level surfaces and avoids erosion by immediate replacement of the cut with the overburden material	There is no evidence of instable, steep and high mining waste heaps – most of the surface is flat and levelled. However no clear evidence of surface levelling through filling of the mined out strips could be found in Google Earth (2019) analyses, thus classifying the EHP as medium.	Medium	C = low, no concrete information, no general specifications in the measurement instructions, (expert) estimate

<p>Remediation measures</p>	<p>Considering the surface miner technology partly applied in Kindia, it can be expected that overburden moved for mining purpose is used to reconstruct the topography or is used for paving roads. However, no site specific data regarding restoration and mine closure plan are available. RUSAL reports to GRI standards. In 2017, the area of reclaimed land of RUSAL activities worldwide was by 21 % higher than the amount of developed land (RUSAL 2018 b).</p>	<p>No clear evidence of systematic renaturation of the mine out strips could be found in GoogleEarth (2019) analyses. Considering the worldwide commitment with RUSAL on sustainability reporting, the EHP is classified as medium.</p>	<p>Medium</p>	<p>C = low, no concrete information, no general specifications in the measurement instructions, (expert) estimate</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>The EHP for landslides is medium which determines the evaluation result. All other sub-indicators have a low EHP.</p>	<p>Medium</p>	<p>B2 = medium, classified according to measurement instructions</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 water shortages in dry areas is supplemented by desert areas. The highest hazard level of the sub-indicators determines the total result.</p>	<p>The water stress for the mining area is low and it is not situated in a desert area, which results in a low EHP.</p>	<p>Low</p>	<p>B2 = medium, classified according to measurement instructions</p>

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 situated in a protected area which determines a medium EHP.	Medium	B2 = medium, classified according to measurement instructions
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## State Governance

Indicators	
WGI 1 -Voice and Accountability	25.12 <sup>ooo</sup>
WGI 2 -Political Stability and Absence of Violence/ Terrorism	24.76 <sup>ooo</sup>
WGI 3 - Government Effectiveness	13.94 <sup>ooo</sup>
WGI 4 -Regulatory Quality	17.79 <sup>ooo</sup>
WGI 5 - Rule of Law	9.13 <sup>ooo</sup>
WGI 6 -Control of Corruption	14.42 <sup>ooo</sup>
EPI (Environmental Performance Index)	46.62

EITI membership	Yes; current status is “meaningful progress”
<b>International Agreements</b>	
ILO 176	Guinea is part of ILO
Others	Signature of the Paris Agreement on Climate Change, Minamata Convention on Mercury (InforMEA n.d.)
<b>Legal framework</b>	
Areas of Law: Environment	<p>The first Mining code was promulgated in 1986. The new Mining Code took effect in September 2011 and was amended in 2013 containing more detailed environmental and rehabilitation obligations. Decree D/2014/014 regulates environmental and social impact assessment for mining operations. Environmental impact notice must be filed to obtain exploration permits. Exploitation permits and concessions require environmental and social impact studies and the funding of environmental rehabilitation trust accounts to guarantee the rehabilitation and closure of the mining site, including restoration of vegetation, land productivity and risk elimination. The Ministry of Mines and the Ministry of the Environment issue a notice of discharge after inspection (Mining Law Review 2019). In accordance to Article 7, title-holders must comply with applicable provisions of the Public Health Code, the Environment Code, the Water Code, the Employment Code, the Wildlife Code, the Livestock Code, the Real Estate Code, the Forestry Code, the Pastoral Code and the Local Communities Code”, using the highest standards applicable in the country and comply in accordance with the provisions of the Environment Code or international best practices in the area (Mining</p>

	<p>Law Review 2019). According to Ruettinger et al (2016) the implementation of the National Action Plan for the Environment from 1994 is very limited due to unstable social and political situation.</p>
<p>Areas of Law: Occupational Health and Safety (OHS)</p>	<p>Guinea has adopted a new Labour Code in 2014, containing very general provisions in relation to occupational safety and health (Rüttinger et al. 2016), including for instance the handling of hazardous substances and operation of heavy machinery as well as the responsibilities and obligations of owners, employers, managers and employees (ILO 2016). The Ministry of Labour is the competent national authority for safety and health at work. Labour inspectors have the power to take and request measures to eliminate hazards. The application of sanctions and penalties by courts is foreseen (ibid.). The New Mining Code from 2011 (Chapter VIII) defines the holder of mining permits as responsible for the implementation of safety measures. According to the Code, Article 143, the implementation of a health adjustment plan to be submitted to the National Mining Authority is mandatory (République de Guinée 2011).</p>

## Corporate Social Responsibility (CSR)

Voluntary Standards	
Aluminium Stewardship Initiative (ASI): Is the mine owning company a member?	No No (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?	No No (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 2018)
Responsible Mining Index Company indicator „Working conditions“	0.369 0.369 / 1.000 (RMI 2018)

Responsible Mining Index Company indicator „Environmental sustainability“	0.198 0.198 / 1.000 (RMI 2018)
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
<b>ISO and CSR reporting</b>	
ISO 14001 (ISO 14004): Is the mine ISO 14001 certified?	No information obtained No information available
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
ISO 26000: Does the mine implement ISO 26000?*	No information obtained No information available
<b>Banking Standards</b>	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	No information obtained No information available
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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