



LARGO

Climate Report 2022

Aligned to the Taskforce on Climate-related
Financial Disclosures (TCFD)

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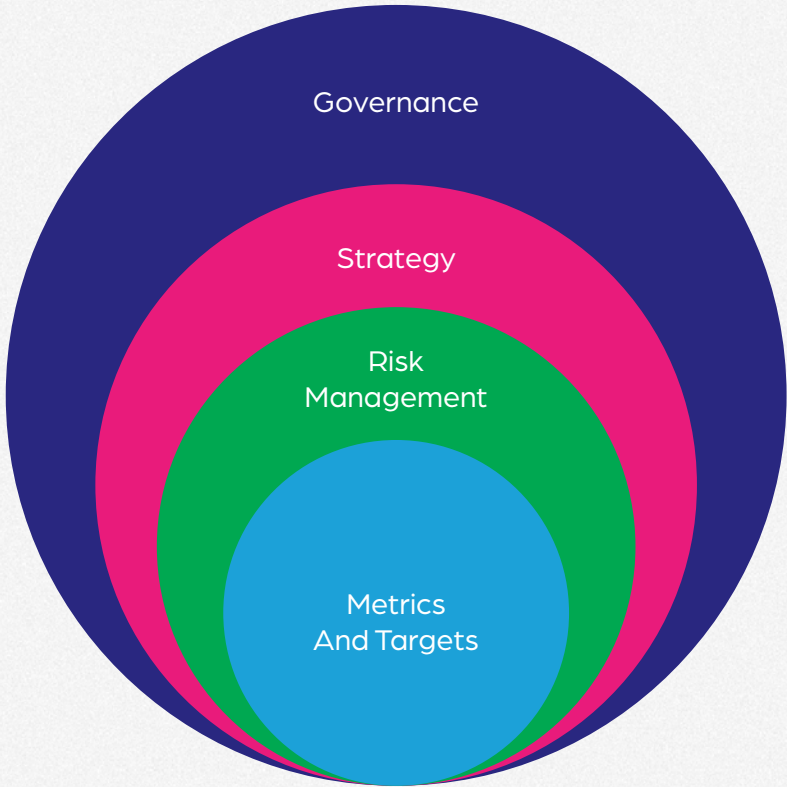
About This Report

This is Largo Inc.'s (Largo) second Climate Report, aligned with the Taskforce on Climate-related Financial Disclosures (TCFD).

Being transparent about our approach to climate change is part of our vision to enable the planet's transition to a low-carbon future using vanadium products.

All Largo's operational units are discussed in the [Governance](#), [Strategy](#) and [Risk Management](#) sections. We present full metrics for our Largo Vanádio de Maracás S.A. (LVMSA) operation in Brazil. This unit represents over 85% of Largo's employees and is our only mining and processing operation. We are pleased to present selected metrics for Largo Clean Energy (LCE) for the first time, as well as reporting on an increased number of Scope 3 categories, consolidated for Largo Inc.

Core Elements of the TCFD Recommendations



Other Relevant Reports



2022 Sustainability Report (including GRI and SASB disclosures)



2022 ESG Data



2022 Annual Information Form

Vanadium produced by Largo – A Part of the Climate Change Solution

Vanadium is a key transition metal used in greener steel and energy storage applications. Approximately 90% of vanadium currently produced is used as an alloy to strengthen steel, most predominantly in reinforcing bars for infrastructure projects. The use of vanadium-bearing high-strength steel allows for the use of less steel, which can reduce the carbon footprint of an entire infrastructure project.

Largo is proud to produce vanadium products since 2014, supporting the world's transition to a low-carbon future.





In the renewable energy industry, wind turbine towers are lighter and more weldable when a vanadium micro-alloyed steel plate is used. In addition to strength, vanadium imparts steel with toughness, wear resistance, and inhibits corrosion and oxidation. It is estimated that between 141.7 and 225.2 million tonnes of carbon dioxide (CO₂) emissions were prevented worldwide in 2019 due to vanadium micro-alloyed reinforcement bars in construction.¹

Largo has a long and successful history as one of the world's preferred vanadium suppliers. Largo's high-purity products are extracted and processed at its Maracás Menchen Mine in Bahia, Brazil, the only vanadium mine in South America.

As the world continues to experience the effects of climate change, from extreme heat waves to wildfires to devastating floods, the aim of the 2015 Paris Accord becomes ever more urgent. All the countries where Largo currently operates or has offices in are signatories to the accord. This includes Brazil, Canada, Ireland, Switzerland and the USA. Largo is doing its part, both as a major supplier of vanadium, and in its efforts to lower its greenhouse gas emissions (GHG).

To reduce GHG emissions and to limit the global temperature increase in this century to 1.5°C, there is a need to reduce the use of fossil fuels and increase the use of renewable sources of energy. Long-duration energy storage (LDES) will synchronize intermittent renewable electricity generation with its use to enable a better regulation of supply and demand. Vanadium redox flow batteries (VRFB) are expected to play a pivotal role in this emerging market, with vanadium being a preferred electrolyte due to its stability.³ The role of battery storage in the clean energy transition is recognized by the International Energy Agency (IEA), and included as one of the technologies analyzed along with critical minerals.⁴

Largo produces about 7% of the global vanadium primary supply and is one of only two large-scale producers of high-purity vanadium that supply the aerospace industry.

Vanadium is one of 37 critical minerals required for clean energy transitions across the International Energy Agency's (IEA) scenarios.²

Governance

IN THIS SECTION

Climate Related Responsibilities >

Decarbonization Working Group – LVMSA (Brazil) >



Largo’s Board of Directors (Board) believe that sound corporate governance practices are essential to the stewardship of Largo, ensuring that it adheres to high ethical and legal standards.

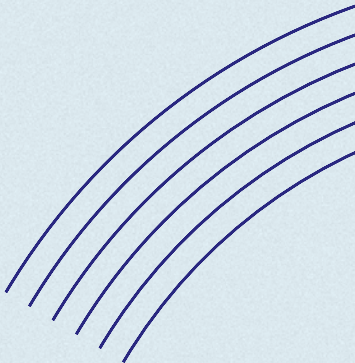
In 2022, the Board updated its committees’ charters, clarifying its oversight of climate change and Environmental, Social and Governance (ESG) issues.

Climate-related Responsibilities at the Executive and Board Level

Board	The Board is involved in Largo’s strategic planning process and has overall responsibility for establishing the Company’s climate-related commitments and objectives and for monitoring progress against them. The Board is involved in reviewing and approving major business opportunities related to climate change, including any expected expansions and/or potential mergers and acquisitions. The Board promotes and encourages fair and transparent disclosure to investors and other stakeholders through appropriate and practical systems of corporate governance and internal controls. It receives information from executive management and maintains an open communications channel with members of Largo’s senior management team.
Governance Committee	The Governance Committee is responsible for reviewing and discussing with management Largo’s climate-related risk exposures and the steps management has taken to monitor and address such exposures. The Committee will report to the Board on its oversight of such risk exposures.
Audit Committee	The Audit Committee reviews the integration of climate-related risks into the Company’s Enterprise Risk Management (ERM) program.
Operations Committee (LVMSA)	The Operations Committee oversees health and safety, environmental and social goals and their performance concerning Largo’s mining and processing operations, reviewing and discussing with management any potential issues and the steps it is taking to address such issues.
Clean Energy Committee (LCE)	The Clean Energy Committee oversees Largo’s clean energy initiatives, including business opportunities, direction, principal business risks, and overseeing the implementation of appropriate systems to manage these risks.
CEO, CFO, CCO, COO, (LVMSA), President (LCE)	The executive team is responsible for implementing the Largo’s ERM program and ensuring that identified risk owners are held accountable for the development and implementation of their respective risk management action plans (RMAPs), including climate-related risks. The executive team is responsible for implementation of the Company’s strategy which includes climate-related opportunities such as Largo Clean Energy’s business initiatives. In addition, each operation is responsible for the management and control of its own risk registers such as for health and safety, or project related.



In 2023, LVMSA formalized its Decarbonization Working Group, **providing strategic coordination and integration of projects that lead to reduced GHG emissions**, through increased energy efficiency, different technologies or the use of cleaner fuels.



Decarbonization Working Group – LVMSA (Brazil)

Chief Operating Officer (COO)	The COO is responsible for providing updates to the executive leadership every quarter, integrated within Production Reports.
Sustainability Manager	The Sustainability Manager is responsible for leading the working group, consolidating progress reports.
Process Manager	The Process Manager is responsible for the mineral processing equipment (e.g. rotary kiln and furnaces), which generate a large percentage of Largo’s GHG emissions. The process management team is responsible for investigating the availability and possibility of using cleaner fossil fuels or other energy sources that meet the technical calorific requirements of each process.
Maintenance Manager	The Maintenance Manager is responsible for the maintenance and efficiency of the operational equipment (excluding mineral processing equipment), including upgrades that result in lower GHG emissions.
R&D Manager	The R&D Manager is responsible for identifying operational improvement opportunities and for managing development projects, including decarbonization projects.
Environment Coordinator	The Environment Coordinator is responsible for the calculation of the GHG Inventory, and implementation of internal controls.
ESG Sr. Analyst	The Sr. Analyst is responsible for quarterly follow-up and reporting of the decarbonization projects.

Strategy

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Business model and value chain

Largo is a commodity producer with limited vertical integration in its value chain. The business activities performed by its subsidiaries include mineral exploration, mine and ore processing operations, research and development, patented vanadium battery technology, a vanadium holding company and sales offices in the USA, Ireland and Switzerland.

Largo's subsidiary Largo Vanádio de Maracás S.A. (LVMSA) is responsible for all mining and ore processing activities that take place at the Maracás Menchen Mine in the state of Bahia, Brazil. As of December 31, 2022, LVMSA employed approximately 500 full-time employees and around 1,000 contractors on site. The number of contractors varies depending on the on-going projects.

LVMSA's suppliers provide a range of products such as chemical products for vanadium processing, fossil fuels and electricity, packing materials (drums and bags), uniforms, personal protective equipment, etc. LVMSA also contracts many services (on site and off site) such as drilling, open-pit mining and transportation of ore and rock waste, transportation of employees, major maintenance, construction, engineering and environmental services. Supporting services include: restaurant, security and financial such as health plan and meal benefits. All Tier 1 suppliers are located in Brazil. A preliminary internal review of their climate-related risk exposures did not identify any significant vulnerabilities in the short-term.



Products are sold and transported directly to customers in Brazil or transferred to Largo’s sales and marketing subsidiaries and sold and/or transported to customers worldwide.

Largo’s main products and industry sectors are:

- 1) Vanadium pentoxide (V_2O_5) that is converted into ferrovanadium (FeV) and used in high-strength steels which are widely used in construction reinforcing bars (rebars) for buildings, tunnels, bridges, wind turbines etc.
- 2) High-purity vanadium pentoxide (V_2O_5) and vanadium trioxide (V_2O_3) that is used in master alloys, which are irreplaceable in aerospace applications, such as jet engines and high-speed airframes. Largo is one of only two large-scale high purity vanadium producers in the world.

Largo’s subsidiary Largo Clean Energy (LCE) is responsible for the development of vanadium redox flow batteries (VRFB) which are ideally suited for long-duration energy storage (LDES) applications. The electrolyte used in VRFBs never degrades, offering a recyclable and long-term solution for renewable energy partners. LCE operates a light industrial manufacturing facility in Massachusetts, USA with approximately 50 employees.

As described above and in the [Vanadium produced by Largo – A Part of the Climate Change Solution](#) section, our products reduce the carbon footprint for high-strength steels, which are a key component of the transition to a low carbon future. It is expected that our clients’ exposure to climate-related risks could be balanced by the continued demand for greener steel to be used in infrastructure renewal.

Timeframes

Timeframes for evaluating business risks are typically very short compared to climate change horizons. Largo has defined the following timeframes according to the life of its main assets, the sectors and the geographies in which it operates, which in turn, influence Largo’s climate-related risk profiles.

Largo’s main, immovable, asset is the Maracás Menchen Mine located in the northeastern part of Brazil, in a semi-arid climate. It is the asset with the highest exposure to physical risks, both acute and chronic.

Largo Clean Energy (LCE) operates from a light industrial facility in Wilmington, MA, USA. A lower level of physical risks is associated with this facility, as the activities are not bound by any specific geographies.

Largo’s Climate-Change Timeframes

Term	Years	Rationale
Short	1 to 5	Largo is observing acute physical risks related to its operations in Brazil. In addition, Largo has started pursuing opportunities related to climate change that are evolving in this period.
Medium	5 to 20	The current Maracás Menchen Mine life of mine is 20 years and Largo could experience chronic physical risks in this period. ⁵
Long	Over 20	Largo will no longer be exposed to climate change risks related to operating the mine. There may be risks associated with the mine site rehabilitation and maintenance. After the mine closure, Largo’s main GHG emissions will be significantly reduced as these sources will be decommissioned.

Financial Impact Levels

Largo is implementing an Enterprise Risk Management (ERM) program, using the following impact financial impact levels. More details are provided in the [Risk Management](#) section.

Financial impact Levels Used In The ERM Prioritization Process

Levels	Impact (CAD/US \$ thousands)
Catastrophic	above 10,000
Major	4,000 – 10,000
Moderate	400 – 4,000
Minor	40 – 400
Insignificant	4 – 40

Risks

Largo has evaluated business activities and operating locations for physical and transition risks that could reasonably be expected to have a significant financial impact in the short to medium term.

PHYSICAL RISKS

At this time, two physical risks emerged as top climate-change risks for Largo.

Top Climate-Related Physical Risks

Physical risk	Subsidiary and business activity location	Time horizon	Risk description	Amount and percentage of assets or business activities vulnerable to climate-related physical risks;	Potential financial Impact
Acute	LVMSA, NE Brazil	Short to medium	Changes in rain precipitation volume, leading to flooding and associated damage	One operational site, 100% of mining and processing activities	Reduced production capacity, impacting significant majority of revenues
Chronic	LVMSA, NE Brazil	Medium	Increased heat and drought duration leading to water shortage	One operational site, 100% of mining and processing activities	Reduced production capacity, impacting significant majority of revenues



Changes in Rain Precipitation Patterns and Volume

Increased precipitation can pose a direct and indirect risk to Largo’s mining operations. Directly as higher than usual volumes in shorter time could lead to water accumulating in Largo’s tailings facilities at a higher rate than typical. In addition, changes in the elevation of the water table and/or volume of water in the drainage system can lead to water flooding in the open pit at a higher rate than it can be pumped out.

Severe rain storms also typically create power shortages and cause damage to roads. The main road from Maracás to the Maracás Menchen Mine is used daily for the transportation of employees, on-site service providers, supplies and finished products. Any damage to the road would create a temporary logistical and financial impact. This type of risk could potentially affect Largo’s supply chain in different parts of the country and interationally as well.



The Maracás Menchen Mine has experienced a change in precipitation volume in the past two rain seasons. This type of event has the potential to lead to reduced capacity or production interruptions, such as the approximately 16 days of operational downtime experienced in December 2022 and January 2023. Risk mitigations are discussed in the [Risk Management](#) section.

At this point, any adverse impact on vanadium production from Largo’s operations in Brazil could have a significant financial impact on Largo, as it represents a significant majority of Largo’s revenues.

Rain Accumulation

2013–2022

Millimetres (mm)



Increase in Temperature and Potential for Droughts

An increase in temperature and the potential for drought directly and indirectly pose risks to Largo’s mining operations. Increases in temperature could potentially cause heat stress on workers, as well as impact equipment performance. Wildfires would be a threat to both workers, installations and the local biome.

Largo withdraws water from the Pedra Reservoir for its operations, and severe droughts could impact the water level at the reservoir and Largo’s ability to obtain alternative water sources on commercially reasonable terms as competition for water increases. This risk could also impact Largo’s operations indirectly, as it affects the lives of Largo’s employees, on-site contractors and suppliers.

The current Maracás Menchen Mine Life of Mine is approximately 20 years⁵. Largo is in the process of assessing climate change chronic risks in terms of the likelihood that its operations would be impacted before the mine closes.

TRANSITION RISKS

The top transition risks identified are summarized in the table and non-significant risks are discussed briefly below.

Top Climate-Related Transition Risks

Type	Subsidiary and/or jurisdiction	Time horizon	Risk description	Amount and percentage of assets or business activities vulnerable to climate-related transition risks	Potential financial impact
Policy and legal – emerging regulation	LVMSA, Brazil	Short	A new legislative proposal for the establishment of a Brazilian Greenhouse Gas Emissions Trading System has been introduced to the Brazilian National Congress in 2023. The proposal would establish a mandatory emissions trading system (ETS) and impose compliance obligations on entities emitting more than 25,000 tCO2e per year, which is more than Largo’s current annual emissions.	One operational site, 100% of mining and processing activities	The potential financial impact of these two risks is closely related. It is expected that if Largo is not able to reduce its emissions through a technological solution, it would still be able to purchase credits in a trading system. There is no financial estimate at this time.
Technology	LVMSA, Brazil	Short to Medium	Prohibitive cost to implement lower emissions technology at current operations. The rotary kiln burns heavy fossil fuel and is responsible for 44% of Largo’s annual emissions. A cleaner fuel that meets the technical calorific requirements has not been found yet.	One operational site, 100% of mining and processing activities	
Market	LVMSA, Brazil LCE, USA	Medium	Disruption in availability and/or increase in the cost of energy and critical raw materials.	Two operational sites, 100% of mining, processing and manufacturing activities	This is a medium-term risk that would impact Largo’s entire value chain and there is no financial estimate at this time.



The following potential transition risks can be expected in the short-term, however they are not considered significant.

In the European Union (EU), Largo will have reporting obligations as a foreign owned EU subsidiary under CSRD, resulting in added costs. A potential EU carbon tax on imports that includes vanadium products would also result in added costs.

In Brazil, Largo could be affected by changes in insurance such as increased premiums, reduced limits or restrictive coverages.

In the short and medium terms, Market Risk (change in customer behaviour) and Technology Risk (substitution of existing product with lower emissions options) were considered and deemed to be not reasonably expected (unlikely), given the vanadium market size and vanadium uses to lower carbon footprint of steel. New Reputation Risks were also considered unlikely, given the overall Mining Sector history in this regard, and the specific criticality of vanadium.



Opportunities

In Brazil, LVMSA has implemented climate-related opportunities in Resource Efficiency and Energy Source, and they are not considered to have a significant financial impact.

In 2020, Largo identified an opportunity to further contribute to the world’s transition to a low-carbon future through the acquisition of technology related to vanadium redox flow batteries (VRFB), which are innovative long duration energy storage (LDES) solutions. Largo Clean Energy (LCE) was created to explore this opportunity. LDES solutions are key to increasing the use of renewable energy necessary to replace fossil fuels.



Top climate-related opportunity

Type	Business activity location	Time horizon	Description	Amount and percentage of assets or business activities aligned with climate-related opportunities	Potential financial impact
Products & services markets	The clean energy subsidiary is located in the USA, and the market is global.	Short to long	New business focused on the use of vanadium-based battery technology and components to address renewable energy demand.	One light industrial manufacturing plant, 100% of this business activity.	Increased revenues through access to new and emerging markets. The quantification of this impact figure is not public at this time.

VCHARGE battery technology is unique due to a variety of innovations that enable an efficient, safe solution that is fully recyclable at the end of the expected 25-year-plus lifespan. VCHARGE technology is designed specifically for long-duration, megawatt-scale energy storage for utility clients.

When used “in front of the meter,” VCHARGE technology can support the electricity network by smoothing peak/through energy flows. When used “behind the meter,” VCHARGE technology can support microgrids with renewable energy generation. This technology is uniquely capable of supporting reliability and grid stability as electricity systems move away from fossil-fuel generation.

Vanadium electrolyte used in VRFBs is 100% reusable with no degradation, which allows unlimited use in long duration energy storage systems with zero risk of thermal runaway in its aqueous electrolyte form. This makes VRFBs easy to recycle, furthering supporting the circular economy. VCHARGE batteries are expected to meet the strict European Union “Sustainable Batteries”⁶ stringent regulatory requirements regarding repurposing or remanufacturing, that entered into force in 2023.

LCE has identified ten key risks related to technology and business development. Largo will continue to identify other potential risks and mitigations, such as assessing the locations of any installed battery for physical risks to ensure that the vanadium electrolyte is not exposed to unmitigated risks.

Historically, Largo’s revenues have been solely attributable to the sale of its vanadium products which are sourced from its operations in Brazil. Largo’s clean energy storage business provides an opportunity to diversify its business strategy.



Scenario Analysis & Resilience

The transition to a low-carbon future will be complex. The timing, magnitude, and pathways of climate system changes and socioeconomic system changes that will impact Largo are uncertain.

The TCFD recommends the use of different climate scenario analyses to understand how climate change could affect Largo and identify vulnerabilities. Typical scenario analysis involves several steps, including formalizing the team, process and governance; exploring questions from Largo’s perspective and defining material issues to be explored; choosing which scenarios to use in terms of relevant data and granularity; understanding possible outcomes and pathways, and monitoring the trends identified. Scenario analyses don’t predict the future, they are a tool to develop a long-term strategy for climate-change resilience.

Largo is in the initial stages of its qualitative scenario analysis process, providing preliminary information at this time.



MATERIAL ISSUES

In the short and medium term, the key uncertainties that exist are potential changes in temperature and precipitation that would impact Largo’s immovable operations responsible for mining and processing its vanadium products in northeastern Brazil.

In the longer term, the main uncertainty is the demand associated with LDES and Largo’s role in meeting the needs of potential energy storage customers.





PATHWAYS AND PROJECTIONS

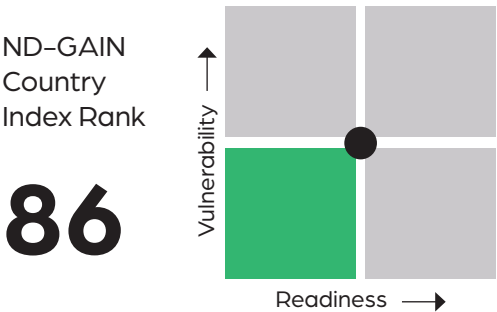
Largo reviewed separate projection models to understand how climate change could impact its current material issues over time.

Physical risks are limited to the operations in Brazil and it's important to consider the country's context when assessing different scenarios. Brazil is a signatory of the Paris Agreement. In July 2022, the Brazilian Supreme Court recognized the Paris Agreement as a human rights treaty, the first country to do so, meaning the government is constitutionally obliged to combat climate change. A new legislative proposal for the establishment of a Brazilian Greenhouse Gas Emissions Trading System has been introduced to the Brazilian National Congress.

The Notre Dame Global Adaptation Initiative (ND-GAIN) Country Index⁷ measures a country's exposure, sensitivity and capacity to adapt to the negative effects of climate change. ND-GAIN measures overall vulnerability by considering six life-supporting sectors: food, water, health, ecosystem services, human habitat and infrastructure. According to the ND-GAIN, Brazil has a low vulnerability index as well as a

low readiness index. Relative to other countries, its current vulnerabilities are manageable but improvements in readiness will help it better adapt to future challenges. As of 2021, Brazil is the 128th most vulnerable country and the 125th most ready country, ranking 86 out of 185 countries.⁸

The World Bank's Climate Risk Country Profile⁹, provides more information on climate-related vulnerabilities for 197 countries, based on past natural hazard occurrence during 1990 -2018. For Brazil, the top three Average Annual Hazard occurrences are flood, landslide and storm, representing a total of 78% of occurrences. As of the latest update, droughts represent 8% of the occurrences.



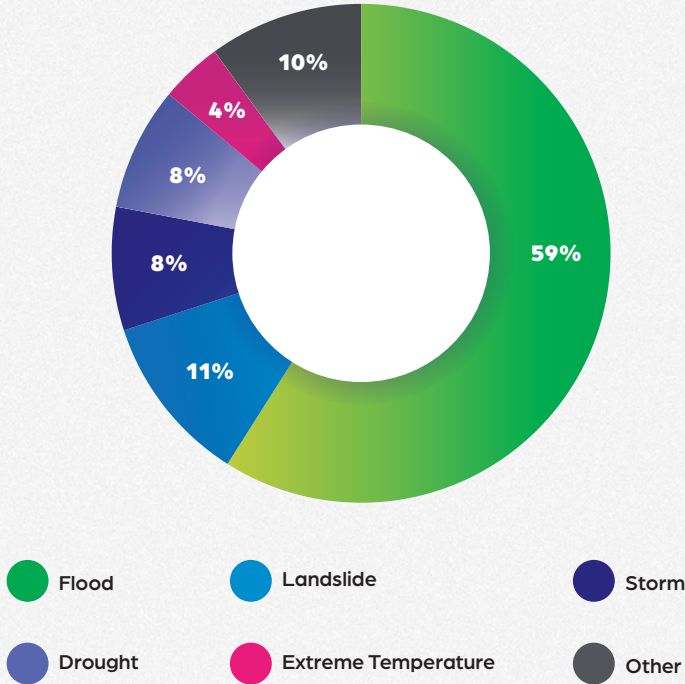
For observed and projected climate change information, Largo referred to the Working Group I (WGI) contribution to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6)¹² on the physical science basis of climate change, which was published in August 2021, and its associated interactive atlas¹³. Please refer to the [Technical Notes](#) section for more details and full references.

According to the IPCC AR6 WGI report, in all the scenarios considered, the temperature of the planet is highly likely to increase by 1.5°C as early as 2030 and exceed the 1.5°C mark in the next 20 years. This would bring more heat waves, and longer warm seasons

and depending on the average temperature increase, the heat might reach extreme temperatures in some places. In terms of the water cycle, it is projected that rain and drought will be more intense, with more floods.

Using the interactive atlas, Largo reviewed climate-change models for Northeastern South America, where Largo’s Brazilian operations are located. The focus was on models for mean temperature and total precipitation in Largo’s short and medium-term timelines (IPCC Near term – 2021 – 2040) relative to 1961–1990.

Top Average Natural Hazards (Brazil)



Brazil is ranked 3 out of 198 countries in share of renewables in electricity generation. (2021 data)¹⁰

Brazil ranks sixth among the global ranking of the Global Wind Energy Report 2023¹¹ with 24GW of onshore wind installed capacity.





The temperature graph shows a clear increase in temperatures even in the most optimistic scenario.

Changes in Mean Temperature (median values) – IPCC AR6

Timeframe	Scenario	Change in mean temperature (median values)
Near Term (2021–2040)	SSP1–2.6	1.1°C
Near Term (2021–2040)	SSP2–4.5	1.2°C
Near Term (2021–2040)	SSP5–8.5	1.3°C

The models for total precipitation are inconclusive for the timeline of interest. The IPCC considers the precipitation model to have a low level of agreement. However, the IPCC Regional Synthesis for North–Eastern South America¹⁴ projects a high confidence of decrease in Mean precipitation and a Medium confidence of increase in Heavy precipitation and pluvial flood.

Changes in Total Precipitation (median values) – IPCC AR6

Timeframe	Scenario	Change in total precipitation (median value)
Near Term (2021–2040)	SSP1–2.6	–0.4%
Near Term (2021–2040)	SSP2–4.5	–2.3%
Near Term (2021–2040)	SSP5–8.5	–2.9%

These models will continue to inform Largo’s scenario analysis discussions and assessments of risks likelihood and impacts. Meanwhile, some risk mitigation actions already in place are described in the [Risk Management](#) section.



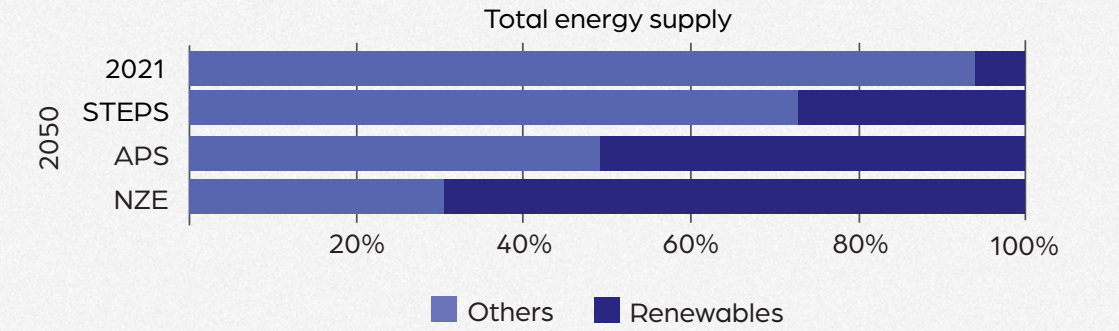
VANADIUM’S ROLE IN RENEWABLE ENERGY STORAGE

Regarding projections related to the growth of renewable energy integration, LDES and VRFBs, Largo reviewed data and models from the International Energy Agency (IEA) and the LDES Council.

The IEA’s *Renewables 2022 – Analysis and forecast to 2027 Report*¹⁵ provides a revised forecast on the role of renewables in the global electricity capacity between 2022 and 2027, which could account for over 90% of the expansion in the time period. This is approximately 30% higher from last year’s report. In summary, renewables are projected to grow by almost 2,400 GW, representing an 85% acceleration from the previous five years. The IEA reports that the revised forecast is mostly driven by the implementation of policies and regulatory and market reforms in the European Union, China, USA and India.

The IEA’s *World Energy Outlook 2022*¹⁶ presents projected growth in renewables for 2050 under three scenarios: Stated Policies Scenario (STEPS), Announced Pledges Scenario (APS) and Net Zero Emissions by 2050 Scenario (NZE). Please refer to the Technical Notes section for more details and full references.

Projected Growth in Renewables Using Different Scenarios, 2020 and 2050



Source: IEA World Energy Outlook 2022

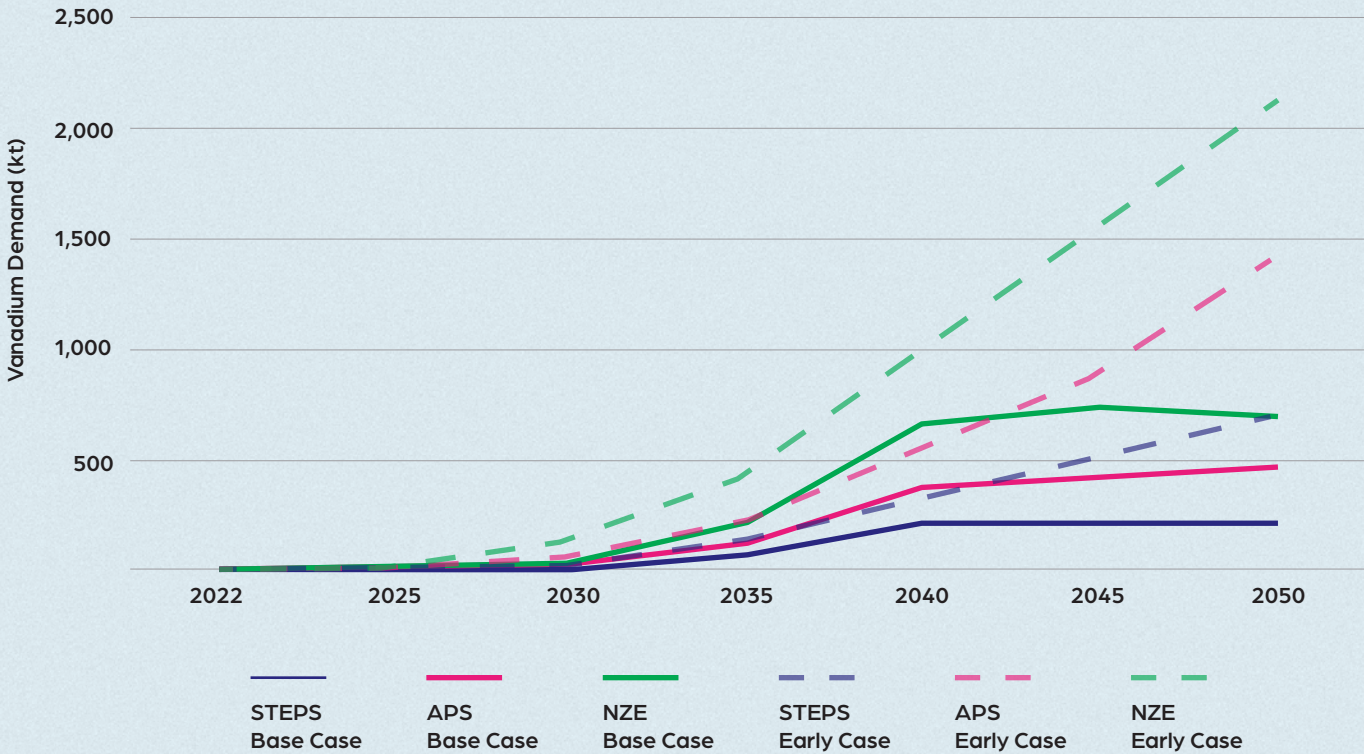
As expected, the supply and demand of renewable energy would be higher in an NZE scenario – representing around 70% of total energy by 2050 – followed by the APS and STEPS scenarios. There is a high degree of variability in the rate of growth of renewables among the models, but all scenarios show growth by 2050 compared to 2021.

LDES technology is expected to play a critical role in enabling the flexibility and stability required for the increase in the renewable share in power generation described earlier. Depending on the levels of policies and sources of capital, the LDES market is expected to continue growing, with expected maturity around 2030–2035. Under a fast decarbonization scenario, there are projections of the installation of 30 to 40 GW power capacity and 140 terawatt hours (TWh) of long duration energy capacity being installed by 2040¹⁷.

The most relevant forecast to Largo, specific for vanadium, is presented in the IEA’s Critical Minerals Data Explorer interactive tool⁴, which includes global demand projections for 37 critical minerals needed for clean energy transitions across the three main scenarios and 12 technology-specific cases. The “Grid battery storage” technology presents projections for a Base Case and an Early Commercialization of Vanadium flow-batteries case, under the three scenarios STEPS, APS and NZE. Refer to the [Technical Notes](#) for more details.

In the Base Case, the cost of energy storage is the determinant factor in adoption. After becoming commercially suitable in 2030, VRFBs grow to capture a higher percentage of the market for energy storage applications in large renewables projects. In the Early commercialization of Vanadium flow-batteries Case, is based on the assumption that VRFBs reach large-scale maturity earlier than expected, and other factors such as size and energy density becoming more important. In this case the IEA estimates a significant increase in their market share from 2030 onwards, with greatest applications in wind and solar farms.

Projected Demand for Vanadium – Base Case and Early Commercialization Case

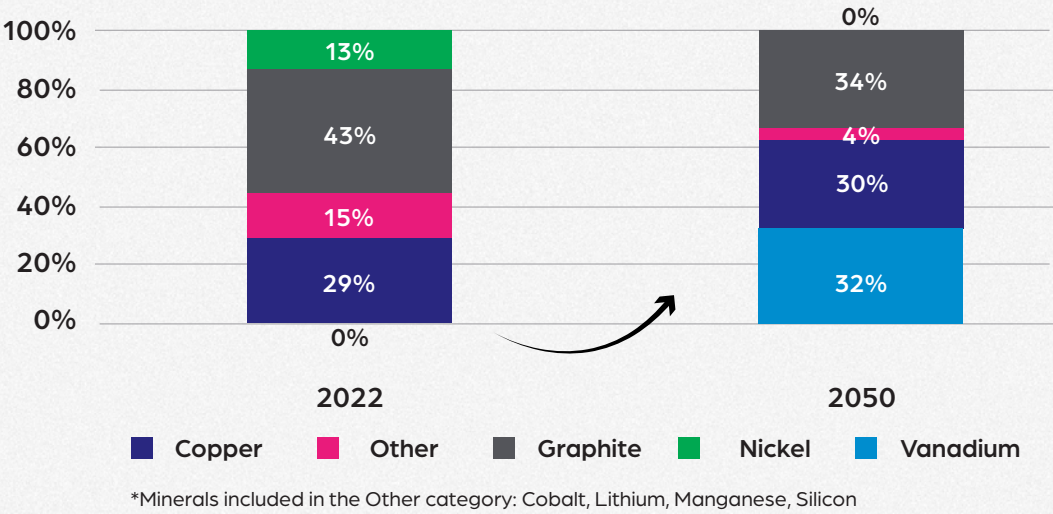


Source: IEA’s Critical Minerals Data Explorer

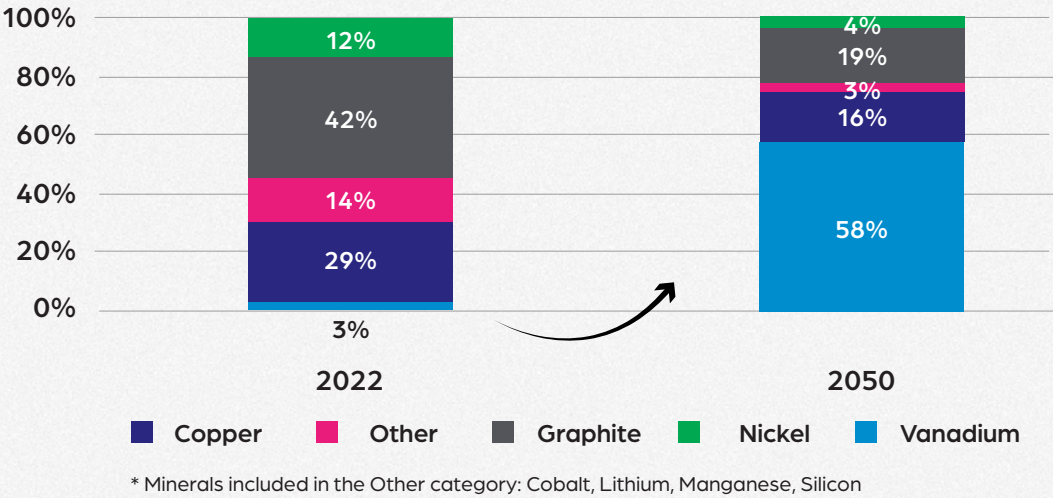
The charts to the right provide a different perspective, projecting how vanadium would displace some of today's common grid battery storage minerals. The charts present the most conservative and the most optimistic projections: a Base case under the STEPS scenario; and an Early commercialization case under the NZE scenario.



STEPS Scenario – Base Case




NZE Scenario – Early Commercialization Case



Source: IEA's Critical Minerals Data Explorer





Largo Clean Energy (LCE) has completed the site acceptance testing of its Enel Green Power España 6.1 MWh vanadium redox flow battery deployment – LCE's inaugural vanadium battery project.

CLIMATE RESILIENCE

Despite all the optimistic projections, it is important to remember that there are still many uncertainties that could slow down the growth of renewable energy generation and penetration. These include issues related to policies, financing, grid integration and social acceptance. The role of higher costs of raw materials and/or critical minerals for batteries also needs to be further explored.

At this time, vanadium demand will continue based on steel consumption related to global infrastructure projects. Vanadium alloys are used to strengthen steel, thus reducing the amount of steel needed.

In Brazil, Largo continues to improve its resilience to the short-term impact of changes in rain volume, as described in the [Mitigation of Risks](#) section.

Risk Management

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 - Largo Clean Energy (USA) >
 - Largo Vanádio de Maracás S.A. (Brazil) >

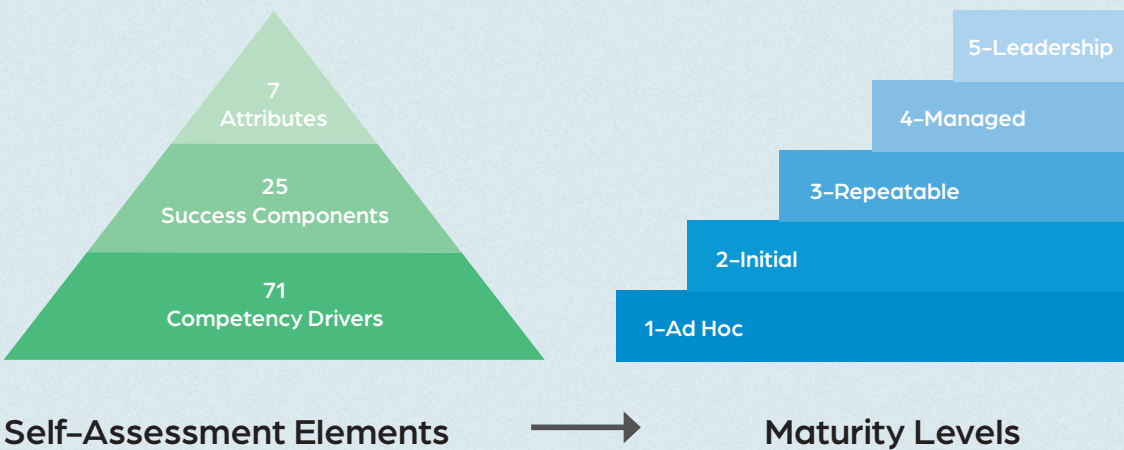


Enterprise Risk Management

Largo continues to implement an Enterprise Risk Management (ERM) program. An ERM program is a holistic, company-wide approach to identifying and managing significant risks and opportunities that have the potential to impact either strategic or business objectives.

An ERM program provides the structure to analyze risk within an organization, improving focus, mitigation efforts, and resources allocation on the areas of the business with the greatest risk.

The Risk Maturity Model (RMM) will be used as a self-assessment and benchmarking tool to measure the maturity of Largo's ERM program.



Overall, an ERM program is a key tool to increase a company's resilience in the face of major uncertainty.

Risks are identified through interviews with leaders and subject matter experts at different levels of the organization. The registers for the first two of Largo's prioritized units, Largo and LCE have already been completed, and LVMSA's is under way.

Enterprise risks were evaluated on an impact scale of 1 (insignificant) to 5 (catastrophic). Impact categories and sub-categories include: safety, environment, human rights, compliance, finance, strategy, and reputation. For every risk, each impact category and its subcategories were considered as possible areas of impact and were taken into consideration as part of the evaluation.

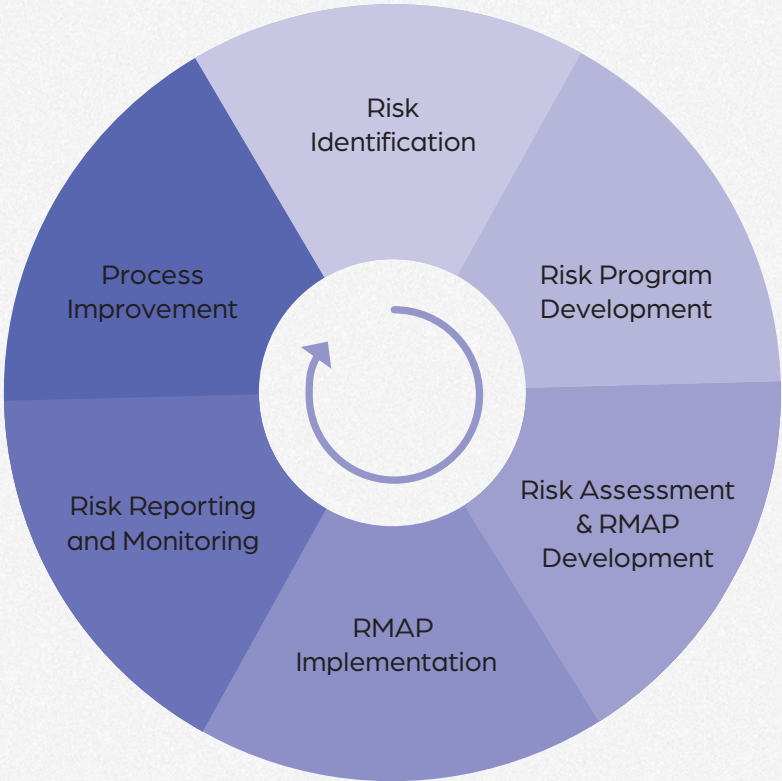
Evaluating the risk from multiple angles (e.g. impact categories) results in a more holistic evaluation of the potential impacts and a deeper understanding of the risk.



Largo’s “Risk Universe” encompasses all corporate and operational areas, including climate-change risks. From Largo’s Risk Universe, twelve risks have been prioritized to be evaluated and managed first, based on their potential severity. Climate change causing severe storms could be a contributing factor to one of the top risks identified – production interruption. Three other risks directly related to climate change were part of this initial identification and prioritization. However, based on their potential severity, they were not prioritized as top risks.

Following the steps of Largo’s ERM program, the Risk Owners for the twelve prioritized risks have been identified and draft RMAPs have been developed. The RMAPs include the identification and implementation of risk controls, monitoring of their effectiveness, reporting and analysis of any incidents or non-compliance events; and overall process improvement.

Largo’s ERM Program Steps



Mitigation of risks

LARGO CLEAN ENERGY (USA)

LCE and the risks related to investing in a climate-related opportunity (see [Strategy](#) section) by developing new products were prioritized for RMAP work which began in Q3 2021.

Upon initial identification, all top risks were inherently ranked as “Extreme” or “High” based on the internal ERM scales. The controls and mitigations currently in place have moved 70% of the top risks into the “Medium” ranking, primarily through a reduction in the likelihood that the risk might occur. Additional controls and mitigations are planned to further reduce the top risks to an acceptable level.

Project-level risks are managed weekly through the project risk register.

LARGO VANÁDIO DE MARACÁS S.A. (BRAZIL)

Largo is actively mitigating risks related to changes in precipitation patterns that have impacted the Maracás Menchen Mine mining and processing operations in Northeastern Brazil for the last two rain seasons.

In 2021, a hydrological engineering study was commissioned to assess the impact of increased rainfall on Largo’s tailings facilities over the life of the mine. Largo’s tailings facilities are built as ponds with impermeable liners and do not have a spillway. Water levels are maintained through pumping and evaporation. Since its tailings materials are not considered chemically inert, Largo must ensure they are always contained within the facilities, even in the case of heavy rainfall.

The engineering study included modelling of extreme rainfall, with durations varying from 1 to 24 hours, and a statistical recurrence of 10,000 years. This volume amounted to 225.55 mm and the study concluded that all facilities would be able to accommodate this volume within the current safety parameters.

In December 2022, the operational site experienced unusually heavy rainfall (approximately 36% more rainfall compared to December 2021, and at least 76% more rainfall on a single day during the same comparative month), disrupting the mining operations. Measures were taken such as installing a rainwater diversion system around the Campbell Pit and revamping its pumping systems.

Rainfall Impact Mitigations Team – **This multi-disciplinary team is responsible for planning and implementing operational prevention and mitigations actions related to increased rainfall at the site.**

In 2023 the LVMSA subsidiary created a formal multi-disciplinary team to manage the risk of future rain events. Identification of the actions, implementation progress and validation are managed by the quality management system team, supported by the operational team and discussed monthly with the leadership. Actions completed in 2023 include installation of an alternative spillway to increase the life of the BNM4 tailings facility, assessment of the conditions of external roads to avoid washouts, improved maintenance of external and internal access roads, frequent inspection of critical engineered drainage points, etc. A total of 70 detailed actions have been identified, of which 30% were already completed at the end of September 2023.



Metrics and Targets

IN THIS SECTION

- Metrics >
- Decarbonizing Our Operations >
- Targets >
- Data >



Metrics

Largo began calculating and reporting on GHG Scope 1 & 2 for FY 2020, as well as reporting on energy and water use. Currently, the majority of these metrics are available for the operations in Brazil only, representing over 85% of Largo’s workforce and the only mining and processing operational site. Largo reported GHG Scope 1 & 2 for LCE light industrial facility in Wilmington, USA and the corporate office in Toronto for the first time in its [2022 Annual Sustainability Report](#).

Largo endeavours to improve its Scope 3 reporting every year, increasing the number of categories reported and their scope and data quality. A 2021 report by the Transition Pathway Initiative, *Carbon Performance Assessment in the Diversified Mining Sector: Methodology*¹⁸ suggests that Scope 3 emissions for ferroalloys like vanadium can be considered immaterial compared to other natural resources’ Scope 3 emissions.

Largo has not set an Internal Carbon Price mechanism, given its clear focus and strategy to provide low-carbon solutions to the world.

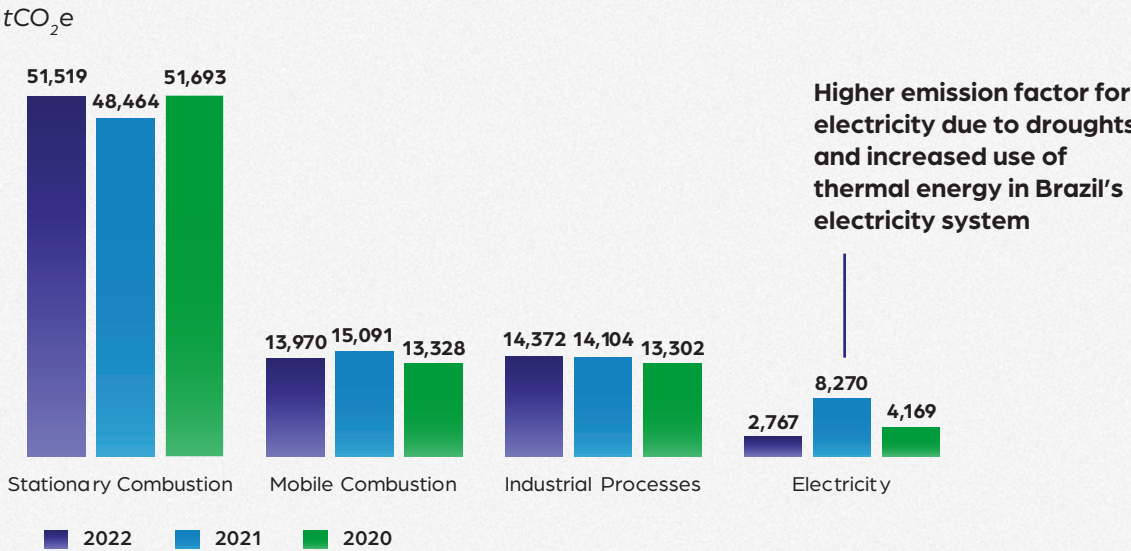
Variable executive remuneration does not include climate-related considerations.

Largo’s Scope 1 and 2 GHG inventory does not indicate major changes in the last three years. A more detailed analysis of Scope 1 and 2 GHG emissions suggests a high sensitivity to production levels, maintenance periods and changes in GHG emission factors. In addition, lower production in 2021 and 2022 resulted in slightly higher energy intensity compared to 2020.

Due to Largo’s maintenance period in January 2021, Largo saw a 9% decrease in overall energy consumption in 2021 compared to 2020, both for fossil fuels

and electricity. Scope 2 emissions in 2021 increased significantly due to changes in the emission factors issued by governing agencies and used for the calculations. In reality, consumption of electricity decreased in both 2021 and 2022 by approximately 3% from 2020 level. There were no intense droughts in Brazil in 2022, and therefore the electricity emission factor decreased from 2021.

GHG Emissions – Scope 1 and 2



Decarbonizing our operations

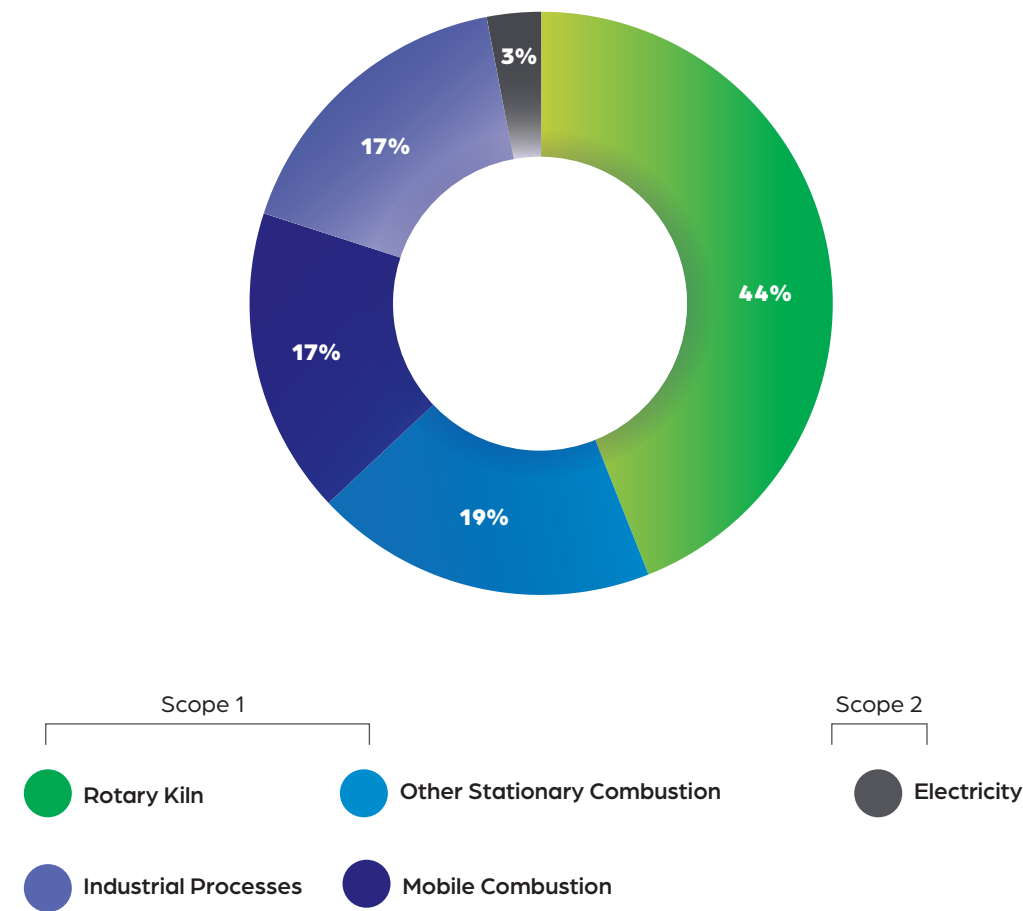
Typical decarbonization opportunities for mining operations include access to a cleaner electricity grid, the use of electric mobile equipment and cleaner fossil fuels, and achieving efficiencies for ventilation in underground mines.

Largo is committed to reducing its GHG emissions and has already invested in many opportunities. Largo’s vanadium trioxide (V₂O₃) plant was completed in early 2021 and was installed to consume liquefied petroleum gas (LPG), a cleaner fossil fuel. Electricity is the main energy source at Largo’s ilmenite concentration plant, which is completed and under ramp up as of Q3 2023. Largo has enabled different pieces of equipment to operate on either LPG or diesel, providing more flexibility to use cleaner fuel alternatives according to market conditions.

Chemical processes require very precise technical specifications to meet the calorific requirements of each process. Largo continuously investigate the feasibility of using alternative, cleaner fuels in its stationary equipment, which account for 63% of Scope 1 and 2 emissions. The plan to replace the fuel in the compressor used for unloading the ammonium sulphate continues to progress. A proposed natural gas pipeline that would reach our site provides a feasible cleaner fuel for our stationary combustion (excluding the rotary kiln), which is responsible for 19% of our emissions. The results of the technical viability studies of using natural gas in the rotary kiln are expected in 2023–24.

Largo purchases electricity from the Brazilian National Integrated System (SNI), which has a very high renewable content in its generation matrix, with an estimate of over 85% annual average for 2022.

2022 GHG Emissions – Rotary Kiln Contribution



Targets

The process to set realistic targets for GHG emission reductions is not simple. It requires having a baseline of emissions and an understanding of the cost and availability of reduction opportunities. The latter are then compiled as marginal abatement cost curves, which provide valuable financial information to develop alternative pathways and targets over a timeline. Pathways charts display the projected reductions in emissions over the years along with the selected target and other projections such as what the “business as usual” emissions would look like if no reduction projects were put in place.

Largo believes that setting formal GHG reduction targets is premature at this time, as there are no reliable estimates of cost and availability of reduction opportunities.

- The rotary kiln generates the largest share (44%) of Largo’s GHG emissions and Largo continues to explore alternative technologies compatible with its calorific requirements. The results of the technical viability studies of using natural gas are expected in 2023–24.
- Mobile equipment is responsible for 17% of Scope 1 and 2 emissions and would be a natural target for reduction. However, it is not clear how the availability of electric mobile mining equipment will evolve in Brazil at this time. Both gasoline and diesel used in mobile equipment already include a renewable component (ethanol and biodiesel.)
- The Maracás Menchen Mine operational site is connected to a grid with a very high component of renewables (above 85% average in 2022).

Largo expects to address the above gaps in information in the near future. Meanwhile, it will continue to pursue additional opportunities for decarbonization as discussed earlier. Since January 2023, LVMSA has increased the share of renewable electricity in its energy mix, through the purchase of solar and wind energy directly from supplier Casa dos Ventos (CDV Holding S.A.).

The current mine life for the Maracás Menchen Mine is 20 years⁵. In the longer term, the mine and processing units will close and with it all of the emission sources.



Additional Data Can Be Found in These Reports



2022 Sustainability Report (including GRI and SASB disclosures)



2022 ESG Data

ENERGY

GRI 302-1 Energy consumption within the organization
SASB EM-MM-130a.1 (1) Total energy consumed, (2) percentage grid electricity, (3) percentage renewable

	2020	2021	2022	2022
Type	Gigajoules (GJ)	Gigajoules (GJ)	Gigajoules (GJ)	% of total energy consumption
Stationary Combustion				
Heavy Fuel Oil	504,615	468,141	612,968	
Diesel S500 (more sulphur, no biodiesel)	182,782	54,451	3	
Liquefied Petroleum Gas	1,377	71,452	39,057	
Acetylene	*	*	81	
Total Stationary Combustion	688,774	594,044	652,109	59%
* not reported				
Mobile Combustion				
Diesel S10 (contains biodiesel)	230,019	227,629	213,049	
Gasoline (contains ethanol)	3,316	3,207	2,813	
Total Mobile Combustion	233,335	230,836	215,863	20%
Electricity				
Purchased Electricity – Brazilian National Integrated System (SIN)	243,392	235,161	237,279	21%
Energy sold	0	0	0	
TOTAL ENERGY CONSUMPTION	1,165,500	1,060,041	1,105,251	

Energy consumption by renewable vs. non-renewable

ENERGY SOURCE	% RENEWABLE (2022)	2022 RENEWABLE (GJ)	2022 NON-RENEWABLE (GJ)
Heavy Fuel Oil	0%	–	612,968
Diesel S500 (more sulphur, no biodiesel)	0%	–	3
Liquefied Petroleum Gas	0%	–	39,057
Acetylene	0%	–	81
Diesel S10 (contains biodiesel)*	10%	21,305	191,744
Gasoline (contains ethanol)**	27%	760	2,054
Purchased Electricity – Brazilian National Integrated System (SIN) ***	87%	207,458	29,821
TOTAL (GJ)		229,523	875,728
TOTAL (%)		19%	81%

* % used in the GHG calculation – Ano Base 2022 (Mineral Engenharia e Meio Ambiente)
** % used in the GHG calculation – Ano Base 2022 (Mineral Engenharia e Meio Ambiente)
***http://www.ons.org.br/Paginas/resultados-da-operacao/historico-da-operacao/geracao_energia.aspx

2022 PURCHASED ELECTRICITY – BRAZILIAN NATIONAL INTEGRATED SYSTEM (SIN)

Energy Source	%
Hydroelectric	72.1%
Wind	13.4%
Solar	2.0%
Total renewable component	87.4%
Thermal	10.2%
Nuclear	2.4%
Total non-renewable component	12.6%

GRI 302–3 Energy intensity

	2020	2021	2022
Annual Production (t V ₂ O ₅)	11,825	10,319	10,436
Total Energy Consumption/V ₂ O ₅ production (GJ/tV ₂ O ₅)	98.56	102.73	105.91

GRI 305–1 Direct (Scope 1) GHG emissions
SASB EM-MM-110a.1 Gross Scope 1 emissions – LVMSA only

EMISSION SOURCE CATEGORY	EMISSIONS (tCO ₂ e) 2020	EMISSIONS (tCO ₂ e) 2021	EMISSIONS (tCO ₂ e) 2022
Stationary combustion	51,693	48,464	51,519
Mobile combustion	13,328	15,091	13,970
Process emissions	13,303	14,104	14,372
Fugitive emissions	182	106	107
Scope 1 Total	78,506	77,765	79,968
Emissions of Biogenic CO ₂ (99% from ethanol and biodiesel consumed by mobile equipment)	2,938	1,757	1,469

The organizational boundaries and data collection period are the same as the boundaries for this report, restricted to Largo's operations in Brazil, during January 1 to December 31, 2022.

The compilation of the GHG inventory was conducted by a consulting company, following the GHG Protocol methodologies and emission factors identified by the GHG Protocol Brazilian Program.

Gases included in the inventory include: CO₂, CH₄, and HFC. The presence of chemical reactions that would result in the emission of N₂O during the ore processing is not confirmed; therefore it was excluded from the calculation at this time. There were no emissions of PCFs, SF₆ nor NF₃.

GRI 305–2 Indirect (Scope 2) GHG emissions

EMISSION SOURCE CATEGORY	EMISSIONS (tCO ₂ e) 2020	EMISSIONS (tCO ₂ e) 2021	EMISSIONS (tCO ₂ e) 2022
Purchase of electricity (location based)	4,169	8,270	2,767

GRI 305–3 Other indirect (Scope 3) GHG emissions *

CATEGORY	SUBSIDIARIES INCLUDED	EMISSIONS (TCO2E) 2022	COMMENTS
1 Purchased goods and services	-	-	Relevant, not calculated yet.
2 Capital goods	-	-	Relevant, not calculated yet.
3 Fuel and energy-related activities	-	-	Relevant, not calculated yet.
4 Upstream transportation and distribution	-	-	Relevant, not calculated yet.
5 Waste generated in operations – Only waste treatment in facilities owned or operated by third parties	-	-	Relevant, not calculated yet.
6 Business travel	Corporate travel only, no subsidiaries included	124	Data provided by the travel agency.
7 Employee commuting	LVMSA only	333	Based on fuel consumed by buses used to transport employees to the site and back.
8 Upstream leased assets	N/A	N/A	Not applicable. Largo reported Scope 1 and 2 emissions related to the Wilmington, MA, USA facility, the only upstream leased asset that it operates.
9 Downstream transportation and distribution	Consolidated for Largo Inc.	4,639	Worldwide maritime transportation. Road transportation in Europe, North and South America.
10 Processing of sold products	-	-	Relevant, not calculated yet. A majority of V2O5 produced is converted into FeV, which in turn is added to steel to impart higher strength.
11 Use of sold products	Not relevant	Not relevant	Not relevant. Vanadium is a key transition metal used in greener steel and energy storage applications. The use of vanadium-bearing high-strength steel allows for the use of less steel, which can reduce the carbon footprint of the entire infrastructure project.
12 End-of-life treatment of sold products	Not relevant	Not relevant	Not relevant. High strength steel and master alloys containing vanadium are recyclable. Steel scrap is a key raw material for steel production, contributing to the reduction of overall GHG emissions. Vanadium electrolyte used in long duration energy storage never degrades, offering a reusable long-term solution for renewable energy partners.
13 Downstream leased assets	N/A	N/A	Not applicable. Largo doesn't own any assets that are leased to other entities.
14 Franchises	N/A	N/A	Not applicable. Largo doesn't have any franchises.
15 Investments	N/A	N/A	Not applicable. Largo doesn't have financial investments that generate GHG emissions other than its own subsidiaries and operations.

* Scope 3 emissions for ferroalloys were considered immaterial by the Transition Pathway Initiative in their Carbon Performance Assessment in the Diversified Mining Sector: Methodology February 2021 Report, compared to other natural resources' Scope 3 emissions.



GRI 305-4 GHG emissions intensity

	2020	2021	2022
Scope 1 and 2 emissions (tCO ₂ e)	82,675	86,035	82,735
Annual production (tV ₂ O ₅)	11,825	10,319	10,436
GHG emissions intensity (tCO ₂ e/tV ₂ O ₅)	6.99	8.34	7.93

2022 GHG emissions outside Brazil

	SCOPE 1 EMISSIONS (tCO ₂ e)	SCOPE 2 EMISSIONS (tCO ₂ e)
Largo Inc.	Zero	8.51*
Largo Clean Energy (USA)	0.01**	142.12***
Largo USA	No Scope 1 & 2 emissions. Rented "hot desks" considered Scope 3	
Other Subsidiaries		

The following GHGs were included in the inventory: carbon dioxide, methane, nitrous oxide and Halotron. Other GHGs were not identified.

* 89.4 % attributed to space heating using natural gas and 10.6% associated with electricity use (location based).

** Scope 1 emissions from fugitive emissions from refrigerants and fire suppressants

*** 39.6% attributed to space heating and 60.4% associated with electricity (market based).

GRI 305-6 Emissions of ozone-depleting substances (ODS)

	EQUIPMENT	TYPE	EMISSIONS (tCO ₂ e) 2020	EMISSIONS (tCO ₂ e) 2021	EMISSIONS (tCO ₂ e) 2022
Kyoto Protocol	Commercial air conditioning	HFC R-410A	182*	106*	107*
	Circuit breakers	SF6	0	0	0
Montreal Protocol	Commercial air conditioning	HCFC-22 (R22)	16	0	0

*included in Scope 1 – Fugitive emissions

WATER AND EFFLUENTS

SASB EM-MM-140a.1 (1) Total fresh water withdrawn, (2) total fresh water consumed, percentage of each in regions with High or Extremely High Baseline Water Stress

GRI 303-3 Water withdrawal

	2020 (ML)	2021 (ML)	2022 (ML)
Surface water from the Pedra Reservoir – water-stressed region	672.5	712.1	620.8

GRI 303-4 Water discharge

	2020 (ML)	2021 (ML)	2022 (ML)
Water discharge	0	0	0

GRI 303-5 Water consumption

	2020 (ML)	2021 (ML)	2022 (ML)
Donated to the village of Água Branca	11.0	9.4	10.4
Operational site consumption	661.5	701.9	610.4

SASB EM-MM-140a.2 Number of incidents of non-compliance associated with water quality permits, standards and regulations	Zero
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SASB EM-MM-000.A Production of (1) metal ores and (2) finished metal products

	2022
Total V ₂ O ₅ equivalent sales (t)	11,091
Total V ₂ O ₅ equivalent production (t)	10,436

Largo does not produce any products that are banned on any markets or are the subject of stakeholder questions or public debate.
Ferrovanadium (FeV) “converters” add iron to V₂O₅ to produce FeV (ferrovanadium), which is the alloy sold to the steel industry.
In Largo’s value chain, “converters” can be both customers and service providers.
In Q3 2022 the Company transitioned to a new mining contractor at the operational site in Brazil.

SASB EM-MM-000.B Total number of employees, percentage contractors

As of 31 December 2022: 472 employees and 986 contractors. The number of contractors is higher in 2022 due to the construction of the ilmenite concentration plant.

Technical Notes on Scenarios Used

The IPCC published the first part (Working Group I) of its 6th Assessment Report (AR6) in August 2021, using five scenarios that cover a range of warming temperatures and the capacity of societies to adapt to the changes. The five scenarios are based on reference socio-economic trajectories – the Shared Socioeconomic Pathways (SSP) – developed by the scientific community to create a common framework for thinking about the issues related to climate change and are considered more precise than previous ones. The scenarios are referred to as SSPx-y, where ‘SSPx’ refers to the Shared Socio-economic Pathway or ‘SSP’ describing the socio-economic trends underlying the scenario, and ‘y’ refers to the approximate level of radiative forcing (in watts per square metre, or W m–2) resulting from the scenario in the year 2100.

SSP SCENARIOS	SUMMARIZED DESCRIPTION ¹²
SSP1-1.9	<ul style="list-style-type: none">• The only scenario that meets the Paris Agreement’s goal of keeping global warming to around 1.5°C above preindustrial temperatures.• CO₂ emissions cut to net zero around 2050• Societies become more sustainable, with the focus shifting from economic growth to overall well-being.
SSP1-2.6	<ul style="list-style-type: none">• Temperatures stabilize around 1.8°C higher by 2100• CO₂ emissions cut to net zero around 2075• Societies become more sustainable, with the focus shifting from economic growth to overall well-being.
SSP2-4.5	<ul style="list-style-type: none">• Temperatures rise by 2.7°C by 2100• CO₂ emissions around current levels until 2050, then falling but not reaching net zero by 2100• Slow progress toward sustainability
SSP3-7.0	<ul style="list-style-type: none">• Temperatures rise by 3.6°C by 2100• CO₂ emissions double from current levels by 2100• Countries become more competitive with one another, ensuring their national security and food supplies.
SSP5-8.5	<ul style="list-style-type: none">• Temperatures rise by 4.4°C by 2100• CO₂ emissions triple by 2075• The global economy grows quickly, fueled by exploiting fossil fuels and energy-intensive lifestyles.

IEA SCENARIO	SUMMARIZED DESCRIPTION ¹⁶
Net Zero Emissions by 2050 Scenario (NZE)	<ul style="list-style-type: none">• A narrow but achievable pathway for the global energy sector to achieve net zero CO₂ emissions by 2050, with advanced economies reaching net zero emissions in advance of others.• Meets key energy-related United Nations Sustainable Development Goals (SDGs), in particular by achieving universal energy access by 2030 and major improvements in air quality.• Does not rely on emissions reductions from outside the energy sector to achieve its goals, but assumes that non-energy emissions will be reduced in the same proportion as energy emissions.• Consistent with limiting the global temperature rise to 1.5 °C without a temperature overshoot (with a 50% probability).
Announced Pledges Scenario (APS)	<ul style="list-style-type: none">• Takes account of all of the climate commitments made by governments around the world, including NDCs as well as longer-term net zero targets, and assumes that they will be met in full and on time.• The global trends in this scenario represent the cumulative extent of the world’s ambition to tackle climate change as of mid-2022.• The remaining difference in global emissions between the APS and the goals in the NZE Scenario shows the “ambition gap” that needs to be closed to achieve the goals agreed in the Paris Agreement in 2015.
Stated Policies Scenario (STEPS)	<ul style="list-style-type: none">• Does not take for granted that governments will reach all announced goals. Instead, it explores where the energy system might go without additional policy implementation.• As with the APS, it is not designed to achieve a particular outcome.• Takes a granular, sector-by-sector look at existing policies and measures and those under development.• The remaining difference in global emissions between the STEPS and the APS represents the “implementation gap” that needs to be closed for countries to achieve their announced decarbonisation targets.



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⁴[International Energy Agency Critical Minerals Data Explorer, July 11, 2023 update](#)

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⁶[European Commission – Batteries](#)

⁷[Notre Dame Global Adaptation Initiative](#)

⁸[Notre Dame Global Adaptation Index](#)

⁹[World Bank – Climate Risk Country Profile](#)

¹⁰[IRENA Country Rankings](#)

¹¹[Global Wind Report 2023](#)

¹²Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.). 2021. Summary for Policymakers. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change . IPCC.

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Cautionary Statement on Forward-looking Information:

This press release contains forward-looking information under applicable securities legislation ("forward-looking information"). Forward-looking information can be identified by the use of forward-looking terminology such as "plans", "expects" or "does not expect", "is expected", "budget", "scheduled", "estimates", "forecasts", "intends", "anticipates" or "does not anticipate", or "believes", or variations of such words and phrases or statements that certain actions, events or results "may", "could", "would", "might" or "will be taken", "occur" or "be achieved". All information contained in this news release, other than statements of current and historical fact, is forward looking information.

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