



# Road to NET ZERO CARBON

CLIMATE ACTION REPORT 2022

Aligned to Task Force on Climate-Related  
Financial Disclosures (TCFD)



**vedanta**  
transforming for good

**aluminium**

# About this Report

At Vedanta Aluminium (hereafter referred as the Sector), we take a great sense of responsibility in providing our stakeholders with information regarding our operations, growth and plans for the future. In addition to our commitments and initiatives for sustainable development, we believe that timely and transparent disclosures are a must for developing trust among our stakeholders.

We are, therefore, publishing Vedanta Aluminium's first report on Climate Change in alignment with the Task Force on Climate-related Financial Disclosures (TCFD) this year. Through this report we aim to inform our climate change related business-related risks and opportunities, Climate management strategy, Commitments and the performance against the plans. We believe these disclosures can serve to expedite our decarbonization efforts through improved accountability and transparency.

The TCFD report is structured around four thematic areas (but not in the same order) that represent the core elements of how we function: governance, strategy, risk management, and metrics & targets.

1. **Governance:** disclosing Vedanta Aluminium's governance around climate-related risks and opportunities
2. **Strategy:** disclosing the actual and potential impacts of climate-related risks and opportunities for Vedanta Aluminium's business, strategy and financial planning where such information is material
3. **Risk Management:** disclosing how the organization identifies, assesses and manages climate-related risks
4. **Metrics and Targets:** Disclosing the metrics and targets used to assess and manage climate-related risks and opportunities where such information is material

Through these four elements, we have identified climate-related issues, assessed and quantified its potential impacts on business and undertaken both historical and forward-looking analysis when considering the financial and non-financial impact of climate change.



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## From the Chairman's Desk



◀ **Anil Agarwal**  
Chairman, Vedanta Resources



It is my pleasure to announce the launch of Vedanta Aluminum's maiden report on climate change in line with the framework of the Taskforce on Climate-related Financial Disclosures (TCFD). The launch of this report bears testimony to our commitment to climate action and ensuring sustainable development of our business and stakeholders. I believe this report will augment the disclosures through our annual Sustainable Development Reports. Vedanta has publicly committed to ambitious targets on various ESG (Environmental, Social and Governance) Key Performance Indicators, in the short and long term.

As the world rapidly transitions to a low carbon economy, Vedanta is prepared to meet the needs of the future as one of the world's leading metals, minerals and oil & gas company. We have embarked on clean energy transition through our fuel switch programs and various other powerful initiatives. Vedanta Aluminum became the largest industrial consumer of green energy in India in 2022, when it purchased 3 billion units of renewable power from India's energy markets. Similarly, we have entered into a Power Delivery Agreement to purchase 380 MW of renewable energy for our aluminium smelters.

Aluminium is a strategic metal, which will be essential to the world's transition to a low carbon future and meeting sustainable development goals. Towards this, Vedanta Aluminum manufactured India's first low carbon aluminium brands, called 'Restora' and 'Restora Ultra', for our customers worldwide. Such strategic new product developments stand testimony to our belief that sustainable business growth must happen on the bedrock of ESG excellence. capacity.

We understand that the physical risks of climate change can directly or indirectly impact our assets, supply chains, people and stakeholders. We are, therefore, ensuring that our assets are resilient and ready to adapt to emerging climate change risks. We are steadily decarbonizing our businesses and identifying opportunities in terms of market and technology that will accelerate the competitiveness of our operations in the future. At the same time, we are also promoting climate resilient practices to help our local communities become resilient to climate change, which will help them minimize the impacts of climate risks. For we will always assess the performance of our businesses through the triple bottom line of planet, people and prosperity.



# CEO Thoughts



◀ **Mr. Rahul Sharma**  
Dy. CEO, Vedanta Limited -  
Aluminium Business



I am delighted to present to you the first TCFD-aligned climate action report of Vedanta Aluminium, which encapsulates our performance for the year 2021-22.

As the world collectively faces the increasing impacts of climate change, this decade leading up to 2030 is critical for climate action, specifically in terms of decarbonisation of businesses and increase in adoption of renewable energy. At the same time, the global transition to a low carbon economy will be metals intensive, with metals like aluminium forming the backbone of a green economy. And hence, Vedanta Aluminium, as one of the world's top and India's largest aluminium producers, needs to maximise its production potential, alongside transitioning towards clean energy and improving our GHG emissions performance.

To this end, we have taken on the ambitious target of being Net Zero Carbon by 2050 and have put into motion put in place a multi-pronged approach for climate-action. This approach has emanated from a detailed analysis of physical and business risks across our units and a comprehensive study of our Scope 3 emissions. The detailed studies, in turn, have guided our strategies to mitigate climate-related risks and take targets to substantially reduce our carbon footprint.

For us at Vedanta Aluminium, business growth and ESG excellence go hand-in-hand. We have a dedicated committee under the leadership of an Independent Director to drive our ESG agenda. Our targets and initiatives are in alignment with the goals of Paris Agreement. Vedanta Group has publicly announced 10 commitments as its action pillars for GHG reduction and climate action and we, at Vedanta Aluminium, are determined to realize these commitments. We have taken a target of

reducing the GHG intensity of our operations by 28% by FY 2030 from FY 2021 baseline. Similarly, we are committed to reducing our Scope 3 GHG intensity by 25% from FY 2021 baseline. To achieve these ambitious targets, we have set the ball rolling on a slew of projects such as renewable energy capacity installation, usage of clean fuels like biomass, initiatives to drive energy efficiency, converting our vehicle fleet into electric/hybrid vehicles, and so on.

We are pleased to share that we have diversified our product portfolio with the inclusion of low-carbon 'green' aluminium brands, called Restora and Restora Ultra. Restora has a GHG intensity that is nearly half the global threshold for aluminium to be considered as low carbon. Restora Ultra has an even lower GHG intensity which is near-zero, amongst the lowest in the world.

We have signed a Power Delivery Agreement (PDA) for 380 MW of renewable energy on long-term basis for our aluminium smelters. FY 2022 also saw us become India's largest green power buyer at around 3 Billion Units. We have also signed an MoU for supply of natural gas to our Alumina Refinery unit, which will help us transition our coal-fired alumina operations to a lower carbon fuel. We have also partnered a global leader in sustainability solutions for making our operations water positive. Actions taken in this decade will be pivotal for limiting global warming at 1.5 Celsius. In lieu of this, we anticipate change in several policies over the decade, which may impact the way we do business. Vedanta Aluminium stands prepared to manage the physical and transition risks that may emerge as a result of climate change.

On that note, I invite you to read Vedanta Aluminium's climate action report for the year 2021-22.

# Vedanta Aluminium

Vedanta Aluminium, a business of Vedanta Limited, is one of the world's leading producers of aluminium, the 'Metal of the Future'. We are India's largest aluminium producer, with a world-class alumina refinery and two state-of-the-art aluminium smelters in the Indian states of Odisha and Chhattisgarh. With a large portfolio of aluminium products, we are catering to the raw material needs of a vast spectrum of industries, spanning aerospace, automobile & electric mobility, building & construction, electrical, consumer goods, renewables, packaging, and more. Today, we are a sought-after supplier of aluminium for an illustrious clientele located in over 45 countries around the world, from developed markets to emerging economies. In FY 2022, we produced 2.27 million metric tonnes of aluminium; and our production

resulted in INR 536.8 billion in revenue and INR 140.4 billion worth of economic value retained.

Aluminium is a strategic metal with applications across all key sectors of growth and development, including current and emerging clean technologies which are critical for the global transition to a low carbon economy. It is poised to become the most important commercial metal in the near future, alongside metals and minerals which will gain prominence by virtue of their requirement in energy transition.

It is our constant endeavor to explore the limitless potential of aluminium as the 'metal of the future' and create long-term value for our customers with sustainable development.



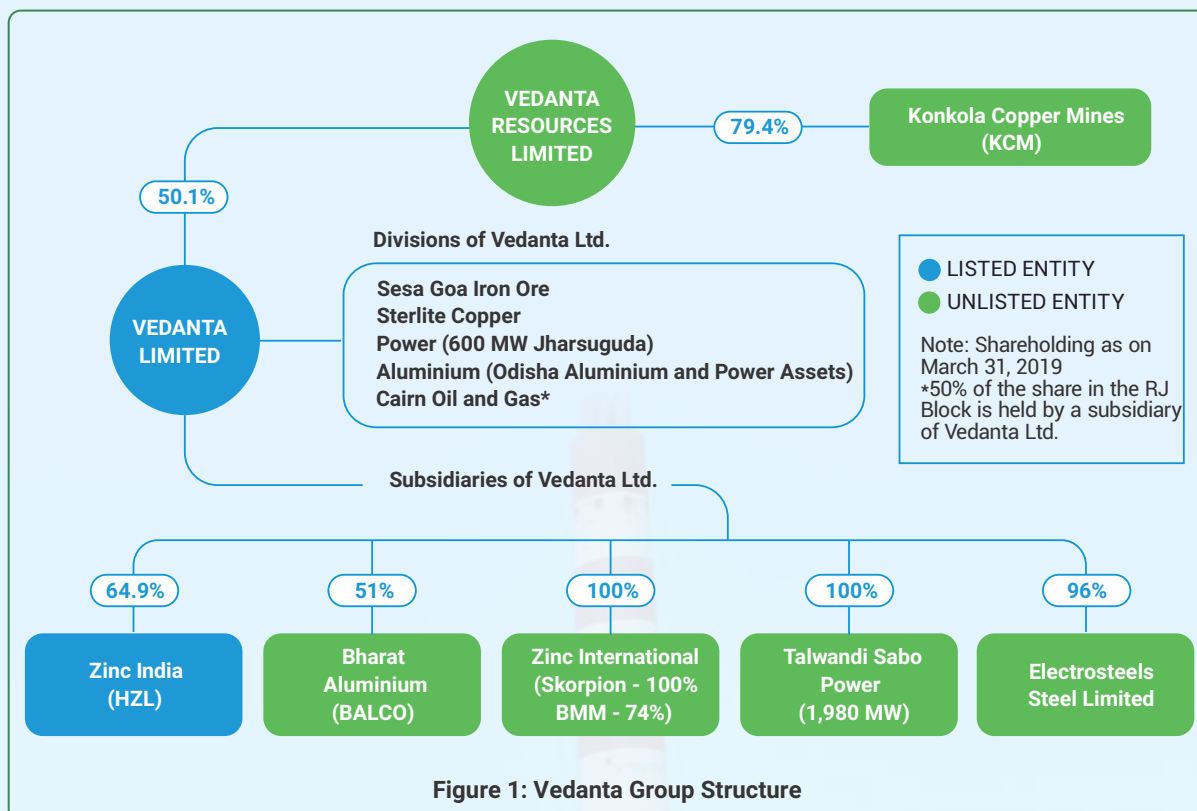


## ► GOVERNANCE

# Vedanta Group structure

Vedanta Limited is diversified natural resource company with interest in aluminum, Zinc, Copper, Lead, Iron Ore, Steel, Oil & gas and Power.

The group structure is illustrated below:

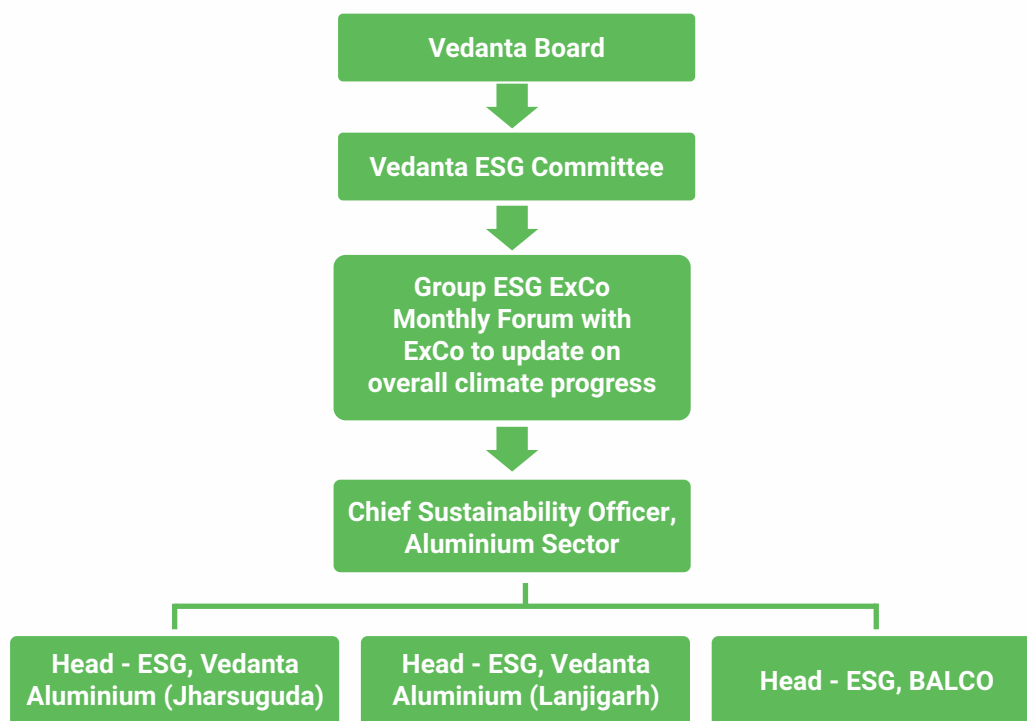


## Governance mechanism for climate change

Our Board and executive leaders play an important role in integrating climate-related scenarios in strategic planning and risk management structures for our business. The management supports and develops all climate-related strategies for better

risk management. The multi-layered governance structure collectively ensures that our operations and value chain adhere to the highest standards and industry best practices with respect to climate change and energy management.

**Figure 2: Climate Change Governance at Vedanta**



The governance structure has been designed for easy flow of information and feedback through all the levels of the company. This being a critical lever for ensuring robust business strategies and transparent decision making, we also have regular consultations with all stakeholders to devise our strategy keeping their needs in mind.

The Group ESG Executive Committee (Exco) meets regularly to oversee climate action strategies being undertaken. As the head of the Group ESG ExCo, the Group CEO is responsible for developing and overseeing the implementation of climate change-

related risk mitigation and resilience measures across our group companies, especially the high investment decarbonisation projects along with other ESG projects. The Group and Business CEOs, supported by the Director – ESG, Carbon & Social Performance, are responsible for delivery of the decarbonisation agenda. The Group's management is also advised by three global ESG expert advisors with rich experience in ESG and climate change management.

The ultimate responsibility and accountability for implementing our climate strategy rests with



Vedanta's Board of Directors. The Group's Risk Management Committee, Audit Committee, and Sustainability Committee support the Board in the regular assessment of effectiveness of the implemented programs and control measures for climate change-related risks and opportunity management. The Group ESG Management Committee (ESG ManCom) is headed by the Group CEO of Vedanta and is responsible for execution of decisions made by the Board, allocation of resources, and reporting to the Board on key climate change & overall sustainability risks and actions being taken to mitigate these risks. The Sustainability Committee is tasked with identifying emerging climate change issues relevant to our business operations, setting up and reviewing emission reduction targets periodically, in alignment with Vedanta's pledge of carbon

neutrality.

At the Sector level, the Chief Sustainability Officer of Vedanta Aluminium is responsible for driving the implementation of climate action plans and reporting the progress regularly to the Sector ExCo and Group's Sustainability Committee. This year, the Sector has incorporated shadow Internal Carbon Pricing for positive reinforcement of low carbon investments and has also initiated public reporting of Scope 3 emissions and set Scope 3 reduction targets.

Beyond regular reviews of the progress against our plans for transitioning into low carbon operations, we have institutionalized linking of management remunerations with climate-related business performance and Internal Carbon Pricing to expedite our journey towards decarbonisation.

## **Linking climate-related business performance with management remunerations**

Vedanta Aluminium has committed to 14% and 28% GHG intensity reduction by FY25 and FY30 over the FY21 baseline year. Towards achieving these short-term and medium-term goals, each of our Business Units has developed annual GHG intensity reduction targets and plans to achieve the same. The annual GHG intensity reduction target is amongst several ambitious ESG targets we have set for ourselves at the Sector. These ESG targets make up 10% of the senior management's KRA (Key Responsibility Areas) at the Sector and the business units. Their performance is evaluated monthly via an indigenously designed ESG dashboard, which tracks progress against all ESG Key Performance

Indicators, and is reviewed during annual performance appraisal.

We have also institutionalized a robust internal awards programme, which includes monthly Sector & business unit CEO Awards, monthly Chairman Awards and quarterly Chairman Sustainability Awards, to recognize individuals, teams and business units for pathbreaking endeavors towards ESG performance improvement at the businesses in the areas of GHG emission reduction, supply chain management, energy reduction, and other business-related ESG issues.

# Climate change and business-related risk and opportunities

At Vedanta Aluminium, we are cognizant of the fact that the impacts of climate change have already started materializing, affecting people, organizations and the ecosystems around us. Climate change has been reshaping our world and may have pervasive and irreversible effects. A report by Deloitte on Climate Change Financial implications suggests that passivity regarding the issue of climate change would cost the world's economy about US \$178 trillion in the next 50 years.

However, we truly believe in our ability to act now and minimize greater impacts of climate change, especially by reducing emissions at our operations and across our entire value chain. We are committed to the principles of sustainable production, as we transition to low carbon operations. The combined effect of our energy conservation projects has led to annual energy savings of around 2.18 million GJ, resulting in total GHG emission savings of 4,29,029 tCO<sub>2</sub>e and cost saving of INR 1.380 billion.

We are entrusted by our stakeholders to realize the potential of natural resources, limit our impact on the climate and mitigate the impacts of climate change. Our growth strategy includes identification of current and potential business risks and developing the right strategies to transform them into opportunities, for us and our stakeholders. With growing focus on climate action, we continue to

include climate change as part of our long-term strategies and encourage climate-based disclosures for strengthening the trust our stakeholders have placed in us.

Climate change is likely to result in dramatic transformation of topography and changes like sea level rise, changes in rain pattern, desertification, high temperatures, etc. This could pose various risks to our business. Through this report we aim to disclose the degree of impact of climate-related risks, and preparedness for minimizing the risks and maximizing the opportunities for us and our stakeholders.

The impacts of climate change on our business depend on the occurrence and scale of climate disasters, regulatory responses to climate change, response of customers, lenders and other investors. Alumina Refinery and Aluminium Smelter operations can potentially be at high chronic and acute physical risk events such as extreme rainfalls, cyclones, temperature rise leading to drought, floods etc. and impacting railway lines, sewage system, power transmission lines, employee health & safety and more thus leading to increase in cost of production towards mitigating these potential impacts.

Our customers are increasingly looking to source responsibly, which is reflected in the demand for low-carbon products. For example, auto makers



have expressed their desire to procure low carbon aluminium for decarbonizing their products and value chains. Looking at such trends in the market, we have to be prepared to cater to evolving customer needs and capitalize on the opportunities they bring.

Our permits and statutory clearances, brand value, and ability to borrow or obtain insurance on just terms, are increasingly determined by climate action and regulations around climate change

across the globe. For example, regulatory compliances for Vedanta Aluminium may arise due to international mechanisms such as CBAM (Carbon Border Adjustment Mechanism).

The Indian Government is also encouraging businesses for greater efforts towards tackling climate change. This could materialize by way of stringent regulations with potential cost impact on our operations.

**The following framework guides our strategy:**



**Reduce carbon footprint across our value chain:**

We have set an ambitious target to be Net Zero Carbon by 2050, and by 2030 we aim to reduce the GHG intensity of our operations by 28% from 2021 baseline. We are also working with our customers and logistics partners to reduce downstream Scope 3 emissions of our business.



**Capitalize on opportunities provided by transition to low-carbon economy:**

We produce metals that are essential for the world's transition to a low-carbon economy. We have launched India's first low carbon aluminum, branded Restora and Restora Ultra, towards this.



**Policy and governance for internal carbon pricing:**

Vedanta Aluminum has integrated carbon pricing in our investment decision making. We have implemented shadow prices to redirect new investments and promote clean technologies, low-carbon solutions and renewable energy projects.



**Support climate resilience:**

We are working proactively to make our operations and support our neighboring communities to become resilient against the physical impacts of climate change. We are incorporating various climate-related risk scenarios into our project design.



### **Vedanta Group's 10 Net Zero Commitments**

1. Net Zero Carbon by 2050 or sooner
2. Use 2.5 GW of Round-The-Clock (equivalent) renewable energy and reduce absolute emissions by 25% by 2030 from a FY 2021 baseline
3. Aim to spend US\$5 billion over the next 10 years to accelerate the transition to Net Zero Carbon
4. No additional coal-based thermal power and use of coal-based power only till the end of the existing power plants' life
5. Decarbonize 100% of our Light Motor Vehicle (LMV) fleet by 2030 and 75% of our mining fleet by 2035
6. Commit to accelerate adoption of hydrogen as fuel and seek to diversify to hydrogen fuel or related businesses
7. Ensure all our businesses account for their Scope 3 GHG emissions by 2025
8. Work with long-term Tier 1 suppliers to submit their GHG reduction strategies by 2025 and align with our commitments by 2030
9. Disclose our performance in alignment with Taskforce on Climate-Related Financial Disclosures (TCFD) requirements
10. Help communities adapt to the impacts of climate change through our social impact/CSR programs

### **Aluminium Sector's Climate Management Commitments**

1. Identify and integrate climate related risks and opportunities as part of business risk management process
2. Become a Net Zero Carbon organization by 2050
3. Reduce Scope 1 and Scope 2 emissions intensity for aluminium business by 14% and 28% by 2025 and 2030 respectively over 2021 as baseline. And reduce Scope 3 emissions intensity for aluminium sector by 25% by 2030 over 2021 as baseline.
4. Increase the quantum of renewable energy consumption at our operations to 7% and 30% from our total power consumption until 2025 and 2030 respectively, as part of our decarbonization journey. This will be achieved by entering into PDA and using of 400 MW of renewable energy by 2025 and 1500 MW of renewable energy by 2030.
5. Support climate resilience actions in our neighboring communities
6. Increase disclosures on climate-related risks and opportunities for our stakeholders



# Scenario analysis

This section presents scenario analysis carried out for our business using the World Bank's Climate Change Knowledge Portal which takes into consideration future business risks and opportunities.

We worked with a reputed consulting firm to articulate the key climate related risks that will be faced by each of our business units between the time period 2020-2060, by estimating the degree, and financial impact of those risks. The analysis helped us intertwine the aforementioned risks and opportunities with strategic decision making for all plausible futures, and consequently integrate resilience into our business operations.

Following the release of recommendations by TCFD in 2017, this is our first TCFD-aligned report: TCFD Report 2021-22. The scenarios presented in this report are in lines with the IEA scenarios- Sustainable Development Scenario and Net Zero 2050. The IEA data offers crucial insights into the

world's energy demand and supply under various scenarios, as well as the implications for energy security, climatic goals, and economic growth. This has been additionally analysed by an expert third party for deeper insights pertinent to Vedanta's Aluminium Business.

The analysis includes two future climate change scenarios, based on IPCC Representative Concentration Pathways (RCPs) and informed by the TCFD technical guidelines (June 2017)

- 1. High Climate Change Scenario (RCP 8.5):**  
Continuation of business as usual with emissions at current rates. This scenario is expected to result in global warming in excess of 4 degrees Celsius by 2100.
- 2. Moderate Climate Change Scenario (RCP 4.5):**  
Strong mitigation actions to reduce emissions to half of current levels by 2080. This scenario is more likely than not to result in warming in excess of 2 degrees Celsius by 2100.



# Climate change related physical risk analysis to business

Climate change is expected to pose both acute physical risks in terms of extreme weather events such as drought, flood and cyclones as well chronic physical events such as rise in temperature, mean sea level, change in precipitation levels and more.

Vedanta Aluminium has conducted scenario analysis using location specific data and tools such as the World Bank Climate Change Knowledge Portal, World Resources Institute (WRI) and National Oceanic and Atmospheric Administration's International Best Track Archive for Climate Stewardship (NOAA IBTrACS) to study historical trends and project future scenarios for analysing climate-related business risks.

As part of the physical risk assessment for the business, several acute risks were identified which can potentially arise due to the continuously changing climate conditions and have shorter durations. Chronic risks arising due to longer term changes were also studied, and these include the entire spectrum – from upstream disruption of critical inputs to downstream disruption of logistics

and value delivery.

We studied historical trends and future projections of various climate hazards such as change in temperature, change in precipitation, floods, droughts, and cyclones, to understand how the changing climate may impact our different business locations. For future hazard trends, two future climate change scenarios based on IPCC Representative Concentration Pathways (RCPs) were used:

We conducted an analysis under difference scenarios i.e. RCP 4.5 and RCP 8.5 to understand potential impact of climate change on temperature and rainfall pattern at our operational units. It is understood that our operations could be subjected to acute and chronic physical risks arising from climate change. These risks include exposure to cyclones, drought, and rise in mean temperature levels, flood and rainfall. The degree to which each risk will have an influence on the business would be based on the geographical locations and the pace with which the world will successfully attain the goal of net zero.





**Table 1: Climate related business risks with qualitative and quantitative impacts on business operations**

Risk Element	Type	Potential impacts	Measures	Action items
Cyclones	Acute Risk	<ul style="list-style-type: none"> <li>• Typical failures in the infrastructure</li> <li>• Increased injuries and/or fatalities due to flying debris/objects amidst a cyclone</li> </ul>	Cyclone resistant construction/ cyclone shelters	Installation of cyclone resistance infrastructure and shelters with dynamic design procedures as per approved building code
Drought/ Flood	Acute Risk	<ul style="list-style-type: none"> <li>• Water crisis during drought situation for plant operation, drinking water etc.</li> <li>• Failure of cooling systems during dry periods</li> <li>• Mines, smelters and refinery flooding risk</li> </ul>	<ul style="list-style-type: none"> <li>• Water recycling and reuse; water harvesting, conservation and ground recharge structures</li> <li>• Climate smart infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Installation of water efficient equipment / processes</li> <li>• Development of greywater recycling unit and rainwater harvesting units</li> <li>• Creation of community water storage and rainwater harvesting infrastructure</li> <li>• Promotion of climate-smart agriculture and infrastructure</li> </ul>
Temperature fluctuations and/ heat waves	Chronic Risk	<ul style="list-style-type: none"> <li>• Temperature variability impacting our plants and staff productivity</li> <li>• Extreme weather events can destroy transmission lines and consequently lead to power outage</li> </ul>	Heating, ventilation, and air conditioning, power storage	<ul style="list-style-type: none"> <li>• Providing heating, cooling, ventilation and air conditioning</li> <li>• Power storage system</li> </ul>
All Risks	Chronic Risk	<ul style="list-style-type: none"> <li>• Employees and business partners</li> </ul>	Provision of shelter and resilient assembly places for staff in case of climate or industrial disasters	<ul style="list-style-type: none"> <li>• Climate resilient infrastructure</li> <li>• Awareness on climate related risk and training/ to mitigate and adapt to those risks</li> </ul>

# Climate related transition risks analysis to the business

As countries and organizations around the world rapidly transition towards a low carbon economy, companies in hard to abate industries are likely be challenged with several transition risks pertaining to policy and regulations, technology, markets, reputation risks.

We have conducted the transition risk scenario analysis using five of the Network for Greening the Financial System (NGFS) reference scenarios that covers three aspects of the matrix (i.e., orderly, disorderly, and hot house world). The transition risk scenario analysis is done in-line with IEA B2DS and Net Zero 2050 scenarios, which helps to analyse the risks and develop appropriate strategies to comply with the changing market structure and policies. For the transition towards low carbon economy, we use five scenarios from NGFS : Current Policies Scenario, Nationally Determined Contributions (NDCs) Scenario, below 2°C Scenario, Delayed Transition Scenario and Net Zero 2050 Scenario. The transition pathways for the NGFS scenarios used in our study have been generated using a well-established integrated assessment model. These are differentiated by several key design choices relating to long-term temperature targets, net-zero targets, short-term policy, overall policy coordination and

technology availability.

Apart from this we have also performed sensitivity analysis to understand the impact of climate change on our business profitability due to potential decrease in water availability. The sensitivity analysis takes into account increase in water tariffs and needs of local population. Over the past few years, we have worked intensively to integrate scenario analysis and implement adaptation measures into our operations. While the adaptation measures will not completely negate the negative impacts of climate change; they will significantly reduce the residual impacts due to extreme climate events.

Our climate change stress and scenario analysis have also helped us understand potential long-term financial impact and opportunities arising for our business due to potential capital expenditures necessary to replace damaged assets that may lead to increased operational or maintenance costs, etc. We have estimated investment and cost-saving potential for implementation of adaptation measures with the help of third-party experts and we see potential to reduce these risks and the associated potential financial impact.



**Table 2: Transition risks with impacts on business operations analysed through scenario analysis**

Type of risk	Climate-related risks	Potential impacts
Policy and Legal	<ul style="list-style-type: none"> <li>Emerging Regulations: Increasing regulation around greenhouse gas emissions such as Perform, Achieve, Trade (PAT) scheme and Renewable Purchase Obligations (short-term).</li> <li>Carbon Pricing: Introduction of carbon emissions trading mechanisms (long-term)</li> <li>Reporting Obligations: Enhanced emission-reporting obligations in accordance with the Paris Agreement, will push for higher accountability for the Private Sector</li> <li>Litigation: Exposure to litigation can be for numerous reasons such as non-compliance with reporting, negative impacts to climate change/ environment, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Increased operational costs (higher compliance costs, increased insurance premium)</li> <li>In case of a domestic carbon tax or Emission Trading System (ETS) in India, the more Unit emits, it will be subjected to greater levels of carbon taxation</li> <li>Impact through increased costs and/ or reduced demand for aluminium products resulting from environmental fines and judgments</li> <li>Increase in local and national reporting requirements</li> </ul>
Technology	<ul style="list-style-type: none"> <li>Low Carbon Product Substitution: The London Metal Exchange (LME) has proposed to introduce LME Passport which specifies carbon footprint of produced aluminium. There is an increasing trend in consumer market for low carbon or 'green' aluminium as consumers look to source responsibly.</li> <li>Costs to transition to lower emission technology</li> </ul>	<ul style="list-style-type: none"> <li>Increased research and development (R&amp;D) expenditures in new and alternative technologies such as low carbon aluminium, or for recycling technologies, greater adoption of electric vehicles and utilization of renewable sources for electricity etc.</li> <li>Costs to adopt/ deploy new practices and processes by changing the current functioning of the company.</li> </ul>
Market	<ul style="list-style-type: none"> <li>Changing consumer behavior due to the Paris Agreement and the European Green Deal</li> <li>Carbon Border Adjustment Mechanism (CBAM) can lead to higher taxes on aluminium goods exported into the European Union</li> <li>Increased cost of raw materials</li> </ul>	<ul style="list-style-type: none"> <li>Reduced demand for aluminium with higher carbon footprint due to shift in consumer preferences</li> <li>Increased production costs due to changing input prices (energy, water) and output requirements (waste treatment)</li> </ul>
Reputation	<ul style="list-style-type: none"> <li>Stigmatization of industrial sectors such as those highly contributing to GHG emissions</li> <li>Shift in interest of the investors</li> </ul>	<ul style="list-style-type: none"> <li>Reduced revenue from decreased demand for goods with higher carbon footprint</li> <li>Reduced revenue from decreased production capacity (supply chain interruptions)</li> <li>Fines and non-compliance, which might ultimately affect the reputation of the company, which will impact access to financing and insurance policies.</li> </ul>



## ► STRATEGY

# Climate related transition opportunities

The transition to a low carbon economy will be metal intensive, with base metals like aluminium playing a critical role in clean technology solutions. The pace of transition required for capping global warming at 1.5 degrees Celsius will require the metals and mining industry to grow much faster to cater to the emerging demand. And at the same time, this growth must happen sustainably, so as not to add to the carbon burden. The transition from fossil fuels to renewable power, batteries and fuel cell for energy storage, electric mobility, green buildings & infrastructure, green hydrogen, closed loop recycling/circular economy, etc., will keep the demand for metals such as aluminium high. And therefore, as one of the world's leading aluminium producers, we need to grow fast while decarbonizing our business and products, to prepare for this future.

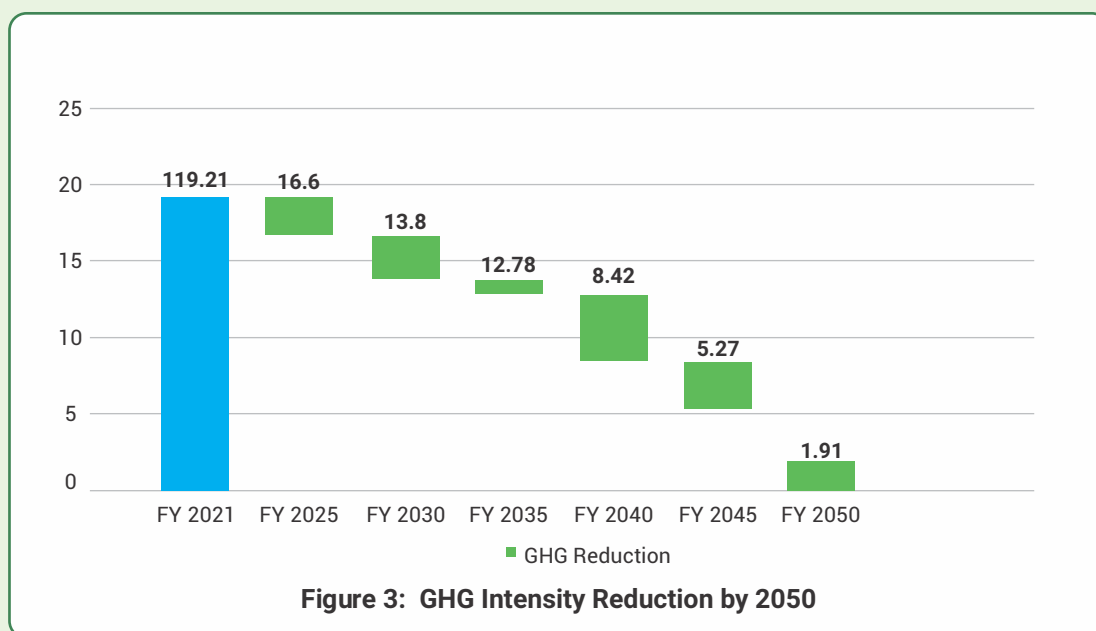
In FY22, Vedanta Aluminum launched 'Restora', its

low carbon aluminium brand. The name Restora symbolizes our endeavours to restore the green balance by producing sustainable aluminium products with a low carbon footprint. We are the first Indian Company to offer low carbon aluminium to customers worldwide looking to source responsibly. Under Restora, we are offering two product lines – Restora (low carbon aluminium) and Restora Ultra (ultra-low carbon aluminium). This line of products are produced using renewable energy. Restora Ultra products are made with aluminium recovered from dross (a by-product of aluminium smelting), through our partnership with Runaya Refining, a fast-growing start-up engaged in providing circular economy solutions to the manufacturing industry. With Restora and Restora Ultra, our customers have the assurance that the aluminium they purchase have amongst the lowest carbon footprints in the world.



## ► RISK MANAGEMENT

# Our decarbonization roadmap



**Table 3: Phase wise action plan for GHG intensity reduction**

FY 2025	FY 2030	FY 2035	FY 2040	FY 2050
Increasing potline energy efficiency through pot graphitization, smart pot controllers, ready to use cathodes, voltage reduction and auxiliary power reduction.	Biomass co-firing up to 5% in 135 MW power plants at BALCO and Jharsuguda respectively	Commencement of inert anodes and wetted cathode usage at our smelters	Continue shift to inert anodes and Wetttable cathodes	100% of anodes to be inert anodes and cathodes to be weighted cathode
Power plant efficiency improvement through annual overhauling and capital overhauling, variable frequency drives (VFD) on auxiliary pumps and fans.	Total 1500 MW of renewable power purchase for our smelter at JSG & BALCO.	Commence Battery backup for storing the RE power at operations.	Explore hydrogen fuel for calciner at alumina refinery	100 % power from RE power at smelters
Shift calciner operations from oil to natural gas at our alumina refinery.	Natural gas at our BALCO and Jharsuguda plants at Cast house & back oven plant.	Additional renewable power capacity for our smelter.		
Enter into PDA and use of 200 MW and 180 MW renewable power for our aluminium smelters at BALCO and Jharsuguda plants respectively.	MoU & pilot trial of inert anodes and wetted cathode usage at our smelters			

## ► RISK MANAGEMENT

# Reducing carbon footprint across the value chain

Vedanta Aluminium recognizes that the path to Net Zero Carbon will require equal focus on our value chain, beyond our own operations.

While we cannot unilaterally drive reductions within the value chain, to bring down our Scope 3 emissions (which are emitted across our value chain), we intend to work closely with our value chain partners for reducing their emissions. In FY21-22, we have initiated reporting material Scope-3 emissions for our value chain. As a part of our commitment to Net Zero Carbon by 2050, we

plan to decarbonise our supply chain by 2050 to the extent possible and offset the remaining GHG emissions. Our Scope 3 emission is about 13.9 % of the overall emission. While we are not required to set Scope 3 emission reduction targets immediately, we are working proactively towards the same by exploring sourcing of raw material from proximal sources by shifting gradually to rail transport from road transport, etc. We aim to reduce our Scope 3 emissions intensity by 10 % and 25 % by FY 25 and FY 30 respectively over FY 21 baseline.





## ► RISK MANAGEMENT

# Our climate management initiatives

### Ash transportation using rails

Coal-based power plants are the primary source for India's energy security. Burning of coal results in ash (fly and bottom ash), which is a voluminous byproduct generated by the thermal power industry. The Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India, in its latest draft notification published on 31st December 2021, mandates Thermal Power Plants (TPP) to utilize 100% of ash generated along with un-utilized accumulated ash (legacy ash). Fly ash finds usage primarily in cement production, manufacturing of bricks & tiles, construction of

roads. Both of our aluminium smelters are working towards 100% utilization of ash, including legacy ash, through gainful avenues. Both of our smelter have commenced operations to transport ash by BOXN rakes since November 2021.

Fly ash rake off-take has been a milestone moment in our circular economy endeavors, for it ensures evacuation in large volumes, brings down outbound logistics pollution and has given us cost savings of up to 30%.

### Biomass usage

Biomass has traditionally been an important energy source in India, considering its many benefits. It is renewable, widely available, carbon- neutral and has the potential to provide significant employment in the rural areas.

Our commitment of Net Zero Carbon operations by

2050, will see us increase consumption of biomass as part of our Fuel Switch program. We have already initiated pilot projects at our BALCO, Jharsuguda and Lanjigarh sites to test feasibility of biomass through co-firing in our thermal power plants with a target of using 5% biomass in our thermal power plants.

### Support for appropriate carbon pricing policies

India aims to achieve its goal of Net Zero Carbon by 2070, and we have pledged to do so by 2050. World over, actions are being taken globally in all areas of society and the economy to combat climate change and accelerate economy-wide decarbonization. Putting a price on carbon generation is shaping up to be an effective tool for providing positive reinforcement to decarbonization efforts.

Internal Carbon Pricing helps companies internalize the cost of emissions and analyse any risks or opportunities associated with climate change. While there are different perspectives on forecasting the future financial implications of implementing carbon costs, we assume that the adoption of carbon pricing will increase globally. Potential adoption of regional and/ or global carbon

price could impact our business adversely. To resolve the same, we are working on introducing shadow carbon price to better understand the risks and devise capital investments accordingly.

The Group, after careful evaluation, has implemented a shadow carbon price of USD 15 per tonne of CO<sub>2</sub> emissions. Being a part of the Vedanta group, the aluminium sector follow the same carbon pricing as that of the price set by the group. However, we are also working on setting an Internal Carbon Price for the sector. Furthermore, we also plan to incorporate carbon price in ROI estimation of projects that will help us in accelerating our investments in energy efficiency, renewable energy and other low carbon transition opportunities.

**Carbon pricing being factored in for our business decisions, we are better positioned to minimize our future climate related impacts.**

## Climate-smart agriculture

Under our strategic community development interventions, we are working with local farming communities, training them in climate-smart agriculture and watershed management activities. Through projects like 'Jeevika Samriddhi' and 'Mor Jal Mor Maati', we are introducing small and marginal farmers to efficient land & water management techniques, better resources, new technologies and expert consultation. We have also

conducted water sensitivity analysis this year at our operations to gauge the degree of water stress in the regions where we operate, so we can proactively take steps to mitigate the risks. We believe this integrated approach to climate-smart agriculture and watershed management will help generate better opportunities for our communities and make agriculture in our areas of operation climate resilient.



## ► METRICS & TARGETS

### Climate resilience

The physical impact of climate change is emerging at an unprecedented rate around the world, threatening to unravel decades of hard-won sustainable development gains. And economic losses from these disasters continue to rise, hitting the poor and most vulnerable, the hardest. We periodically assess the exposure of our assets to the extreme climate events and consistently improve the resilience of our climate adaptation measures against these natural disasters. The efforts to prepare for and manage these risks have to be both innovative and effective.

Our BUs are working with neighbouring communities and governments to promote climate resilient practices such as climate resilient agriculture, rainwater harvesting, disaster and emergency response plan, etc. We are also supporting climate resilient infrastructure like providing shelter and resilient assembly places in case of any calamities

and providing awareness and training on same. In view of the increasing unpredictability and frequency of rains in various parts of India, we have also conducted Flood Risk Assessment studies through hydrological modelling at our operations. The assessment helped us understand all possible risks associated with potential extreme rainfall events, check adequacy of existing plant drains, expand drainage network as required and develop emergency measures to manage extreme rainfall events. We have since then been able to de-bottleneck the drainage system to minimize consequences of heavy rainfall events on our operations, in the future. We have planned and developed Integrated Watershed Management Program for our operational areas in public consultation with communities, panchayat, NGOs and government bodies. This will not only support the communities at times of excess rainfall/droughts but also ensure availability of water.

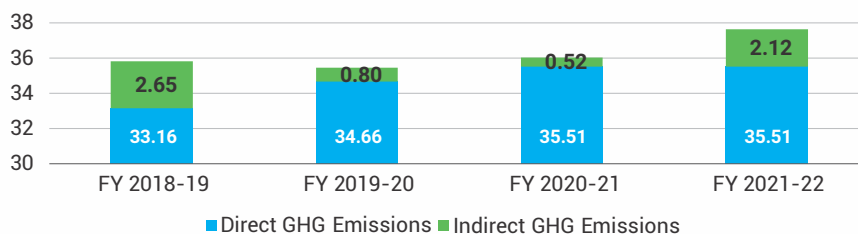
#### Our climate related metrics, targets and performance

Vedanta Aluminum has set a long-term goal of becoming Net Zero Carbon by 2050, in line with the Paris Agreement. Achieving this objective requires reducing the operational emissions (Scope 1 and 2) as well as Scope 3 emissions (indirect emission sources in value chain). We aim to achieve 14%

GHG intensity reduction by FY 2025 and 28% by FY 2030 over FY 2021 as the baseline year. In addition, we have also aimed at 10% and 25% reduction in Scope 3 emissions intensity, by FY 2025 and FY 2030 respectively, from FY 2021 baseline.

#### Scope 1 and 2 emissions:

**Figure 4: Scope 1 and Scope 2 GHG Emissions for AL Business  
(Million MT of CO<sub>2</sub> Equivalent)**



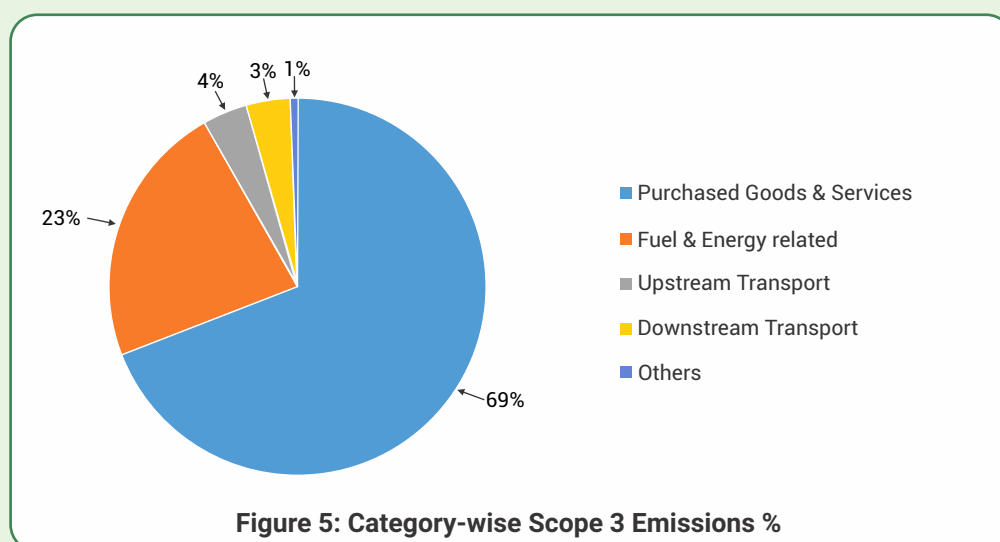
In FY22, the total GHG emissions from our Aluminum Business were around 37.64 million tCO<sub>2</sub>e, of which 35.51 million tCO<sub>2</sub>e were from direct GHG emissions (Scope 1) and 2.12 million tCO<sub>2</sub>e were from indirect GHG emissions (Scope 2).

We have achieved our previous target of 24% intensity reduction from FY12 baseline against target timeline of FY 2025 this year itself, which reflects- that our efforts are in the right direction.

## Scope 3 emissions

Given the nature of our operations, Scope 3 emissions include many activities which occur beyond our operational boundaries. The following Scope 3 categories are material to our business. This year we estimated scope 3 emissions from our value chain as summarized below.

Total Scope 3 Emissions (tCO2e)	67,83,289
Category 1- Purchased Goods and Services	46,78,298
Category 2- Capital Goods	2,232
Category 3- Fuel and Energy Related	15,48,651
Category 4- Upstream Transport	2,64,171
Category 5- Waste in operations	35,800
Category 6- Business Travel	172
Category 7- Employee Commute	8,346
Category 9- Downstream Transport	2,45,621



**Figure 5: Category-wise Scope 3 Emissions %**

## PFC emissions

The primary aluminium production process is amongst the largest anthropogenic source of emissions of two perfluorocarbons (PFCs): tetrafluoromethane (CF<sub>4</sub>) and hexafluoroethane (C<sub>2</sub>F<sub>6</sub>). We had taken a target of capping PFC

emissions at 0.1 kg/metric tonne of aluminium produced. Our actual performance stood at 0.106 kg/metric tonne against target of 0.01 kg/metric tonne. We have further plans to reduce the same in future through process optimization and controls.

Location	UoM	FY 2019	FY 2020	FY 2021	FY 2022
Aluminium Sector	kg/tonne	0.151	0.160	0.103	0.106

While our aluminium production increased from 1.97 million MT to 2.27 million MT over the last one year, our GHG emission intensity reduced from 19.3 tCO<sub>2</sub>e/MT to 17.6 tCO<sub>2</sub>e/MT over the same time.



**Table 6: Our progress towards climate associated sustainability targets and goals**

Net Zero emission by 2050	Summary of progress in 2022	Target 2022	Target 2025	Target 2030
Scope 1+ Scope 2 GHG intensity	From 19.3 tCO <sub>2</sub> e/T in FY 21 to 17.6 tCO <sub>2</sub> e/T in FY 22 which is a reduction of 8.8% from previous year for our aluminium business. We have achieved our target of 24% intensity reduction from FY 12 baseline for our aluminium business Against target year of 2025. The GHG Intensity of Power business (IPPs) is 1.0 tCO <sub>2</sub> e/MWH. We are now taking new targets based on FY 2021 baseline.	18.2 tCO <sub>2</sub> e/T from 19.3 tCO <sub>2</sub> e/T in FY 21 baseline for our aluminium business.	16.6 tCO <sub>2</sub> e/t from 19.3 tCO <sub>2</sub> e/T in 2021 leading to around 14% intensity reduction from FY 21 baseline for our aluminium business.	13.8 tCO <sub>2</sub> e/T from 19.3 tCO <sub>2</sub> e/T in FY 2021, a reduction of 28% for our aluminium business.
Scope 1 + Scope 2 Absolute emission	VAL: 29.7 million tCo2e BALCO: 12.28 million tCO <sub>2</sub> e The absolute emission for power business (IPPs) is 4.42 million tCO <sub>2</sub> e.	The target for VAL was 31 million tCo2e. BALCO target was 12.05 million tCO <sub>2</sub> e	Vedanta Aluminium's target is 38 million tCo2e	Vedanta Aluminium's target is 31 million tCO <sub>2</sub> e
Scope 3 emission	Absolute Emission: VAL: 5.5 million tCo2e BALCO: 1.2 million tCO <sub>2</sub> e Emission Intensity: VAL: 3.49 tCO <sub>2</sub> e/ T of AL BALCO: 2.12 tCO <sub>2</sub> e/ T of AL	Estimation of Scope 3 emission for the business.	10% reduction in Scope 3 emission intensity from FY 21 baseline for aluminium sector.	25% reduction in Scope 3 emission intensity from the FY 21 baseline for aluminium sector.

Table 7: Our progress towards climate associated sustainability targets and goals				
Net Zero emission by 2050	Summary of progress in 2022	Target 2022	Target 2025	Target 2030
100% Renewable Energy by 2050	<p>3% of total energy procured across all our BUs was renewable energy</p> <p>3 billion units of renewable energy consumed</p>	2.5% of power requirement of the Sector to be met through renewable energy	<p>7% of power requirement of the Sector to be met through renewable energy</p> <p>Enter into PDA for and use of 400 MW of RE power</p>	<p>30% of power requirement of the Sector to be renewable energy</p> <p>Enter into PDA and use of 1500 MW of RE power</p>
Achieve climate resilience and adaptation for business operations and communities	Completed debottlenecking of drains and plant infrastructure at BALCO based on flood analysis and hydraulic modelling done in previous years.	Initiate debottlenecking of drains and plant infrastructure at Jharsuguda based on studies	Work with community in 25 villages supporting integrated watershed management projects across the Sector	Work with community in 50 villages supporting integrated watershed management projects across the Sector



# Forward-looking Statement

According to the Task Force on Climate-related Financial Disclosures (TCFD): "A scenario describes a path of development leading to a particular outcome. Scenarios are not intended to represent a full description of the future, but rather to highlight central elements of a possible future and to draw attention to the key factors that will drive future developments. It is important to remember that scenarios are hypothetical constructs; they are not forecasts or predictions, nor are they sensitivity analyses."

Projecting future scenarios and factors influencing climate change is a work in progress and there may be multiple challenges in predicting how the path may unfold in the future. The current analysis can help us understand the risks and opportunities; however, they may change over time and the actual

impact may differ measurably from those predicted in this report. All statements other than statements of historical facts in this report (such as previous years' data etc.) are forward looking statements. Such statements have an unknown and uncertain factor to it that might result in deviation from the future results described in the report. Many political, environmental, regulatory, market, technological, economic factors on a global level can lead to such differentiation. Therefore, it is important to take notice that these statements include assumptions. This report is a work in progress due to limited data availability, but we have an opportunity to improve on aspects like scenario analysis and stress testing. This will help us in building more robust mechanisms, minimising uncertainties and making important decisions towards our decarbonization strategy and its implementation.







**aluminium**

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