



Northvolt AB

Green Finance Second Opinion

10 February 2023

Executive Summary

Northvolt is a supplier of lithium-ion battery cells and battery systems, which has a cell production capacity target of 150 GWh by 2030. By March 2022, Northvolt had an order book of cell supply agreements totaling USD 55 billion and the majority of its batteries (more than 70%) will be used by the automotive industry. Founded in 2016 and headquartered in Stockholm, Sweden, Northvolt employs over 4,000 staff across several European locations and its advanced technology center in the San Francisco Bay Area.

Northvolt expects to allocate the large majority of proceeds under the framework to the production of battery cells and cathode active material, with smaller shares to its recycling projects, production of battery systems, and research and development projects. Investments can be undertaken by Northvolt, its subsidiaries, or by Northvolt's share in joint ventures.

We rate the framework **CICERO Dark Green** and give it a governance score of **Excellent**. The project category itself receives a Medium Green to Dark Green shading, reflecting the importance of Northvolt's batteries to electrification and the functioning of energy systems, its efforts to minimize emissions, and emphasis on circularity through investments in battery recycling, while also considering fossil fuel linkages and mining impacts in Northvolt's supply chain, and potential contribution to adverse environmental impacts depending on end-use (electric mining vehicles, in particular). The overall Dark Green shading reflects the above considerations, on balance, as well as Northvolt's Excellent governance score.

Strengths

Batteries are a crucial building block for the transition to electrified transportation and industry, as well as the successful integration of renewable energy technologies, among other things. The framework's focus on battery production therefore supports and facilitates these transitions.

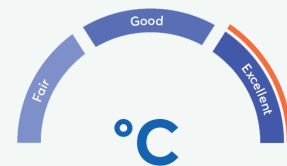
According to Northvolt's analysis, the lifecycle emissions of its batteries are currently less than one-third of the industry average, with a target to be around 90% lower than the current industry average by 2030. In general, battery production is energy and emissions intensive. Northvolt has primarily reduced its emissions through the use of renewable electricity (98% in 2021). For this, Northvolt utilizes guarantees of origin - though note that guarantees of origin do not influence the emissions from electricity actually delivered. Northvolt also has several strategies and approaches to reduce its Scope 3 emissions, for example procuring materials with lower lifecycle impacts, and relocation of suppliers to cleaner grids.

SHADES OF GREEN



°CICERO
Dark Green

GOVERNANCE ASSESSMENT



GREEN BOND AND LOAN PRINCIPLES

Based on this review, this framework is found to be aligned with the principles.



The framework's inclusion of battery recycling represents a strength. Northvolt's recycling process produces battery-grade materials and, while battery recycling is itself energy intensive and can use materials with high embodied emissions such as chemicals, Northvolt informed us that its analysis shows significant reduced environmental impact potentials of its process compared to virgin raw material use. Northvolt can also point to efforts to increase the recyclability of its batteries, while its battery joint venture has set a target to reduce emissions from recycling by around 60% by 2030.

Northvolt shows a strong awareness of physical climate risks. According to the framework, Northvolt screens all its sites for physical risks, conducts risk and vulnerability assessments in relation to the identified risks, and prepares adaptation solution plans for each site. Two climate scenarios to 2050 are used in the screening (RCP 4.5 and RCP 8.5). We welcome that Northvolt acknowledges the physical risk exposure of its supply chain as an area for development moving forward, given that physical risks in its supply chain are magnified by, for example, a need for large amounts of water in mining and processing raw materials.

Pitfalls

The mining of raw materials required to produce batteries can have substantial adverse environmental and social impacts. While Northvolt has comprehensive policies and approaches in these respects, such risks are difficult to manage and will likely exacerbate as the demand for such materials continues to increase.

Synthetic graphite, a key material in Northvolt's supply chain, depends on fossil fuel-based inputs. Synthetic graphite production is an energy-intensive process, dependent on fossil fuel-derived inputs, and there appear to be few commercially viable low-carbon alternatives. The use of this feedstock therefore poses climate transition risks in Northvolt's supply chain. Northvolt is working with its graphite suppliers to develop graphite recycling and increase the use of renewable energy in their production processes.

Not all potential end-uses of Northvolt's batteries are aligned with a 2050 future. According to Northvolt, the majority of its batteries will be used in the automotive industry (exceeding 70%). It is currently producing only cells for battery-electric vehicles, and, though they are not excluded in the framework, states that it is not part of its strategy to produce batteries for hybrid vehicles, nor would this be realistically feasible given the technical specifications of its batteries and the investments necessary to do so. Other end-uses include use in energy systems (e.g. in the regulation of renewable energy systems), and heavy industry (e.g. the electrification of mining and construction equipment). Through potential use in mining trucks or other heavy industries, Northvolt's batteries could contribute to adverse environmental impacts.

EU Taxonomy

CICERO Shades of Green considers the EU Taxonomy activity 3.4 – Manufacture of batteries relates to Northvolt's framework, and assesses that the framework activities are likely aligned with the relevant mitigation and Do No Significant Harm criteria. Moreover, CICERO Shades of Green considers that Northvolt likely fulfils the requirements in the EU Taxonomy's minimum social safeguards.



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1 Northvolt's environmental management and green finance framework

Company description

Northvolt AB ("Northvolt") is a supplier of lithium-ion battery cells and battery systems, which has a cell production capacity target of 150 GWh by 2030. Northvolt's cells utilize nickel-manganese-cobalt (commonly referred to as NMC) cathodes and are available in cylindrical and prismatic formats, though it is looking to expand to additional chemistries and cell formats. It also produces modular components and complete scalable battery systems.

By March 2022, Northvolt had an order book of cell supply agreements totaling USD 55 billion. The majority of its batteries (more than 70%) will be used by the automotive industry, though they will also be used in energy systems and heavy industry (e.g. via its partnership with mining equipment producer Epiroc¹), among other uses. Founded in 2016 and headquartered in Stockholm, Sweden, Northvolt employs over 4,000 staff across several European locations - including Europe's first gigafactory in Skellefteå, Sweden - and its advanced technology center in the San Francisco Bay Area, America.

Sector risk exposure

Physical climate risks. Changing and more volatile weather can impact production sites, for example increased flood risk in Northern Europe. Climate change can also disrupt logistics and transportation of raw materials and end products - in the case of battery production, materials are typically transported across a wide range of locations and geographies. The battery supply chain is also exposed to physical climate risk - as well as issues related to more extreme weather, certain raw materials, which require large amounts of water in extraction, are sourced in areas vulnerable to water shortages (e.g. Chile or Argentina).

Transition risks. Due to the profound changes needed to limit global warming to well below 2°C, transition risk affects all sectors. A widescale and quick shift to electrified / decarbonized solutions is necessary, which will entail a large demand for batteries (a transition opportunity for battery manufacturers). Nonetheless, battery producers face risks if this shift is slower than anticipated (e.g. car manufacturers missing electric vehicle targets), while raw material supply chains may be strained by rapid demand increases. The production of batteries typically entails high emissions, for example from heating and drying and the use of chemicals, while raw materials sourcing and production can also be very energy intensive. The production of anode materials, for example synthetic graphite and silicon, can be reliant upon fossil fuels (e.g. needle coke, pet coke, coke, and coal).

Environmental risks.

Local environmental problems associated with the production of batteries include air pollution, waste and wastewater, as well as potential biodiversity risks from the construction of facilities. Greater environmental risks are found in the supply chain, where the extraction and refining of battery raw materials, including cobalt, nickel, and lithium, comes with substantial environmental risks. This can include intensive water use and potential contamination, impacts on habitats (including deforestation) and biodiversity, air pollution, and land contamination.

¹ [Northvolt / Epiroc](#)

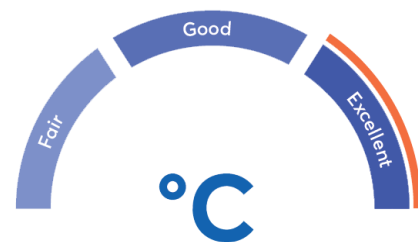


Governance assessment

Northvolt has a comprehensive and advanced sustainability strategy. Among other things, its time bound emissions target (10 kg CO₂e/kWh by 2030 on a cell level) covers Scope 1, 2, and 3 emissions and represents a 70% decrease from 2021 levels, and it can point to various approaches, projects, and investments that show a seriousness about reaching the target level. Northvolt moreover demonstrates a rigorous approach to environmental and social risks in its supply chain.

Northvolt's selection process is strong, with environmental competence in its green finance committee and consensus decision making. The green finance committee also reviews the overall environmental/sustainability profile of the project under consideration, based on assessments such as environmental impact assessments and lifecycle assessments.

Northvolt is committed to reporting on allocation and impact: it has specified relevant impact indicators in its framework, and will disclose impact calculation methodologies. It could improve its reporting commitments in several ways, by committing, for example, to report the share of battery outputs used in different applications (e.g. automotive and industrial), and to pro rate impacts based on its ownership share in joint ventures (e.g. in respect of its recycling joint venture) and proportion of projects financed by proceeds raised under the framework.



The overall assessment of Northvolt's governance structure and processes gives it a rating of **Excellent**.

Environmental strategies and policies

Northvolt calculates its emissions in accordance with the Greenhouse Gas Protocol and reports these in its annual sustainability report, prepared in accordance with the GRI Standards and TCFD recommendations. In 2021, Scope 1 emissions totaled 6,460 tCO₂e (primarily from fugitive emissions), Scope 2 emissions totaled 2,582 tCO₂e,² and Scope 3 emissions totaled 34,584 tCO₂e. The largest sources of Scope 3 emissions were purchased goods and services (around 72% of Scope 3 emissions), capital goods (around 8% of Scope 3 emissions), and upstream transportation and distribution (around 16% of Scope 3 emissions).

Northvolt's climate and environmental targets include:

- **100% fossil-free energy supply for production (rolling target).** In 2021, around 98% of its energy supply was from fossil-free sources, with residual fossil fuel use for facility heating (no direct fossil fuel use in production). In Europe, Northvolt utilizes guarantees of origin, though states it has a strategy to pursue power purchase agreements across its locations in the coming years. Northvolt calculates that using fossil-free energy in production reduces the lifecycle emissions of a battery by around 50%, while it also improves energy efficiency in production through, for example, layout and temperature optimization and digitalization.
- **10 kg CO₂e/kWh by 2030 on a cell level covering Scope 1, 2 and 3 emissions.** According to Northvolt, this is around 90% lower than the current industry average (98 kg CO₂e/kWh)³ and around 70% lower than its 2021 performance (33 kg CO₂e/kWh). As well as focusing on its production process, achieving

² Market-based: 546 tCO₂e; location-based: 1,982 tCO₂e.

³ Northvolt bases this on [Dai et al, Life Cycle Analysis of Lithium-Ion Batteries for Automotive Applications \(2019\)](#) and [Lithium-Ion Vehicle Battery Production \(ivl.se\)](#)



this target will require increased circularity and resource efficiency, and efforts to decarbonize its supply chain (see below). Northvolt does not utilize carbon offsetting.

- **50% recycled material in cells by 2030.** In 2021, Northvolt undertook a lifecycle assessment analysis on the benefits of using recycled materials in cell production, estimating that producing cathode active material with only recycled materials lowers emissions by 78% compared to the use of virgin raw materials.

Given its use of fossil-free energy in production, Northvolt calculates that, for a blended portfolio average of its cell models, around 94% of its total emissions are attributable to the materials it purchases. Of these materials, it has calculated that cathode materials account for around 50% of emissions, anode materials for around 20% of emissions, and chemicals for around 12% of emissions. As such, Northvolt acknowledges the need to work with its suppliers to improve the efficiency of its upstream activities. To this end, Northvolt's energy policy states that it will 'select suppliers and partners with precedence given to carbon intensity and energy efficiency criteria', while its sourcing and procurement policy states it will 'procure, where justifiable, goods, works and services that can demonstrate a lower overall (lifecycle) environmental impact'⁴ and that it will 'actively engage with suppliers to reduce environmental impacts for example by reviewing material specifications, packaging requirements, and transport channels'. A further element of its supply chain strategy is the relocation of suppliers to locations with cleaner grids (and shorter transport distances to its plants).

According to Northvolt, the production of graphite (natural and synthetic) used in cell material production represents a fairly large share of its Scope 3 emissions, and it is therefore working with graphite suppliers to develop graphite recycling and use of renewable energy in their production. The use of graphite also represents a fossil fuel linkage in Northvolt's supply chain: synthetic graphite is intrinsically dependent on the fossil fuel sector as it is produced from needle coke, which is obtained primarily as a byproduct from oil refining, with a smaller proportion of global supply coming from the coking of coal for blast-furnace steelmaking.⁵

Northvolt has various targets in respect of raw material sourcing (rolling targets). Firstly, 100% traceability to mine for raw materials; in 2021, 89% of its contracted raw material suppliers (excluding graphite) had traceable feed. Secondly, 100% of significant suppliers screened for sustainability risks; in 2021, 309 suppliers had been screened. Finally, 100% of significant suppliers accepting its supplier code of conduct.

The supplier code of conduct covers various labor and human rights risks, environmental issues (including the provision of emissions data), as well as a requirement for suppliers to conduct due diligence on their own supply chains. Northvolt's approach to raw material sourcing is set out in its sourcing and procurement policy, its supply chain sustainability due diligence manual, and its supply chain sustainability risk assessment procedure. A site visit will be undertaken in the case of a high- or very high-risk counterparty,⁶ as well as a gap analysis according to the IFC Performance Standards. For cobalt, lithium, nickel, and natural graphite (and compounds of these), due diligence is carried out in accordance with the (draft) EU Battery Regulation,⁷ which is required to be conducted using international instruments such as the OECD's Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.⁸ In early 2023, Northvolt introduced an updated risk assessment and due diligence - while each supplier is subject to screening, the type and level depends on the supplier's risk categorization.

⁴ By way of example, Northvolt points to its nickel supply agreement with Vale: [Vale / Northvolt](#)

⁵ [Mining.com - needle coke](#)

⁶ In 2021, two site visits and audits were conducted.

⁷ [Battery Regulation - Proposal](#)

⁸ [OECD - DD Guidance Minerals](#)



In its sustainability report, Northvolt includes a critical materials overview, where it sets out how it addresses key sustainability risks relating to materials such as cobalt, graphite, and lithium. In respect of cobalt, for example, for current long-term contracts for mass production, it does not currently source from the Democratic Republic of Congo, though it may start to do so if it can ensure this is done sustainably.

According to Northvolt, the majority of its batteries will be used in the automotive industry (exceeding 70%). It is currently producing only cells for battery-electric vehicles, and, though they are not excluded in the framework, states that it is not part of its strategy to produce batteries for hybrid vehicles, nor would this be realistically feasible given the technical specifications of its batteries and the investments necessary to do so. Northvolt's batteries will also be used in energy systems (e.g. in the regulation of renewable energy systems), and heavy industry (e.g. the electrification of mining and construction equipment).

Northvolt opened a pilot recycling plant at its Northvolt Labs site in Västerås in 2020, and used this to improve its recycling process. In 2021, it produced its first cathode material from 100% recycled nickel, manganese, and cobalt, and commissioned a recycling plant in Fredrikstad, Norway as part of its joint venture with Norwegian aluminum producer Hydro.⁹ This plant has the capacity to process 12,000 tons of battery packs per year. At the same time, Northvolt has begun to develop a recycling plant at its Northvolt Ett site, which will have the capacity to recycle 125,000 tons of battery material per year. Any battery grade cathode material will be re-used only by Northvolt.

According to the framework, Northvolt screens all its sites for physical risks, conducts risk and vulnerability assessments in relation to the identified risks, and prepares adaptation solution plans for each site. Two climate scenarios to 2050 are used in the screening (RCP 4.5 and RCP 8.5). Northvolt has carried out a preliminary assessment on the physical risk exposure of its supply chain, and requires suppliers to undertake physical risk screening, though it considers this an area for development going forward.

Green finance framework

Based on this review, this framework is found to be aligned with the Green Bond Principles and Green Loan Principles. For details on the issuer's framework, please refer to the green finance framework dated February 2023

Use of proceeds

For a description of the framework's use of proceeds criteria, and an assessment of the categories' environmental impacts and risks, please refer to section 2.

Selection

Northvolt has established a green finance committee, consisting of representatives from its finance, sustainability and treasury departments, a member of the business control team, and representatives from additional functions as required. The green finance committee will convene every six months or when otherwise considered necessary.

The selection process consists of two steps. Firstly, sustainability experts and representatives within Northvolt evaluate potential investments' compliance with the categories listed in the framework. Based on their analysis, such investments can be nominated for potential financing under the framework. Secondly, the green finance committee reviews the list of nominated investments and makes the final decision on the eligibility of the investments under the framework. In reviewing nominated investments, the green finance committee will also review the overall environmental/sustainability profile of the project, based on assessments such as environmental impact assessments and lifecycle assessments. The green finance committee's decisions are made by consensus.

⁹ [Hydrovolt](#)



Management of proceeds

Northvolt will use a green register to track the allocation of net proceeds to eligible projects under the framework. If there are unallocated proceeds under the framework, they will be temporarily placed in Northvolt's liquidity reserve. According to Northvolt, unallocated funds placed in its liquidity reserve will not be invested in a way that undermines the objectives of the framework.

Reporting

Until full allocation and in the event of material developments, Northvolt will report annually on allocation and impact. It only commits to public reporting for green bonds (for other instruments, it may report directly to lenders or counterparties). Reporting may be on an aggregate or per-project basis - currently, given Northvolt expects the number of projects to be limited, reporting on a per-project basis is more likely.

In respect of allocation, Northvolt will include the following information:

- Nominal value of outstanding debt under the framework
- Amounts allocated for each project category
- Share of financing and refinancing
- Descriptions of selected green projects

Where feasible and subject to data availability, Northvolt will report on the impact of its share of each project. The metrics listed in the framework are:

- GWh of installed battery cell production capacity
- GWh of installed battery module and system production capacity
- Tons of recycled battery material produced in Northvolt's Revolt process
- Kg CO₂e/kWh battery cell produced (Scope 1, 2 and 3 emissions)

The report will, to the extent feasible, include a section on the methodology used for impact calculations. An independent third party will, until full allocation and in the event of material development, on an annual basis provide a review confirming that an amount equal to the net proceeds has been allocated to eligible projects under the framework. We understand that reported impacts will not be independently reviewed or verified.



2 Assessment of Northvolt's green finance framework

The eligible projects under Northvolt's green finance framework are shaded based on their environmental impacts and risks, based on the "Shades of Green" methodology.



Shading of eligible projects under Northvolt's green finance framework

- Proceeds under the framework will finance or refinance investments undertaken by Northvolt, its subsidiaries,¹⁰ or its share of joint ventures, which align with the eligible project types in the framework. According to Northvolt, as a general principle, it only enters into joint ventures that align with its mission 'to build the world's greenest battery'. It is not required to be a majority owner of joint ventures,¹¹ however, in such cases it pursues safeguards such as veto rights or board position(s) to ensure alignment with its policies.
- Northvolt defines financing as allocated amounts to projects financed within the reporting year, and refinancing as allocated amounts to projects financed prior to the reporting year. Northvolt expects around 25% refinancing. Northvolt has not indicated the expected look-back period for refinancing.
- Northvolt expects around 90% of proceeds under the framework to be allocated to the production of battery cells and the production of cathode active material.
- Though projects outside of the European Union are possible, Northvolt expects most investments under the framework will be in the European Union.
- The framework excludes allocating proceeds to projects for which the purpose is fossil fuel energy production, weapons and defence, gambling or tobacco.

¹⁰ According to Northvolt, its policies apply directly to all subsidiaries. Northvolt's targets are only applicable on a group level, however many targets will require alignment of subsidiaries (e.g. use of fossil free energy).

¹¹ See e.g. its 50/50 joint ventures with Volvo and Norsk Hydro: [NOVO Energy](#), [Hydrovolt](#).



Category	Eligible project types	Green Shading and considerations
Manufacture of batteries contributing to climate change mitigation  	<ul style="list-style-type: none"> - Production of battery cells - Production of battery systems - Production of cathode active material - Recycling of end-of-life batteries - Research and development and supporting projects 	<p>Medium Green to Dark Green</p> <ul style="list-style-type: none"> ✓ The shading reflects the contribution of Northvolt’s batteries to electrification and the functioning of energy systems, its efforts to minimize emissions, and emphasis on circularity through investments in battery recycling, while also considering fossil fuel linkages and mining impacts in Northvolt’s supply chain, and potential contribution to adverse environmental impacts depending on the end-use (electric mining vehicles, in particular). ✓ According to Northvolt, the majority of its batteries will be used in the automotive industry (exceeding 70%). It is currently producing only cells for battery-electric vehicles, and, though they are not excluded in the framework, states that it is not part of its strategy to produce batteries for hybrid vehicles, nor would this be realistically feasible given the technical specifications of its batteries and the investments necessary to do so. Other end-uses include use in energy systems (e.g. in the regulation of renewable energy systems), and heavy industry (e.g. the electrification of mining and construction equipment). ✓ According to Northvolt’s analysis, the lifecycle emissions of its batteries are currently less than one-third of the industry average, with a target to be around 90% lower than the current industry average by 2030. The most significant factor is its use of renewable energy in production (98% in 2021). For this, Northvolt utilizes guarantees of origin - note that guarantees of origin do not influence the emissions from electricity actually delivered - but it is also looking into PPAs and ways to green the electricity actually delivered. ✓ Northvolt calculates that, for a blended portfolio average of its cell models, around 94% of its total emissions are attributable to the materials it purchases. Northvolt



has several strategies and approaches to reduce these emissions, for example procuring materials with lower lifecycle impacts, working with suppliers to increase renewable energy use, and relocation of suppliers to cleaner grids. Synthetic graphite, a key material in Northvolt's supply chain, depends on fossil fuel-based inputs; sourcing this provides indirect support for fossil fuel sectors.

- ✓ Mining of lithium, cobalt and other raw materials required to produce batteries can have substantial adverse environmental and social impacts; while Northvolt has comprehensive policies and approaches in these respects, such risks are difficult to manage and will likely exacerbate as the demand for such materials continues to increase. Raw material supply chains are also exposed to physical climate risk, magnified by e.g. a need for large amounts of water in mining and processing.
- ✓ Increasing the use of recycled materials will help to address supply chain risks highlighted above, while modeling indicates that closed-loop recycling will play a minor but increasingly important role in the supply of battery materials between now and 2050. According to Northvolt, it will utilize any battery-grade materials recovered itself.
- ✓ Battery recycling is itself energy intensive and can use materials with high embodied emissions such as chemicals. Northvolt has undertaken a lifecycle analysis of its recycling process, which shows significant reduced environmental impact potentials of its process compared to virgin raw material use, while its two planned recycling facilities will be powered by renewable energy. Furthermore, Northvolt can also point to efforts to increase the recyclability of its batteries (e.g. developing guidelines for system design to allow for easier disassembly and recyclability), while its battery joint-venture has set a target to reduce emissions from recycling by around 60% by 2030.

Table 1. Eligible project categories



EU Taxonomy

The EU Taxonomy Regulation is a classification system setting criteria for economic activities to be defined as environmentally sustainable.¹² The regulation defines six environmental objectives. To be considered sustainable, an activity must substantially contribute to at least one of the six environmental objectives without harming the other objectives (“Do No Significant Harm”), while complying with minimum social safeguards.^{13,14}

CICERO Shades of Green considers the EU Taxonomy activity 3.4 – Manufacture of batteries to relate to Northvolt’s framework. CICERO Shades of Green assesses that the framework activities are likely aligned with the relevant mitigation and Do No Significant Harm criteria, see Appendix 2.

Minimum social safeguards

To qualify as a sustainable activity under the EU regulation certain minimum social safeguards must be complied with. CICERO Shades of Green has assessed the company’s social safeguards with a focus on human and labor rights. We take the sectoral, regional, and judicial context into account and focus on the risks likely to be the most material social risks.

CICERO Shades of Green considers that Northvolt likely fulfils the requirements in the EU Taxonomy’s minimum social safeguards. Northvolt has policies referring to the requirements of the OECD Guidelines for employees, suppliers, and business partners, and a separate policy setting out requirements for social issues in procurement. Northvolt undertakes risk assessments to identify the most salient risks linked to its activities, including its supply chain, and emphasizes risks related to its dependence on minerals and metals. There are particular risks related to the extraction of cobalt, and Northvolt has several policies and processes to mitigate these (e.g. the pre-screening of potential suppliers, where it requires transparency down to mine level). Northvolt reports on social risks, measures, and results on an annual basis in its sustainability report.

¹² Regulation EU 2020/852 <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN>

¹³ The six environmental objectives as defined in the proposed Regulation are: (1) climate change mitigation; (2) climate change adaptation; (3) sustainable use and protection of water and marine resources; (4) transition to a circular economy, waste prevention and recycling; (5) pollution prevention and control; (6) protection of healthy ecosystems.

¹⁴ Alignment with the OECD Guidelines for Multinational Enterprises and UN Guiding Principles on Business and Human Rights, including the International Labour Organisation’s (‘ILO’) declaration on Fundamental Rights and Principles at Work, the eight ILO core conventions and the International Bill of Human Rights.









3 Terms and methodology

This note provides CICERO Shades of Green’s second opinion of the client’s framework dated February 2023. 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 Shades of 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.

‘Shades of Green’ methodology

CICERO Shades of 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:

Shading	Examples
 Dark Green is allocated to projects and solutions that correspond to the long-term vision of a low-carbon and climate resilient future.	 Solar power plants
 Medium Green is allocated to projects and solutions that represent significant steps towards the long-term vision but are not quite there yet.	 Energy efficient buildings
 Light Green is allocated to transition activities that do not lock in emissions. These projects reduce emissions or have other environmental benefits in the near term rather than representing low carbon and climate resilient long-term solutions.	 Hybrid road vehicles

The “Shades of Green” methodology considers the strengths, weaknesses and pitfalls of the project categories and their criteria. 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, including potential macro-level impacts of investment projects.

Sound governance and transparency processes facilitate delivery of the client’s climate and environmental ambitions laid out in the framework. Hence, key governance aspects that can influence the implementation of the green bond are carefully considered and reflected in the overall shading. CICERO Shades of 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. Please note this is not a substitute for a full evaluation of the governance of the issuing institution, and does not cover, e.g., corruption.



Assessment of alignment with Green Bond Principles

CICERO Shades of Green assesses alignment with the International Capital Markets' Association's (ICMA) Green Bond Principles. We review whether the framework is in line with the four core components of the GBP (use of proceeds, selection, management of proceeds and reporting). We assess whether project categories have clear environmental benefits with defined eligibility criteria. The Green Bonds Principles (GBP) state that the "overall environmental profile" of a project should be assessed. The selection process is a key governance factor to consider in CICERO Shads of Green's assessment. CICERO Shades of Green typically looks at how climate and environmental considerations are considered when evaluating whether projects can qualify for green finance funding. The broader the project categories, the more importance CICERO Shades of Green places on the selection process. CICERO Shades of Green assesses whether net proceeds or an equivalent amount are tracked by the issuer in an appropriate manner and provides transparency on the intended types of temporary placement for unallocated proceeds. Transparency, reporting, and verification of impacts are key to enable investors to follow the implementation of green finance programs.

EU taxonomy assessment

CICERO Shades of Green has assessed the activities against the EU Taxonomy's technical screening criteria, including the do-no-significant-harm (DNSH) criteria. In addition, we have assessed alignment with the minimum social safeguards, as described in article 18 of the EU taxonomy. To assess activities' taxonomy alignment, CICERO Green has reviewed the issuer's green finance framework, other supporting documents provided by the issuer, and written responses to questions on each asset's taxonomy alignment.



Appendix 1: Referenced Documents List

Document Number	Document Name	Description
1	Green Finance Framework (dated February 2023)	
2	Sustainability Report (2021)	
3	Anti-Corruption Policy (2021)	
4	Business Partner Policy (2021)	
5	Code of Conduct (2022)	
6	Energy Policy (2022)	
7	Environmental Policy (2020)	
8	Northvolt Sustainability Goals (undated)	
9	LCA review produced by Sweco (2021)	



10 Sourcing and Procurement Policy (2020)

11 Supplier Code of Conduct (2021)

12 Supply Chain Sustainability Risk Assessment
Procedure (2022)

13 Supply Chain Sustainability Due Diligence Manual
(2022)

14 Work Environment Policy (2020)



Appendix 2: EU Taxonomy criteria and alignment

Complete details of the EU taxonomy criteria are given in [taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf \(europa.eu\)](https://eur-lex.europa.eu/eli/reg/2021/2800/annex_1_en.pdf)

Manufacture of batteries

Framework activity	Manufacture of batteries contributing to climate change mitigation		
Taxonomy activity	3.4 - Manufacture of batteries (NACE codes C27.2 and E38.32)		
	EU Technical mitigation criteria	Comments on alignment	CICERO Green's comments on alignment
Mitigation criteria	<p>The economic activity manufactures rechargeable batteries, battery packs and accumulators (and their respective components), including from secondary raw materials, that result in substantial GHG emission reductions in transport, stationary and off-grid energy storage and other industrial applications.</p> <p>The economic activity recycles end-of-life batteries.</p>	<p><u>Contextual information</u></p> <p>Under the framework, proceeds can be used for both the manufacturing and recycling of batteries.</p> <p><u>Information provided by the issuer</u></p> <p>Northvolt manufactures battery cells and battery systems that aim to both have the lowest possible carbon footprint and serve as an enabling technology for GHG emission reductions in other sectors. The majority of its batteries are delivered to the automotive industry for integration into electric vehicles (EVs), but it also delivers to clients in the energy and industrial sectors.</p> <p>Northvolt also recycles end-of-life batteries through Revolt. Revolt started as an in-house program for recycling and developed into a pilot recycling plant at Northvolt Labs dedicated to developing and refining the recycling process.</p> <p>It is now establishing industrial-scale recycling capacities in parallel to its battery manufacturing capacity – Hydrovolt in Norway and Revolt Ett recycling plant alongside the Northvolt Ett gigafactory in Sweden. Fully built, Revolt Ett will recycle some 125,000 tons of battery materials per year, including production scrap from its neighbouring facility. The facility is by far the largest recycling plant of its type in Europe, recovering metals</p>	<p>Likely aligned.</p>



		such as nickel, cobalt, manganese and lithium, and will ultimately be able to provide Northvolt Ett with 50% of its raw materials for cathode production.	
	EU Taxonomy DNSH-criteria	Comments on alignment	Alignment
Climate change adaptation	<p>The physical climate risks that are material to the activity have been identified (chronic and acute, related to temperature, wind, water, and soil) by performing a robust climate risk and vulnerability assessment with the following steps:</p> <ul style="list-style-type: none"> a) screening of the activity to identify which physical climate risks from the list in Section II of this Appendix may affect the performance of the economic activity during its expected lifetime; b) where the activity is assessed to be exposed to physical climate risks, a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity; c) an assessment of adaptation solutions that can reduce the identified physical climate risk. <p>The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that:</p> <ul style="list-style-type: none"> (a) for activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale; (b) for all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios consistent with the expected lifetime of the activity, including, at least, 10 to 30 year climate projections scenarios for major investments. <p>The climate projections and assessment of impacts are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change reports, scientific peer-reviewed publications, and open source or paying models.</p>	<p><u>Information provided by the issuer</u></p> <p>Northvolt has screened all its sites for physical climate risks and conducted a risk and vulnerability assessment in relation to the identified risks. Northvolt currently utilizes two climate scenarios to 2050 in its screenings (RCP 4.5 and RCP 8.5). Adaptation solutions have been assessed in the environmental permit process and in the Environmental Impact Assessment (EIA) for each site to understand the measures already taken. In addition, adaptation solution plans have been prepared for each site. Adaptation solutions have been implemented for identified high and medium risks.</p>	<p>Likely aligned.</p>



	<p>For existing activities and new activities using existing physical assets, the economic operator implements physical and non-physical solutions ('adaptation solutions'), over a period of time of up to five years, that reduce the most important identified physical climate risks that are material to that activity. An adaptation plan for the implementation of those solutions is drawn up accordingly.</p> <p>For new activities and existing activities using newly built physical assets, the economic operator integrates the adaptation solutions that reduce the most important identified physical climate risks that are material to that activity at the time of design and construction and has implemented them before the start of operations.</p> <p>The adaptation solutions implemented do not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of cultural heritage, of assets and of other economic activities; are consistent with local, sectoral, regional or national adaptation strategies and plans; and consider the use of nature-based solutions or rely on blue or green infrastructure to the extent possible.</p>		
<p>Sustainable use and protection of water and marine resource</p>	<p>Environmental degradation risks related to preserving water quality and avoiding water stress are identified and addressed with the aim of achieving good water status and good ecological potential as defined in Article 2, points (22) and (23), of Regulation (EU) 2020/852, in accordance with Directive 2000/60/EC of the European Parliament and of the Council and a water use and protection management plan, developed thereunder for the potentially affected water body or bodies, in consultation with relevant stakeholders.</p> <p>Where an Environmental Impact Assessment is carried out in accordance with Directive 2011/92/EU of the European Parliament and of the Council and includes an assessment of the impact on water in accordance with Directive 2000/60/EC, no additional assessment of impact on water is required, provided the risks identified have been addressed.</p>	<p><u>Information provided by the issuer</u></p> <p>The discharge of water is one of the environmental aspects covered in the EIA (carried out in accordance with national law and Directive 2011/92/EU) when applying for a new or updated environmental permit to the authorities. In cases where EIAs are not required (i.e. for its office buildings), Northvolt always conducts a separate water impact assessment except in cases where it is not relevant.</p>	<p>Likely aligned.</p>
<p>Transition to a circular economy</p>	<p>For manufacturing of new batteries, components and materials, the activity assesses the availability of and, where feasible, adopts techniques that support:</p> <p>(a) reuse and use of secondary raw materials and reused components in products manufactured;</p>	<p><u>Information provided by the issuer</u></p> <p>Scaling battery recycling in parallel to the ramp-up of battery manufacturing capacity is at the core of Northvolt's strategy and it applies the following approach to align with the criteria to the left:</p>	<p>Likely aligned.</p>



	<p>(b) design for high durability, recyclability, easy disassembly and adaptability of products manufactured; (c) information on and traceability of substances of concern throughout the life cycle of the manufactured products.</p> <p>Recycling processes meet the conditions set out in Article 12 of Directive 2006/66/EC of the European Parliament and of the Council and in Annex III, Part B, to that Directive, including the use of the latest relevant Best Available Techniques, the achievement of the efficiencies specified for lead-acid batteries, nickel-cadmium batteries and for other chemistries. These processes ensure the recycling of the metal content to the highest degree that is technically feasible while avoiding excessive costs.</p> <p>Where applicable, facilities carrying out recycling processes meet the requirements laid down in Directive 2010/75/EU of the European Parliament and of the Council.</p>	<p>a) Northvolt runs an in-house program focused on developing and refining the battery recycling process based around hydrometallurgy and is in the process of establishing industrial-scale recycling capacities. These initiatives are key in order to reach the target to source 50% of the metals for battery cell production from recycling by 2030;</p> <p>b) Northvolt’s product development and design process ensures that its products have a high durability, recyclability, and are easy to disassemble and adapt. Furthermore, Northvolt works cross-functionally with its recycling team and external suppliers to continuously improve the recyclability of products;</p> <p>c) Northvolt is required to declare chemical substances, materials and components used in products in international data systems for its customers to meet their obligations. In addition, it has a target of 100% traceability of raw materials and all suppliers are screened for sustainability risks.</p> <p>As for compliance with the referenced EU directives, these are integrated into the national laws and regulations that Northvolt’s production and operations need to comply with.</p>	
<p>Pollution prevention and control</p>	<p>The activity does not lead to the manufacture, placing on the market or use of:</p> <p>(a) substances, whether on their own, in mixtures or in articles, listed in Annexes I or II to Regulation (EU) 2019/1021 of the European Parliament and of the Council, except in the case of substances present as an unintentional trace contaminant;</p> <p>(b) mercury and mercury compounds, their mixtures and mercury-added products as defined in Article 2 of Regulation (EU) 2017/852 of the European Parliament and of the Council;</p> <p>(c) substances, whether on their own, in mixture or in articles, listed in Annexes I or II to Regulation (EC) No 1005/2009 of the European Parliament and of the Council;</p>	<p><u>Information provided by the issuer</u></p> <p>Northvolt complies with all European directives and regulations relevant to pollution, prevention, and control criteria, including national laws applicable for manufacture and placing batteries on the European market. It continuously monitors the regulatory list of chemicals that are part of the relevant EU regulations and has guidelines in place outlining chemicals that are restricted, prohibited or to be avoided where possible within its operations.</p> <p>Relevant stakeholders are expected to comply with these as well, together with all relevant national/international legislations, and compliance is monitored through a supplier portal. Lastly, all introductions of new chemicals</p>	<p>Likely aligned.</p>



	<p>(d) substances, whether on their own, in mixtures or in an articles, listed in Annex II to Directive 2011/65/EU of the European Parliament and of the Council, except where there is full compliance with Article 4(1) of that Directive;</p> <p>(e) substances, whether on their own, in mixtures or in an article, listed in Annex XVII to Regulation (EC) 1907/2006 of the European Parliament and of the Council, except where there is full compliance with the conditions specified in that Annex;</p> <p>(f) substances, whether on their own, in mixtures or in an article, meeting the criteria laid down in Article 57 of Regulation (EC) 1907/2006 and identified in accordance with Article 59(1) of that Regulation, except where their use has been proven to be essential for the society;</p> <p>(g) other substances, whether on their own, in mixtures or in an article, that meet the criteria laid down in Article 57 of Regulation (EC) 1907/2006, except where their use has been proven to be essential for the society.</p>	<p>in the production require approval from the local Chemical Committee, and it continuously monitors emissions and reports environmental performance to the national authorities.</p>	
<p>Protection and restoration of biodiversity and ecosystems</p>	<ul style="list-style-type: none"> • An Environmental Impact Assessment (EIA) or screening has been completed in accordance with Directive 2011/92/EU, or in accordance with national provisions. • Where an EIA has been carried out, the required mitigation and compensation measures for protecting the environment are implemented. • For sites/operations located in or near biodiversity-sensitive areas (including the Natura 2000 network of protected areas, UNESCO World Heritage sites and Key Biodiversity Areas, as well as other protected areas), an appropriate assessment, where applicable, has been conducted and based on its conclusions the necessary mitigation measures are implemented. 	<p><u>Information provided by the issuer</u></p> <p>Northvolt conducts EIAs for the sites where this is required by the EU or local regulation. EIAs cover the assessment of direct and indirect environmental impacts of a planned activity, including on biodiversity and ecosystems, and set out compensation measures to be implemented if needed.</p>	<p>Likely aligned.</p>



Appendix 3: About CICERO Shades of Green

CICERO Shades of Green, now a part of S&P Global, provides independent, research-based second party opinions (SPOs) of green financing frameworks as well as climate risk and impact reporting reviews of companies. At the heart of all our SPOs is the multi-award-winning Shades of Green methodology, which assigns shadings to investments and activities to reflect the extent to which they contribute to the transition to a low carbon and climate resilient future.

CICERO Shades of Green is internationally recognized as a leading provider of independent reviews of green bonds, since the market's inception in 2008. CICERO Shades of 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 Shades of Green operates independently from the financial sector and other stakeholders to preserve the unbiased nature and high quality of second opinions

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- ★ **2021 Largest External Reviewer**, Climate Bonds Initiative Awards
 - ★ **2020 External Assessment Provider Of The Year**, Environmental Finance Green Bond Awards
 - ★ **2020 Largest External Review Provider In Number Of Deals**, Climate Bonds Initiative Awards
 - ★ **2019 External Assessment Provider Of The Year**, Environmental Finance Green Bond Awards
 - ★ **2019 Largest Green Bond SPO Provider**, Climate Bonds Initiative Awards
 - ★ **2018 External Assessment Provider Of The Year**, Environmental Finance Green Bond Awards
 - ★ **2018 Largest External Reviewer**, Climate Bonds Initiative Awards
 - ★ **2017 Best External Assessment Provider**, Environmental Finance Green Bond Awards
 - ★ **2016 Most Second Opinions**, Climate Bonds Initiative Awards