



# LKAB

## Green Bond Second Opinion

November 21, 2019

**LKAB is an international mining and mineral company wholly owned by the Swedish government. It is specialized on mining and upgrading iron ore products and services in Sweden.** In Sweden, LKAB mines approximately 150,000 tonnes of iron ore daily. LKAB accounts for approximately 80% of the EU's iron ore production. In addition, LKAB operates a special products division responsible for developing and supplying products and services for industrial minerals, drilling for mining and construction industries. LKAB's current iron ore production is emission intensive and uses coal. The iron and steel industry in Sweden represent 12% of Sweden's total emissions and utilizes iron ore from LKAB.

**LKAB's green bonds under this framework provide the opportunity to finance innovative research projects for fossil free iron ore mining and steel production as well as electrification in LKAB's infrastructure.** While iron ore production still features significant process and energy related emissions, LKAB allocates proceeds to its flagship zero-emission research projects Sustainable Underground Mining (SUM) and HYBRIT, which is supported by the Swedish Energy Agency. This is an innovative step towards LKAB's long-term target to become completely fossil-free and carbon-dioxide-free by 2045.

**The risk of locking in emissions into potentially fossil fuel intensive infrastructure as well as overall emission increase is particularly high as LKAB has no short-or medium-term absolute emission targets.** According to LKAB, major investments in production systems and processes are screened for alignment with their 2045 zero-emission target. Risks are mitigated by the fact that LKAB has a clear focus on completely electrified assets and excludes direct investments into energy efficiency improvements of current mining process. In addition, LKAB has a 2045 zero-emission target and is covered under the EU-ETS absolute emissions cap. The EU-ETS will reduce emissions from the European industry sectors by 43% by 2030 compared to 2005.

**Metals and minerals such as rare earth minerals are a necessity to make the conversion to a fossil free society.** However, while investments into innovative low-carbon metal and mineral production are commendable, LKAB currently does not systematically map its customers or exclude selling metals and minerals to where alternatives for a low-carbon future already exist. In addition, LKAB does not implement TCFD recommendations and does not systematically screen for climate risks.

**There are local pollution and land use concerns linked to mining.** LKAB is in the process of relocating a whole town and parts of the proceeds are allocated to infrastructure in the relocated town. LKAB has confirmed that they are working closely with the local community and that there are no pending controversies.

Based on the overall assessment of the project types that will be financed by the green bonds, governance and transparency considerations, LKAB's green financing framework receives a **CICERO Medium Green** shading and a governance score of **Good**. LKAB is investing into crucial measures for the transition of iron and steel industry, but has a responsibility to ensure a rigorous environmental assessment that support the green ambitions of the framework.

### SHADES OF GREEN

Based on our review, we rate the LKAB's green bond framework **CICERO Medium Green**.

Included in the overall shading is an assessment of the governance structure of the green bond framework. CICERO Shades of Green finds the governance procedures in LKAB's framework to be **Good**.



### GREEN BOND PRINCIPLES

Based on this review, this Framework is found in alignment with the principles.





# Contents

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<b>1</b>	<b>Terms and methodology</b>	<b>3</b>
	Expressing concerns with 'shades of green'	3
<b>2</b>	<b>Brief description of LKAB's green bond framework and related policies</b>	<b>4</b>
	Environmental Strategies and Policies	4
	Use of proceeds	5
	Selection	6
	Management of proceeds	6
	Reporting	7
<b>3</b>	<b>Assessment of LKAB's green bond framework and policies</b>	<b>8</b>
	Overall shading	8
	Eligible projects under the LKAB's green bond framework	8
	Background	13
	Governance Assessment	14
	Strengths	14
	Weaknesses	15
	Pitfalls	15
	<b>Appendix 1: Referenced Documents List</b>	<b>17</b>
	<b>Appendix 2: About CICERO Shades of Green</b>	<b>19</b>

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# 1 Terms and methodology

This note provides CICERO Shades of Green's (CICERO Green) second opinion of the client's framework dated November 21, 2019. This second opinion remains relevant to all green bonds and/or loans issued under this framework for the duration of three years from publication of this second opinion, as long as the framework remains unchanged. Any amendments or updates to the framework require a revised second opinion. CICERO Green encourages the client to make this second opinion publicly available. If any part of the second opinion is quoted, the full report must be made available.

The second opinion is based on a review of the framework and documentation of the client's policies and processes, as well as information gathered during meetings, teleconferences and email correspondence.

## Expressing concerns with 'shades of green'

CICERO Green second opinions are graded dark green, medium green or light green, reflecting a broad, qualitative review of the climate and environmental risks and ambitions. The shading methodology aims to provide transparency to investors that seek to understand and act upon potential exposure to climate risks and impacts. Investments in all shades of green projects are necessary in order to successfully implement the ambition of the Paris agreement. The shades are intended to communicate the following:

### CICERO Shades of Green



**Dark green** is allocated to projects and solutions that correspond to the long-term vision of a low carbon and climate resilient future. Fossil-fueled technologies that lock in long-term emissions do not qualify for financing. Ideally, exposure to transitional and physical climate risk is considered or mitigated.



**Medium green** is allocated to projects and solutions that represent steps towards the long-term vision, but are not quite there yet. Fossil-fueled technologies that lock in long-term emissions do not qualify for financing. Physical and transition climate risks might be considered.



**Light green** is allocated to projects and solutions that are climate friendly but do not represent or contribute to the long-term vision. These represent necessary and potentially significant short-term GHG emission reductions, but need to be managed to avoid extension of equipment lifetime that can lock-in fossil fuel elements. Projects may be exposed to the physical and transitional climate risk without appropriate strategies in place to protect them.



**Brown** is allocated to projects and solutions that are in opposition to the long-term vision of a low carbon and climate resilient future.

### Examples



Wind energy projects with a strong governance structure that integrates environmental concerns



Bridging technologies such as plug-in hybrid buses



Efficiency investments for fossil fuel technologies where clean alternatives are not available



New infrastructure for coal

Sound governance and transparency processes facilitate delivery of the client's climate and environmental ambitions laid out in the framework. Hence, the governance aspects are carefully considered and reflected in the overall shading of the green bond framework. CICERO Green considers four factors in its review of the client's governance processes: 1) the policies and goals of relevance to the green bond framework; 2) the selection process used to identify and approve eligible projects under the framework, 3) the management of proceeds and 4) the reporting on the projects to investors. Based on these factors, we assign an overall governance grade: Fair, Good or Excellent.



## 2 Brief description of LKAB's green bond framework and related policies

LKAB is an international mining and mineral company wholly owned by the Swedish government. It is specialized on mining and upgrading iron ore products and services in Sweden. LKAB mines approximately 150,000 tonnes of iron ore daily with mines and refining plants being located in Malmfälten in the north of Sweden and production operations located in Kiruna, MalMBERGET and Svappavaara. Iron ore is subsequently sorted and upgraded to small iron pellets in Sweden and transported via rail to the Luleå port in Sweden for shipping to European customers (77% of iron ore products) or the Narvik port (Norway) for customers outside of Europe. LKAB accounts for approximately 80% of the EU's iron ore production. In addition, LKAB operates a special products division responsible for developing and supplying products and services for industrial minerals, drilling for mining and construction industries.

### Environmental Strategies and Policies

LKAB recognizes the Government's and the Parliament's goal to achieve zero emissions in Sweden by 2045 and confirmed that this target was adopted for LKAB accordingly. In addition, the issuer informed us that they are in the process to set new targets for the period until 2030 incl. Science Based Targets (SBT). LKAB aims to increase its productivity by 40-50% in the next generation of mining and to reduce emission intensity to 23.9kgCO<sub>2</sub>/tonne of finished product in 2021, down by 12% compared to 2015. In addition, LKAB aims to reduce its energy intensity 17% compared to 2015 to 138kWh/tonne in 2021 and has intensity goals on NO<sub>x</sub>, nitrogen discharge and particulate matter. LKAB confirmed that the productivity increase might require exploitation of new mining sites incl. potentially associated urban transformation/relocation projects. According to the issuer, the company is working very closely with the regulators and the local community. The issuer informed us that increased productivity does not necessarily result in increased production of iron ore pellets due to a current and future bottleneck in the pelletizing process.

In 2018, LKAB's scope 1 and 2 from (mining, production of iron ore, transporting and ports) emissions amounted to 691 000tCO<sub>2</sub>, an increase of 2% compared to 2015, which is the base year of LKAB's emission intensity reduction goal of 12%. 49% of LKAB's energy and process related emissions in 2018 were caused by coal and 29% by fuel oil. With 4 329GWh of energy consumed, LKAB is one of Sweden's largest consumer of energy, largely due to electricity (56%), coal (23%) and fuel oil (17%). This is an increase of 5.6% compared to 2015, which is the base year of LKAB's energy intensity reduction goal of 17%. LKAB receives free allowances under the EU-ETS and informed us that 94.62% of CO<sub>2</sub> emissions are currently covered by EU-ETS. According to the issuer, the remaining share is related to diesel for transport, some LPG used for "defrosting" of ore-trains and district heating emissions.

LKAB is part of several initiatives to reduce its climate impact. These include initiatives for steel making without the use of coal, concrete mix production with little to no emissions and fossil free iron-ore extraction:

- 1) The issuer recognizes the risk of coal dependency and is in the process of exploring alternative fuels within the HYBRIT project and with Vattenfall and SSAB in order to achieve carbon dioxide-free ore-based steel production by 2035. The project involves test plants based on biofuel in MalMBERGET and hydrogen based reduction of iron ore in Luleå. The Swedish Energy Agency supports HYBRIT with 528 million Swedish kroner for a pilot facility. A second phase will explore carbon dioxide-free heating in



LKAB's pelletizing plants. According to the issuer, within the initiative LKAB is investigating hydrogen gas and plasma heating. If successful, a transition to electricity based heating options will mean CO<sub>2</sub> free pelletizing.

- 2) LKAB has joined the group Sustainable Underground Mining (SUM) together with several other Swedish industrial companies. The group aims to develop measures until 2023 to ensure sustainability of mining in greater depths before 2030. This includes the goal of 100% electrical operations, where the electricity or hydrogen in fuel cells comes from renewable electricity generation.
- 3) Within the GGBS (Grinded Granulated Blast Furnace Slag) project, LKAB works with steel producers and aims to recycle accruing non-iron slag from steel production from iron-ore pellets as an additive to concrete. According to the issuer, GGBS production solely runs on electricity and does not produce additional CO<sub>2</sub> emissions (e.g., electrified grinding mills for slag). LKAB informed us that about 100kt of cement are used every year and that approximately 50% of the cement could be replaced by GGBS resulting in corresponding CO<sub>2</sub> reductions of 50%. LKAB estimates a total planned production of 350kt of GGBS that will also be available outside of LKAB's operations.
- 4) The ReeMAP project includes R&D and investments to process waste material from LKAB's mining operation in order to commercially extract rare earth metals (REE) and phosphor products e.g. fertilizers (MAP). The project is another example of LKAB's ambition to promote a circular economy.

LKAB has a supplier code of conduct in place. In addition, the issuer has an energy and environmental management system that is certified according to ISO 50001 and ISO 14001. The issuer recognizes its local environmental impact and aims to reduce local emissions and discharges according its Land use Guidelines (2015) and remediate of impacted sites. LKAB prepares its sustainability reports in accordance the Global Reporting Initiative already since 2008.

The issuer currently does not implement TCFD recommendations and does not use climate scenarios. However, the issuer informed us that climate risks are integrated into LKAB's general risk management processes for their production facilities (e.g., increased amount of rain and lightning).

### Use of proceeds

Net proceeds will be used for financing or refinancing of acquisition, development, construction or renovation and upgrade of new and existing assets located in the EU28 and Norway in eight eligible project categories (see Table 1). According to LKAB, investments are currently only intended in Sweden, but investments could also be considered in Norway, England, Holland, and Germany. Eligible assets can be related to capital expenditures and environmentally related R&D throughout the complete value chain. New assets have to be planned, in progress or finalized up to one year before the approval by the Green Bond Committee. LKAB expects to allocate approximately 40% of proceeds to the pollution prevention and control category and approximately 20% for each the clean transportation and the green buildings category. LKAB informed us that 85-90% of proceeds from the first bond are expected to be allocated to financing new projects. The look-back period for refinancing is two years. More than 50% of the investments in the category Pollution Prevention and Control will be allocated to HYBRIT and SUM research project.

LKAB informed us that urban transformation projects might be required and that parts of these might be eligible under this framework. Specifically, under this framework a new hotel with Miljöbyggnad Silver certification is planned to be financed. For urban transformation projects LKAB confirmed that they will ensure that these projects are in accordance with LKAB's routines and guidelines that are based on international guidelines and best practice as well as legislation and demands close interaction with stakeholder. According to the issuer, this includes holding to either regulation or international guidelines depending on which is stricter as well as reimbursement guideline



that goes beyond what is required. Restrictions exist to require more stringent environmental criteria than regulation when relocating assets that are not owned by the company itself.

LKAB excludes fossil-fuel based energy generation projects, but explicitly includes using waste heat from fossil processes. In addition, LKAB has confirmed that investments in energy efficiency in current mining processes are excluded from green bond financing in order to avoid the risk of lock-in effects.

### **Selection**

The selection process is a key governance factor to consider in CICERO Green's assessment. CICERO Green typically looks at how climate and environmental considerations are assessed when evaluating whether projects can qualify for green finance funding. The broader the project categories, the more importance CICERO Green places on the governance process.

The issuer has established a Green Bond Committee that evaluates potential assets and decides in consensus if potential projects meet the eligibility criteria and feature a high likelihood that the net, long-term environmental effects are positive. The green bonds committee will in their screening process for each project, indifferent to category, ensure that the investment does not lead to lock in effects. The issuer confirmed that the committee will meet once every quarter and convene in between if necessary. The committee includes the Head of Treasury as well as environmental expertise through the Heads of Sustainability, Environment, Energy, Research & Development.

LKAB informed us that due to Sweden's strict environmental regulations demand that LKAB has experts within many different environmental areas such as engineers, biologists, geologists, hydrologists and chemists. According to the issuer, this awareness and knowledge can and will be used in governance of the framework.

Projects will be removed from the pool of projects if eligible assets no longer meet the eligibility criteria and will not receive further funding from green bond proceeds. According to LKAB, the projects are reviewed in connection with the approval and then in connection with the annual reporting.

According to LKAB, future major investments in production systems and processes must take into account the 2045 target in accordance with LKAB's strategy to become completely fossil-free and carbon-dioxide-free by 2045.

### **Management of proceeds**

CICERO Green finds the management of proceeds of LKAB to be in accordance with the Green Bond Principles. The net proceeds are credited to a segregated green account. At the end of every fiscal quarter, funds are deducted from the green account for individual or portfolio disbursements for the financing of eligible assets during the quarter.

LKAB aims to use all proceeds within one year and no later than two years from the time of issuance of the green bonds. Until disbursement, the green account balance will be placed in the liquidity reserve and managed in accordance with LKAB's finance policy and investment guidelines. These guidelines allow for bank holdings, money market papers and short dated bonds and exclude, e.g., direct investments in fossil fuel extraction companies.



## Reporting

Transparency, reporting, and verification of impacts are key to enable investors to follow the implementation of green finance programs. Procedures for reporting and disclosure of green finance investments are also vital to build confidence that green finance is contributing towards a sustainable and climate-friendly future, both among investors and in society.

The issuer will report annually on total amount of green bonds issued and outstanding, allocation of proceeds and a description of the portfolio of approved assets incl. a description of the main environmental impacts on project-by-project level. Indicative environmental impact measurement to be reported on include, e.g., GWh, tonnes of CO<sub>2</sub>, nitrogen, sulphur or dust, and kg of, e.g., heavy metals. The report will be published on LKAB's website. LKAB confirmed that the Green Bond Committee will be responsible for ensuring that the data is collected, compiled and reported on the website.

The issuer will also report on the unallocated balance. The ambition of LKAB is to include information about the expected/actual environmental impacts of the assets where possible. The internal tracking, the allocation of fund and the investor report will be verified by a limited assurance provider. The respective report will be made publicly available.



### 3 Assessment of LKAB's green bond framework and policies

The framework and procedures for LKAB's green bond investments are assessed and their strengths and weaknesses are discussed in this section. The strengths of an investment framework with respect to environmental impact are areas where it clearly supports low-carbon projects; weaknesses are typically areas that are unclear or too general. Pitfalls are also raised in this section to note areas where LKABs should be aware of potential macro-level impacts of investment projects.

#### Overall shading

Based on the project category shadings detailed below, and consideration of environmental ambitions and governance structure reflected in LKAB's green bond framework, we rate the framework **CICERO Medium Green**.

#### Eligible projects under the LKAB's green bond framework

At the basic level, the selection of eligible project categories is the primary mechanism to ensure that projects deliver environmental benefits. Through selection of project categories with clear environmental benefits, green bonds aim to provide investors with certainty that their investments deliver environmental returns as well as financial returns. The Green Bonds Principles (GBP) state that the "overall environmental profile" of a project should be assessed and that the selection process should be "well defined".

Category	Eligible project types	Green Shading and some concerns
Pollution prevention and control 	<p>Expenditures included should lead to either of the following outcomes in LKAB's businesses and processes;</p> <ul style="list-style-type: none"><li>• Significantly reduced emissions of greenhouse gases</li><li>• Significantly reduced harmful emissions other than greenhouse gasses to air or land</li><li>• Soil remediation measures to site-specific guideline values</li><li>• Waste prevention, waste reduction or waste recycling</li><li>• Reduction of the amount of waste / emissions through product development in our value chain</li></ul> <p>In order to approve projects primarily aiming to prevent local pollution, the project must achieve environmental goals that go beyond the strict national legislative requirement and/or involves</p>	<p><b>Medium Green</b></p> <ul style="list-style-type: none"><li>✓ Investments in HYBRIT or SUM qualify as Medium Green as they currently constitute only a part of the solution to a full transition to zero emission iron and steel production.</li><li>✓ Investments into environmental improvements that go beyond regulatory requirements or are the best in class in a global perspective and recycling of by-products (e.g., GGBS) from iron ore production qualifies Medium Green as it is tied to fossil material based iron ore production but constitutes</li></ul>



technological innovation to meet new, strict requirements and is above the market practice in the mining sector.

At least fifty percent (50%) of investments in this category will consist of investments in HYBRIT and SUM.

Projects in this category will not increase the usage of fossil-fuel based energy to reduce “harmful emissions other than greenhouse gases”. Projects included based on “significantly reduced emissions” will have a comment on expected and/or actual reduction in the investor report.

necessary infrastructure for the transition

- ✓ The issuer informed us that no new fossil fuel infrastructure is eligible under this category
- ✓ According to the issuer, new or expanded capacity of landfills are excluded
- ✓ Different objectives in emissions reductions are eligible under this category (e.g., nitrogen, phosphor, sulfur)
- ✓ The issuer informed us that each project will be described in the investment report

Eco-efficient and/or circular economy adapted products, production technologies and processes



Expenditures should through innovation or process or product development lead to one of the alternatives below;

- A substantially more environmentally sustainable production or products
- The use of manufactured products leads to higher environmental performance than existing alternatives with the same function. (Benchmark)

Projects included based on “significantly more environmentally sustainable” will have a comment on expected and/or actual improvements in the investor report.

**Medium Green**

- ✓ Recycling waste material from mining operation in order to commercially extract rare earth metals and phosphor products e.g. fertilizers qualifies as Medium Green
- ✓ The issuer informed us that no new fossil fuel infrastructure is eligible under this category as well as that all investments in this category are not linked to fossil fuel investments and can be used in LKAB’s low-carbon solution for 2045

Clean transportation



Expenditures should lead to the use of transportation with;

- No tail-pipe emissions of fossil CO2 or,
- That run with 100% electrical power or,
- Infrastructure for clean energy vehicles

**Medium Green**

- ✓ All criteria for this category comply with a Dark Green rating. However, new transportation or mining infrastructure for currently fossil fuel based iron ore products supports LKAB’s and currently constitute only a part of the solution to a full transition to zero emission iron and steel production.



- ✓ Examples include IORE-trains and 100% electrified loading machines.
- ✓ Corresponding infrastructure includes charging or biofuel stations

Environmentally sustainable management of living natural resources and land use



Expenditures should be composed of measures that promote either of the following outcomes;

- Environmentally sustainable forestry, including afforestation or reforestation,
- Preservation or restoration of natural landscapes
- Biological diversity within the categories of rehabilitation and compensation in accordance with the "Mitigation Hierarchy".

*Definition; the "Mitigation Hierarchy" mean that we 1) design facilities so as to minimise the impact on sensitive areas. 2) Take all reasonable significant measures to alleviate damage in order to minimise the impact on soil and water. 3) Plan for ecological restoration of mining environments that have been closed. 4) Strive to compensate for residual damage to biodiversity after measures to alleviate damage have been taken.*

**Medium Green**

- ✓ Sustainable forestry, reforestation and afforestation projects that are important for a 2050 climate solution
- ✓ Examples include ecological remediation and compensation areas for biological diversity
- ✓ According to LKAB, the issuer does not own extensive forest areas and would obtain respective forestry certifications in the future

Renewable energy



Expenditures should lead to either of the following outcomes;

- The replacement of fossil fuels with renewable or carbon dioxide free energy, including electricity
- Investments in systems / plants using biofuels
- Fossil fuel-free energy production

**Medium Green**

- ✓ Power plants for currently fossil fuel based iron ore products supports LKAB's intended iron ore capacity increase and associated significant risks of rebound effects in total emission increase, but are necessary in a 2050 perspective. Due to these rebound effects this category is rated Medium Green.
- ✓ This project category includes use of hydrogen, biofuels and renewable electricity (wind, bioenergy and small hydro power) for BIO-furnaces, pellet mills, fuel boilers and transport



- ✓ Despite of LKAB taking into account life cycle emissions, production of biofuels (biooil, tree pellets, HVO) features substantial risks, e.g., for biodiversity and potential incentives to deforestation and could compete with food crops.
- ✓ Concerns arise from the potential large demand of biofuels and the import from wood pellets from Canada

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### Green buildings



Expenditures should meet either of following thresholds;

- The Building meets or will meet a certification of “Miljöbyggnad Silver” or equivalent.
- The Refurbishment of buildings will lead to energy improvement to a level of 30%.

### Medium Green

- ✓ According to LKAB, this project category is aimed at urban transformation building projects
- ✓ All building projects have environmental and social impacts on its surroundings: the issuer should take care to minimize these by adopting low-emission transport and building material options.
- ✓ Voluntary environmental certifications can measure or estimate the environmental footprint of buildings and raise awareness of environmental issues. However, they fall short of guaranteeing an environmentally-friendly building, reduction in GHG emissions and considerations of resiliency
- ✓ According to LKAB, the respective municipality will be responsible for climate risk assessments
- ✓ According to the IEA, new buildings should already now be constructed with passive and plus house technologies



Sustainable  
water and wastewater  
management



Expenditures should lead to either of the following outcomes;

- Clean water through wastewater treatment
- Reduced impact on natural watercourses from LKAB-related emissions
- Flooding mitigation

In order for projects to be approved they must achieve environmental goals and meet new, strict requirements above the market practice in the mining sector.

Projects in this category will not increase the usage of fossil-fuel based energy to reduce “harmful emissions other than greenhouse gases”.

**Medium Green**

- ✓ The water management system is currently supporting fossil material in steel production.
- ✓ According to LKAB water and wastewater management investments are not linked to fossil fuel technology and can be used in LKAB’s low-carbon solution for 2045
- ✓ Examples include water purification and handling of wastewater

Climate change adaptation



Expenditures should be allocated to projects which serve to better handle the consequences of climate change, such as extreme weather (e.g. adaptation to precipitation variations in amounts and patterns, thunderstorms etc.) or improve information support systems, early warning systems or climate observation.

In order for projects to be approved they must achieve environmental goals and meet new, strict requirements above the market practice in the mining sector.

Projects in this category will not increase the usage of fossil-fuel based energy to reduce “harmful emissions other than greenhouse gases”.

**Medium Green**

- ✓ Large construction projects can produce significant emissions that should be managed accordingly
- ✓ According to LKAB climate change adaptation investments are not linked to fossil fuel technology and can be used in LKAB’s low-carbon solution for 2045
- ✓ According to the issuer, new or Expansion of tailing ponds are excluded under this category, but temporary clearing ponds with the aim to improve water clarification are included
- ✓ Other examples include adaption of electrical infrastructure

Table 1. Eligible project categories



## Background

Iron is a key material used for construction projects and vital for traditional as well as for growing sectors such as renewable energy with wind power and buildings. According to the IPCC, iron ore mining has increased by 10% annually between 2005 and 2012.<sup>1</sup> While energy intensity of crude steel production made from iron ore has peaked in 2009 and fell with an annual average of 0.9% since<sup>2</sup>, the global crude steel production has increased to 1.8Gt in 2018<sup>3</sup>. Steel production has increased over the past years, but the World Steel Association and McKinsey observe current overcapacities and estimate a slower increase in demand of 0.8% annually until 2025 and a risk of future overcapacity.<sup>4</sup> Currently, energy supply for steel production is largely based on coal (75%)<sup>2</sup>. Iron ore can be pelletized and delivered to steel manufacturers, e.g., in the form of pellets. Pelletizing feature a 6-7<sup>5</sup> times lower emissions factor compared to sinter<sup>6</sup>. LKAB uses pelletizing of iron ore with a current emissions factor of 25.7kg/t in 2018 compared to, e.g., China with 270kg/t<sup>7</sup>. According to LKAB, in all sinter and pellet producing installations in the EU LKAB has the ones with the lowest emissions with an EU average of 57 kgCO<sub>2</sub>/t (data from 2012<sup>8</sup>) pellets when it comes to direct emissions of pelletizing. Recycling scrap is a crucial element to reduce energy consumption and emissions in the future. OECD estimates that melting scrap requires only 40% of the energy and 30% of associated emissions compared to modern steel mills.<sup>9</sup>

In 2017, the iron and steel industry represented 12% of Sweden's total emissions of 52.7 million tonnes of CO<sub>2</sub>. Compared to 2012, total emissions of the iron and steel industry have increased by 12% to a total of 6.27 million tonnes in 2017.<sup>10</sup> Several of the single biggest emission sources are steel related, such as, e.g., SSAB Luleå.<sup>11</sup>

Cement is a large source of emissions globally as coal remains the largest energy source for production with a share of more than 60%.<sup>12</sup> According to the IEA, alternative cement constituents such as blast furnace slag are vital for the Sustainable Development Scenario (SDS), but blast furnace slag production will likely become less available with a transition to a low-carbon and climate resilient future. With the IEA's average energy intensity of 0.54tCO<sub>2</sub> per tonnes of cement, adding up to 50% of slag to LKAB's annual 100kt cement use can reduce LKAB's emissions significantly.

<sup>1</sup> [https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc\\_wg3\\_ar5\\_chapter10.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter10.pdf)

<sup>2</sup> <https://www.iea.org/tcep/industry/steel/>

<sup>3</sup> <https://www.worldsteel.org/steel-by-topic/statistics/steel-statistical-yearbook/World-Steel-in-Figures.html>

<sup>4</sup> <https://www.mckinsey.com/industries/metals-and-mining/our-insights/the-current-capacity-shake-up-in-steel-and-how-the-industry-is-adapting>

<sup>5</sup> [https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/bm\\_study-iron\\_ore\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/bm_study-iron_ore_en.pdf)

<sup>6</sup> [https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/bm\\_study-iron\\_and\\_steel\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/bm_study-iron_and_steel_en.pdf)

<sup>7</sup> Gan, Yu & Griffin, W. Michael. (2018). Analysis of life-cycle GHG emissions for iron ore mining and processing in China—Uncertainty and trends. Resources Policy. 58.

<sup>8</sup> JRC (2012) N. Pardo, J.A. Moya, K. Vatopoulos. Prospective Scenarios on Energy Efficiency and CO<sub>2</sub> Emissions in the EU Iron & Steel Industry.

<sup>9</sup> <https://www.oecd.org/sti/ind/Item%209.%20Laplace%20-%20Steel%20Energy.pdf>

<sup>10</sup> <https://www.naturvardsverket.se/Sa-mar-miljon/Statistik-A-O/Vaxthusgaser-utslapp-fran-industrin/>

<sup>11</sup> [https://ec.europa.eu/clima/sites/clima/files/ets/registry/docs/verified\\_emissions\\_2018\\_en.xlsx](https://ec.europa.eu/clima/sites/clima/files/ets/registry/docs/verified_emissions_2018_en.xlsx)

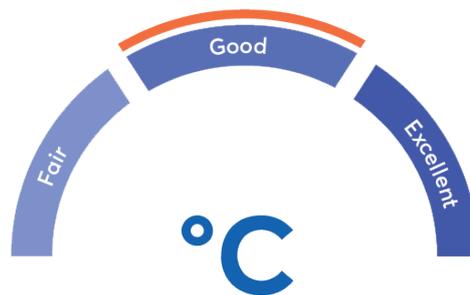
<sup>12</sup> <https://www.iea.org/tcep/industry/cement/>



### Governance Assessment

Four aspects are studied when assessing the LKAB's governance procedures: 1) the policies and goals of relevance to the green bond framework; 2) the selection process used to identify eligible projects under the framework; 3) the management of proceeds; and 4) the reporting on the projects to investors. Based on these aspects, an overall grading is given on governance strength falling into one of three classes: Fair, Good or Excellent.

LKAB has in place a sound management and governance structure, several environmental strategies as well as regular reporting about green bond project achievements to investor. Despite currently only having emission intensity target, LKAB's goal is to become carbon neutral by 2045. LKAB has two research projects, HYBRIT and SUM, that aim at enabling zero-carbon steel production and underground mining. LKAB has a selection committee with environmental experts that decide in consensus and that includes environmental expertise. According to the issuer, due to the complex environmental regulations, a broad range of experts will be involved in the governance of this green bond framework. The issuer's annual allocation and impact reporting is externally verified. Some indicative impact metrics are specified in the framework and LKAB commits to report impact metrics where possible. The overall assessment of LKAB's governance structure and processes gives it a rating of **Good**.



### Strengths

It is a clear strength that LKAB's framework finances innovative R&D projects aiming to support LKAB's goal to become fossil free and CO<sub>2</sub> emission free by 2045. Since the iron ore and steel production industry is one of the most emission intensive industries, LKAB's contribution to developing a long-term solution of emission free production is encouraging and commendable. The Swedish Energy Agency supported project HYBRIT as well as SUM are projects that show LKAB's commitment toward becoming a zero-emission company by 2045 and could yield innovative results that can be taken up by the whole industry.

LKAB is in the process of setting new environmental targets, but does not yet have short-or medium-term absolute emissions targets. Despite this, LKAB features a production emission factor among the lowest globally per tonne of iron ore produced. With a European market share of nearly 80%, further efficiency improvements in iron ore production has the potential to reduce global emissions if production is replaced in countries where emissions are higher.

It is a strength that LKAB excludes direct investments in fossil fuel energy generation as well as components using fossil fuel. While LKAB's overall operations are fossil fuel intensive, LKAB invests into decarbonizing the whole value chain from mining the ore, pelletizing, transporting, shipping as well as remediation. While iron ore production still features significant process and energy related emissions, LKAB invests in low-carbon infrastructure such as electrified rail transport of iron ore or electrified recycling of by-products. According to LKAB, future major investments in production systems and processes must take into account the 2045 zero-emission target, which can reduce the risk of locking in emissions. LKAB excludes investments in energy efficiency of current mining practice from funding under this framework.

While the environmental impact of iron ore mining can be significant, it constitutes a clear strength that LKAB aims at going beyond Sweden's regulation regarding pollution prevention and control or best-in class globally.



### Weaknesses

LKAB excludes direct investments into efficiency improvements of current mining practices. However, this framework includes direct investments in electrified supporting infrastructure that support a production process that utilizes fossil carbon sources, such as coal, for the production of iron ore pellets. Investors should be aware that these investments could lead to significant lock-in or rebound effects as LKAB without having in place short- or medium-term absolute emission target yet.

Metals and minerals such as rare earth minerals are a necessity to make the conversion to a fossil free society. However, metals and minerals are also used in the fossil fuel intensive industries and industries where alternatives for a low-carbon future already exist.

### Pitfalls

LKAB has an emissions intensity target of 23.9kgCO<sub>2</sub>/tonne of finished product in 2021 which is low compared to its competitors. While LKAB also commits to zero-emissions by 2045, currently no absolute cap or target applies. While LKAB is in the process of adopting absolute short-/medium-term emissions targets, investments under this framework bear a risk of short-term emission increase through efficiency improvements. This risk is particularly high as LKAB aims to increase iron ore mining productivity by up to 50% within the next generation. According to LKAB, the risk of rebound effects is partly mitigated by the fact that increased productivity does not necessarily result in increased production of iron ore pellets due to a current and future bottleneck in the pelletizing process. In addition, LKAB's operations are covered under the EU-ETS absolute emissions cap. The EU-ETS will reduce emissions from the European industry sectors by 43% by 2030 compared to 2005. We encourage the issuer to not invest in projects with particularly high risk of rebound.

LKAB currently does not systematically map its customers or exclude selling iron ore pellets toward industries that are not aligned with a low-carbon future. While steel production is very fossil fuel intensive itself, the produced steel in turn can then be used in fossil fuel intensive applications.

LKAB informed us that about 350kt of GGBS will be produced, which is more than is needed by LKAB's, omomg processes (approximately 100kt) and which will therefore be used for other applications, such as, e.g., construction of buildings where it can be added to cement. However, while it is commendable that LKAB recycles slag as a cement additive within the GGBS project in order to directly replace cement and the associated emissions, investments nevertheless bear a risk of stranded assets. According to the issuer, the possibility of using blast furnace slag will reduce when steel production becomes fossil free. Despite steel and cement being crucial for modern building production, life cycle analyses have shown that wood based buildings show a reduced long-term need for fossil fuels and feature less GHG emissions when the wood is sourced from sustainable forestry.<sup>13</sup>

Despite listing some impact metrics, it is a clear pitfall that LKAB currently does not list the minimum impact metrics required for its potential investments for all different categories. This bears the risks of not transparently communicating actual impacts achieved through investments under this framework. This risk is partially mitigated by the fact that the allocation and impact reporting will obtain an external review.

LKAB confirmed that the productivity increase might require exploitation of new mining sites incl. potentially associated urban transformation/relocation projects and that parts of these might be eligible under this framework. In that case LKAB confirmed that they will ensure that these projects are in accordance with LKAB's routines and guidelines that are based on international guidelines and best practice as well as legislation and demands close interaction with stakeholders. This bears the risk of controversial projects with significant environmental impacts.

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<sup>13</sup> <https://webbutik.skl.se/bilder/artiklar/epub/7585-377-2.epub>



Relocation of towns should take into account climate considerations such as low-carbon construction and building materials as well as climate resilience.

The issuer currently does not implement TCFD recommendations or systematically assess climate risks. Emission allowance prices and some physical climate risks are assessed in LKAB's standard risk procedures. However, considering the long-term ambitions of the issuer, CICERO Green encourages the issuer to adopt TCFD recommendations and to screen for physical and transition climate risks regarding all of LKAB's major investments.



# Appendix 1: Referenced Documents List

Document Number	Document Name	Description
1	LKAB Green Bonds Framework, November 21, 2019	
2	This is LKAB	Overview of the company
3	2018 Annual and sustainability report	LKAB's 2018 Combined annual and sustainability report
4	Environment and energy policy	LKAB's environment and energy policy
5	Sustainability policy	LKAB's sustainability policy
6	Code of conduct	LKAB's code of conduct
7	Supplier code of conduct	LKAB's supplier code of conduct
8	Statement on conflict minerals	LKAB's statement on conflict materials
9	2018 GRI APPENDIX TO THE ANNUAL AND SUSTAINABILITY REPORT	Additional information on the annual and sustainability report
10	2015 Annual and sustainability report	LKAB's 2015 Combined annual and sustainability report
11	Our way to sustainability – Group Presentation	LKAB presentation
12	Guidelines for Land Use	LKAB's guidelines for land use
13	Roadmap for a competitive fossil-free mining and minerals industry in Sweden	Roadmap for mining and mineral industry developed by Svemin



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14	Miljörapport LKAB Kiruna 2018	Environmental report for Kiruna
15	KÄLLSORTERINGSHANDBOK	LKAB's Recycling handbook
16	Overall remarks - LKAB to Cicero - 14 Nov 2019	Remarks document from LKAB addressed to CICERO Shades of Green
17	LKAB's The Future of Mining – 21 Nov 2019	Remarks document from LKAB regarding future productivity increase of iron ore production
18	Independent Verification Report of "Carbon Footprint Report KLAB Pellets"	Independent report on LKAB's pellets' footprint

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## Appendix 2: About CICERO Shades of Green

CICERO Green is a subsidiary of the climate research institute CICERO. CICERO is Norway's foremost institute for interdisciplinary climate research. We deliver new insight that helps solve the climate challenge and strengthen international cooperation. CICERO has garnered attention for its work on the effects of manmade emissions on the climate and has played an active role in the UN's IPCC since 1995. CICERO staff provide quality control and methodological development for CICERO Green.

CICERO Green provides second opinions on institutions' frameworks and guidance for assessing and selecting eligible projects for green bond investments. CICERO Green is internationally recognized as a leading provider of independent reviews of green bonds, since the market's inception in 2008. CICERO Green is independent of the entity issuing the bond, its directors, senior management and advisers, and is remunerated in a way that prevents any conflicts of interests arising as a result of the fee structure. CICERO Green operates independently from the financial sector and other stakeholders to preserve the unbiased nature and high quality of second opinions.

We work with both international and domestic issuers, drawing on the global expertise of the Expert Network on Second Opinions (ENSO). Led by CICERO Green, ENSO contributes expertise to the second opinions, and is comprised of a network of trusted, independent research institutions and reputable experts on climate change and other environmental issues, including the Basque Center for Climate Change (BC3), the Stockholm Environment Institute, the Institute of Energy, Environment and Economy at Tsinghua University and the International Institute for Sustainable Development (IISD).

