

Natural Capital



Enriching Lives by Fostering a More Sustainable Future

At Hindalco, our unwavering commitment to enriching lives is intricately woven into our sustainability efforts. We firmly believe in creating a greener future, and to achieve this, we are committed to attaining our environmental goals. Our ESG commitment is deeply ingrained in our strategic priorities, which drive positive change and make a lasting impact on the planet. We have emerged as a leader in the Aluminium industry for the third consecutive time in the S&P Global Corporate Sustainability Assessment (2022 ESG Score 83/100).

We are steering our journey towards achieving environmental excellence by integrating sustainable practices across our operations and taking conscious steps to minimise the impacts on the environment.

Focus Areas

Net Carbon Neutrality	Water Positivity and Zero Liquid Discharge	Circular Economy & Recycling
Zero Waste to Landfill	Sustainable Mining	No Net Loss to Biodiversity

Key Highlights

Specific GHG emissions for aluminium*

▼ 20 %
(from base year 2011-12)

Waste utilisation – an increase of 8% points from FY2020-21

88 %

Specific freshwater consumption for aluminium operations*

▼ 6 %
(baseline FY 2018-19)

Trees planted in FY2022-23*

417,873

Renewables capacity in execution*

~71 MW

Specific energy consumption for aluminium*

▼ 19 %
(from base year 2011-12)

Zero Waste to Landfill sites

5

Wastewater recycling in aluminium operations*

22.67 %

Cumulative green cover*

5,460 acres

Spent on waste utilisation initiatives*

₹356.77 Crore

*The details provided are for India Operations | ▼ Reduction

Contributions to SDGs



Interlinkages with material topics and other capitals

Material topics

- ▶ Energy and GHG Management
- ▶ Waste and Hazardous Materials Management
- ▶ Water Management
- ▶ Air Emissions
- ▶ Biodiversity
- ▶ Compliance Management

Capitals connected

- ▶ Financial Capital
- ▶ Manufactured Capital
- ▶ Intellectual Capital
- ▶ Human Capital
- ▶ Social and Relationship Capital

Key Risks and Opportunities addressed

R1	Increased focus on decarbonisation	R7	Shareholders/ lenders focus on ESG
R5	Solid waste management	R9	Changes in the regulatory requirements
R6	Depletion of natural resources		

Alignment with Strategic Priorities

SP-3 Strong ESG Commitment

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Environment Management

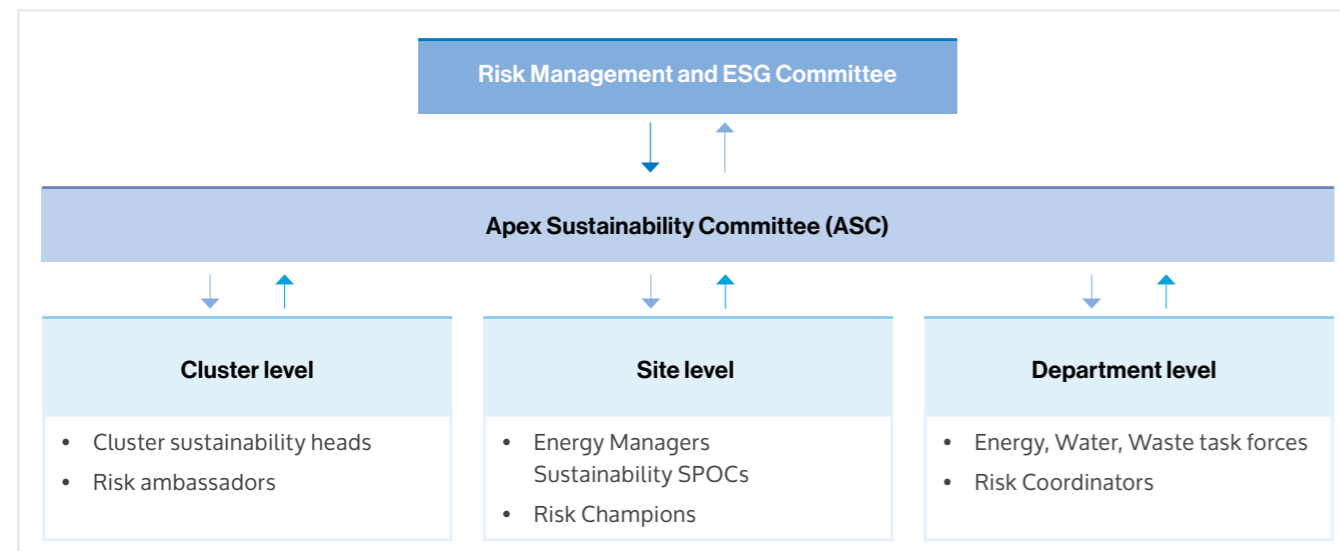
Robust governance is imperative for environmental sustainability and helps us to manage our resources effectively and comply with laws and regulations.

At Hindalco, we have implemented a multi-tiered environmental governance structure that enables effective management of the environment across various levels. At the top is the Risk Management and ESG (RM & ESG) committee, which includes the Board of Directors and Managing Director, who provide strategic guidance to improve environmental performance.

The Apex Sustainability Committee (ASC) is responsible for driving sustainability across Hindalco. It comprises the Chief Risk Officer, Chief Sustainability Officer, Chief Technology Officer, and Head of Energy and Green Energy. Every quarter, the ASC provides the RM & ESG committee with a report on environmental performance.

Additionally, we have established specialised teams at the cluster, corporate, department, and site levels to drive sustainability projects.

Environmental Governance Structure



Robust governance helps us to manage our resources effectively and comply with laws and regulations.

We periodically conduct climate risk assessments in alignment with Task Force on Climate-related Financial Disclosures (TCFD). The details of the latest assessment is provided in [Hindalco's Task Force on Climate-related financial disclosure report FY2021-22](#).

Our [Environment Policy](#), [Sustainability Policy](#), [Biodiversity Policy](#), and [Energy & Carbon Policy](#) serve as the foundation to achieve excellence and address the challenges faced in minimising environmental impact.

Through these policies, we also adhere to all the applicable laws and regulations. We conduct Environmental Impact Assessment (EIA) for the new operations.

To enhance environmental performance, we have adopted robust environmental systems and practices. All our operations in India are ISO 14001: 2015 certified. 80% of Novelis' operations are EMAS certified, with additional seven sites audited internally as part of the ESG audit by the corporate team. In addition, four Hindalco and 17 Novelis sites have received certification for Aluminium Stewardship Initiative Standards.

To prioritise environmental initiatives, at Hindalco, we allocated ₹453.98 Crore in capital expenditure and ₹691.25 Crore in operational expenditure in FY 2022-23. At Novelis, we invested ₹8.03 Crore (US\$1 million) in capital expenditure and ₹144.58 Crore (US\$18 Million) in operational expenditure for environmental management. These investments led to cost savings of ₹155.64 Crore.

Building Resilience

As a prominent manufacturing Company, we are fully aware of the influence our business has on the environment. We acknowledge the impact of climate change and have integrated climate change considerations into business strategy, operations, and financial decision-making.

To understand the effect of climate change on our business, we conducted a detailed analysis considering various scenarios.

We used the Representation Concentration Pathways (RCP) scenarios by Intergovernmental Panel on Climate Change (IPCC) to evaluate physical risks, such as the effects of changes in temperature and precipitation at our sites.

Further, we have considered IEA scenarios developed by International Aluminium Institute (IAI) to analyse potential transition risks. This analysis has helped us to identify climate-related risks, steps to mitigate them and seize opportunities for the future.

We leverage climate change mitigation and adaptation efforts to our advantage, as they offer benefits such as improved resource efficiency and cost savings. By adopting low-emission energy sources and manufacturing products with a low carbon footprint, we align with the sustainability needs of our customers.

Embracing such green business opportunities also opens doors to new markets and enhances supply chain resilience. We have integrated these opportunities into our business strategy.

INTERNAL CARBON PRICING

At Hindalco, we have implemented an Internal Carbon Pricing (ICP) framework to associate the cost for each MT of CO₂e emitted from our operations.

After carrying out a technical analysis, we calculated the price based on the shadow pricing method. We have finalised the price of \$31 (₹2,489.92) for 2021-2030, \$43 (₹3,453.76) from 2031-2040 and \$59 (₹4,738.88) for 2041-2050.

At present, we are considering Scope 1 and 2 emissions for pricing. ICP is integrated into our investment decisions and helps in the selection of projects with lesser emissions and higher cost savings.

With the existing and upcoming regulations on carbon emissions, it will help us address climate related-risks and opportunities.

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Decarbonisation Strategy

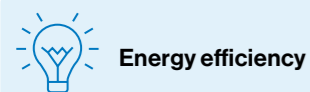
Aluminium is a vital commodity because of its applicability in various sectors, yet manufacturing it is carbon-intensive and reducing emissions is an arduous task. We recognise our responsibility in expediting the transition to a carbon-free society given the growing awareness of climate change and the efforts being made to mitigate the impacts of global warming.

At Hindalco, we have developed a well-defined decarbonisation plan, and we are committed to achieving Net Carbon Neutrality by 2050. In addition, we have set a target to reduce specific greenhouse gas (GHG) emissions by 25% by FY 2024-25, measured against the base year FY 2011-12.

For our Novelis operations, we plan to reduce the absolute carbon footprint by 30% by FY 2026 and 100% by 2050 against the base year FY 2016. Further, we aim to reduce energy intensity by 10% by FY 2026 against the base year FY 2020.

Energy efficiency, a shift in the energy mix with the use of renewables and low carbon fuel, and electrification of some of the thermal processes such as steam generation, recycling, Carbon Capture, Utilisation, and Storage (CCUS) and carbon offsets are some of the levers that we have considered for the decarbonisation journey.

Reduction of Energy intensity through



Energy efficiency



Recycling



Renewable Energy



Hydrogen and CCUS



We are continuously implementing innovative technology solutions and creative efforts to improve energy efficiency and have increased the amount of renewable energy in our portfolio.

By 2025, we aim to achieve 300 MW of renewable capacity of which 200 MW will be without storage and 100 MW with storage. We are researching the market for green hydrogen and exploring options for utilising captured CO₂ and intend to take up a pilot Carbon Capture project.

Since secondary aluminium requires less energy than primary aluminium, we are enhancing our existing recycling capabilities in Novelis operations. Our commitments and the initiatives taken demonstrate our dedication to mitigating climate change and transitioning to a sustainable future.

ERASE: Energy Reduction and Sustainable Engineering

ERASE is one of our initiatives that focuses on the technology landscape, roadmap and partnering with start-ups and established innovators in the sustainability realm. We will pilot small-scale demonstrators for feasibility analysis and scale them to commercial impact. Key focus areas of the collaborations are CCUS, waste heat recovery and energy reduction. ERASE will facilitate the evaluation, development and piloting of new technologies and methodologies to provide technologically sound and field-proven solutions for global implementation in Novelis operations.

This has been instrumental in laying the blueprint for the long-term decarbonisation strategy by providing a technical lens to Novelis operations. It has supported business case development for CCUS strategy for decarbonisation in our new plant being installed and energy reduction analysis for the North America facility.

Energy Management

At Hindalco, we recognise that energy plays a significant role in our operations hence, we regularly monitor the energy performance at all our sites. The Energy Managers and Energy Task Force are responsible for monitoring and identifying initiatives to improve energy efficiency and minimise losses.

We also conduct regular audits to track the progress against our targets and commitments.

To enhance our performance, we have established effective and efficient energy management systems at all our operations. A total of six large upstream plants are ISO 50001- Energy management system certified, and the certification of one plant is in progress.

In FY 2022-23, Hindalco and Novelis consumed 312.90 Million GJ of energy. The rise in energy consumption was due to an increase in production volume and ongoing organic expansions. Of the total energy consumed at Hindalco, 96% was

consumed by aluminium operations and 4% by copper operations. In the reporting period, Novelis operations consumed 38.01 Million GJ of energy, which is 4% less than FY 2021-22.

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Energy Consumption (Million GJ)

Year		Renewable Energy	Non-Renewable Energy	Total
FY 2019-20	Hindalco	0.23	272.73	272.96
	Novelis	-	30.51	30.51
	Total	0.23	303.24	303.47
FY 2020-21	Hindalco	0.28	254.90	255.18
	Novelis	-	37.28	37.28
	Total	0.28	292.18	292.46
FY 2021-22	Hindalco	0.59	270.21	270.80
	Novelis	-	39.69	39.69
	Total	0.59	309.90	310.49
FY 2022-23	Hindalco	0.91	273.97	274.88
	Novelis	-	38.01	38.01
	Total	0.91	311.98	312.89

Energy Type (Million GJ)

Year		Fossil Fuels	Electricity Purchased	Renewable Energy Source	Steam/Heating/Cooling and other energy (Non-renewable) Purchased	Total Non-Renewable Energy (Electricity, Heating and Cooling) Sold
FY 2019-20	Hindalco	273.79	3.03	0.23	0.002	4.10
	Novelis	21.55	8.69	-	0.27	-
	Total	295.34	11.72	0.23	0.27	4.10
FY 2020-21	Hindalco	255.65	1.90	0.28	-	2.70
	Novelis	25.64	11.42	-	0.21	-
	Total	281.29	13.32	0.28	0.21	2.70
FY 2021-22	Hindalco	269.72	2.68	0.59	0.01	2.20
	Novelis	29.34	10.05	-	0.30	-
	Total	299.06	12.73	0.59	0.31	2.20
FY 2022-23	Hindalco	272.12	3.56	0.91	0.01	1.71
	Novelis	27.93	9.84	-	0.23	-
	Total	300.05	13.40	0.91	0.24	1.71

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Accelerating the Use of Renewable Energy

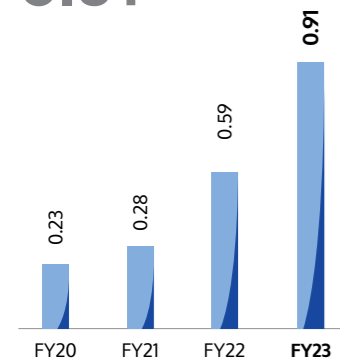
To expand our renewable energy portfolio and reduce the dependency on conventional sources, we have taken various initiatives at Hindalco. We have increased our renewable energy consumption by 54% as compared to last year.

Till FY2022-23, our renewable energy portfolio included solar, wind, hydroelectric and biomass-based projects, and their capacity stood at 108 MW. Some of the projects are:

- Biomass-based boiler at Belagavi to generate 4 MW of power and 33 TPH of process steam.
- 4.5 MW Hydel power plant dedicated to Taloja at Temghar
- 5 MW Wind Power plant at Taloja
- Co-firing of biomass in all our coal-based power plants
- 7.5 MW Solar plant at Mouda with battery storage

Renewable energy consumption (Million GJ)

0.91



We are in the process of adding another 71 MW of renewable energy to the mix. This includes 41 MW Hybrid (Wind + Solar) in Dahej and 30 MW of Hybrid

(Wind + Solar) in Belagavi. Other projects include a 9 MWp floating solar plant at Mahan and 2 MW of ground-mounted solar plant at Alapuram. A renewable

hybrid energy project with pumped hydro storage to deliver 100–300 MW of round-the-clock power is also being finalised.

BIOMASS POWER PLANT – JOURNEY TOWARDS GREEN ALUMINA

As part of our decarbonisation journey, we have commissioned a biomass power plant at Belagavi, having a 4 MW extraction-cum-back pressure steam turbine, 33 TPH boiler, 67.0 kg/cm² working pressure, water tube, patented lambion grate technology with heat recovery systems and Electrostatic Precipitator (ESP). The plant is equipped with a generation capacity of 24,120 MWh/year.

The incorporation of grate technology has helped in burning different types of loose biofuels without adversely affecting the efficiency of the boiler. Furthermore, this initiative has resulted in a reduction of ~17,300 MT of furnace oil, ~54,400 MT of annual CO and ~1,400 MT of SOx emission.

The initiative was the first of its kind in Hindalco and was awarded under CII's Most Innovative Project Category.

Energy Intensity

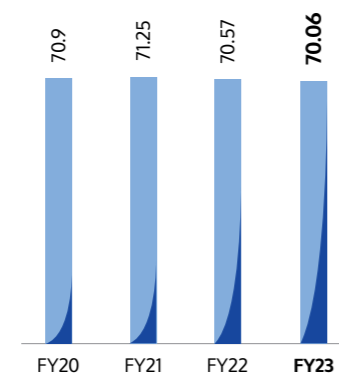
Specific energy consumption for our aluminium operations refers to the energy consumed per MT of primary aluminium produced in the smelter, alumina refinery, and anode plant operations. For copper operations, specific energy consumption refers to the energy consumed per MT of copper cathode produced.

Since FY 2020-21, we have achieved a 1.67% reduction in energy intensity for aluminium production and an impressive reduction of 24.45% for copper production.

At our India operations, the energy intensity with respect to turnover accounted for 3,575.54 GJ/₹Crore in the reporting period and 4,002.78 GJ/₹Crore in the previous year.

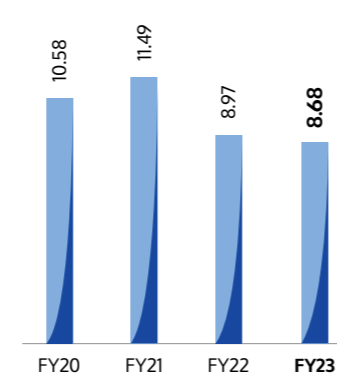
Energy Intensity Aluminium (GJ/MT)

70.06



Energy Intensity Copper (GJ/MT)

8.68



*Chemicals and specialty alumina business are not considered in the energy intensity calculations

IN-HOUSE DEVELOPMENT OF SOLAR POWERED VEHICLE

The large volume of materials transferred within the plant leads to high vehicular movement. As there weren't enough trucks to ferry materials a drop in productivity was observed. To curb this problem and reduce emissions from vehicular movement, the Captive Power Plant mechanical team at Mahan built a solar-powered vehicle. The vehicle, entirely built from scrap, is powered by one solar module.

The carrying capacity of the vehicle is 750 kg of material or six passengers.

It has decreased the requirement for fuel-powered vehicles, which has helped lower carbon emissions. Since it has become easier to carry supplies within the facility, the vehicle has also increased productivity. By deploying just two vehicles, we were able to save ₹10.22 lakh.



REDUCTION OF AUXILIARY POWER CONSUMPTION THROUGH DE-STAGING THE BOILER FEED PUMP

Mahan CPP is a 900 MW power plant consisting of 6 units of 150 MW each. Each unit has two Boiler Feed Pumps (BFPs). The BFPs are the highest power-consuming motors in the plant. Due to a change in duty point, the BFPs were not operating at their design efficiency, leading to higher power consumption. We decided to de-stage the BFPs to improve their efficiency and reduce power consumption. De-staging involves removing one or more stages from a multi-stage pump. This reduced the head and flow capacity of the pump, thus reducing the power consumption.

The average power consumption of the BFPs was reduced by 6.95%, which resulted in a direct monetary gain of ₹4 Crore/annum. The de-staging also resulted in a reduction of carbon footprint by 6,955 tCO₂ per annum.

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REPLACING SCREW-TYPE AIR COMPRESSORS WITH TURBO COMPRESSORS

To improve energy efficiency at our Novelis operations, we replaced 10 screw-type air compressors with turbo compressors.

Turbo compressors have higher pressure ratios and mass flow rate per unit which leads to improved energy efficiency and power savings. Screw-type air compressors are typically less efficient than turbo compressors, and over time their efficiency is likely to decrease.

With this replacement, we expect an energy saving of 368 GJ/year and are likely to avoid 618 MT of CO₂ emissions.

The investment cost us ₹2.70 Crore (\$328,000) and we expect to save ₹1.47 Crore (\$179,000).

INSTALLATION OF OPC-M AT NOVELIS YEJ PLANT

At our YEJ plant in South Korea, we installed OPC-M, a patented technology that uses advanced control systems to optimise energy use.

The system has enabled an average energy saving of 26.3%. This translates to annual savings of 1,353 megawatt-hours (MWh) and avoidance of 631 MT of carbon emissions. The technology is also cost efficient with a payback period of 1.3 years.

Emissions Management

Reducing greenhouse gas (GHG) emissions is critical and we are continuously working to meet our targets.

We regularly monitor and track emissions at all plants and mines. We calculate our emissions based on the guidelines provided by the GHG protocol and IPCC and have used location-based method to calculate the Scope 2 emissions.

In FY 2022-23, we contributed 44.81 Million tCO₂e. At Hindalco operations, Scope 1 and 2 accounted for 27.56 million tCO₂e. The increase in emissions is due to the expansion of operations and an increase in production.

We are in the process of calculating Scope 3 emissions in five categories — purchased goods and services, fuel and energy-related activity not covered under Scope 1 or Scope 2, upstream transportation, waste generation and transportation and downstream transportation and distribution.

For all our Novelis operations, we have changed the GHG accounting method from operating boundary to equity control leading to a change in emissions for the past three years.

Our total Scope 1 and 2 emissions amounted to 2.24 million tCO₂e in FY 2022-23. We monitor Scope 3 emissions in the categories of purchased goods and services, and upstream transportation and distribution.

In FY 2022-23, the total Scope 3 emissions accounted for 15.01 million tCO₂e. Of this, purchased goods and services contributed to 14.58 million tCO₂e and upstream transportation and distribution accounted for 0.43 million tCO₂e.

Emissions-Hindalco* (Million tCO₂e)

Year	Scope 1		Scope 2		Total (Scope 1+2)
	Aluminium+ Mines	Copper	Aluminium+ Mines	Copper	
FY 2019-20	25.94	1.00	0.58	0.11	27.63
FY 2020-21	24.33	0.83	0.39	0.04	25.59
FY 2021-22	25.76	0.79	0.45	0.14	27.14
FY 2022-23	26.07	0.79	0.52	0.18	27.56

Emissions-Novelis (Million tCO₂e)

Year	Scope 1	Scope 2	Total (Scope 1+2)	Scope 3
	FY 2019-20	1.32	1.11	2.43
FY 2020-21	1.45	1.10	2.55	13.34
FY 2021-22	1.42	0.91	2.33	17.80
FY 2022-23	1.38	0.86	2.24	15.01

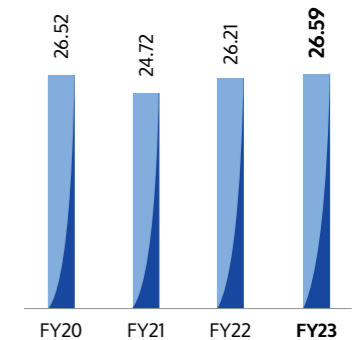
*The gases considered for the calculation of GHG emissions are Carbon Dioxide (CO₂) and Perfluorocarbon emissions (PFCs).



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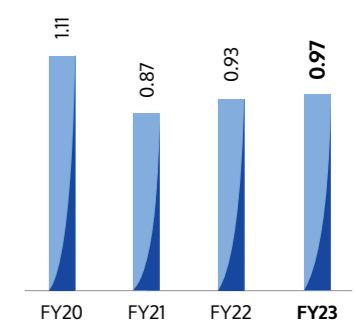
GHG Emissions Aluminium+Mines (Million tCO₂e)

26.59



GHG Emissions Copper (Million tCO₂e)

0.97



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Emissions Intensity

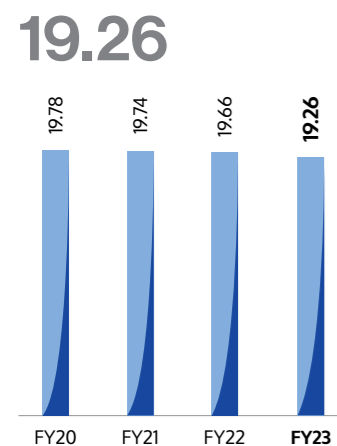
In the reporting period, we successfully achieved a reduction in emissions intensity for both aluminium and copper operations. In aluminium operations, we have reduced our emissions intensity by 20.08% as compared to FY 2011-12.

Our target is to reduce emissions intensity by 25% by FY 2024-25. Additionally, at our India operations, the emission intensity with respect to turnover for Scope 1+Scope 2 accounted for 358.49 tCO₂e/₹Crore in the reporting period and 401.14 tCO₂e/₹Crore in the previous year.

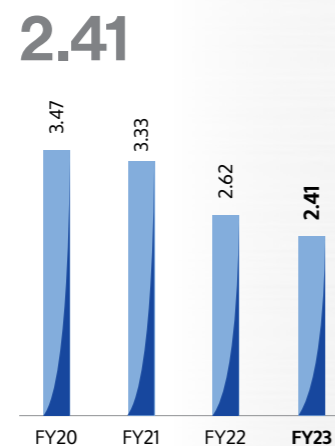


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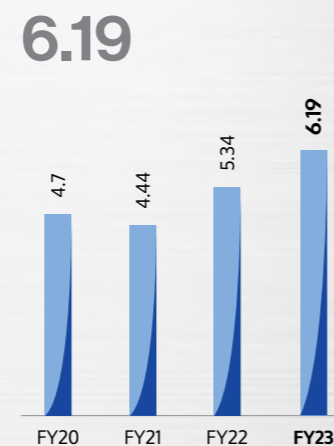
GHG Emissions Intensity Aluminium* (tCO₂e/MT)



GHG Emissions Intensity Copper (tCO₂e/MT)



GHG Emissions Intensity Novelis (tCO₂e/MT)



* Chemicals and specialty alumina business is not considered in the emission intensity calculations

Stack Emissions

To safeguard the health and safety of our employees and the surrounding communities, we have implemented projects to decrease pollution and maintain air quality.

We have installed an Online Continuous Emission Monitoring System (OCEMS) in the stacks to monitor our emissions. To enhance the tracking mechanism, we conduct offline monitoring regularly through NABL-accredited third-party labs.

Our upstream plants contribute to fugitive emissions, and we regularly conduct air quality assessments and monitor the Air Quality Index (AQI) to minimise impact and meet regulatory requirements.

At Novelis, the volatile organic compounds accounted for 2.44 KT. At the Novelis Ulsan plant, a new Selective Catalytic Reduction (SCR) technology was installed on three



aluminium Soaking Furnaces. The SCR system reduced Nitrogen Oxide (NOx) emissions by 80%. The overall investment for this project is \$1.5 million.

We faced one environmental non-compliance at our Novelis plant in South Korea for exceeding the levels of stack emissions. A fine of \$45,588 was levied by the local authority for the non-compliance.

Further, Hindalco India operations recognised ₹ 5.54 Crore as environmental liability accrued at the end of the year pursuant to a report of a committee constituted by the National Green Tribunal (NGT). The report of the committee is pending for consideration by NGT and yet to be decided upon.

Air Emissions ('000 MT)

Pollutants	FY 2021-22				FY 2022-23			
	Aluminium	Copper	Novelis	Total	Aluminium	Copper	Novelis	Total
Oxides of Sulphur (SOx)	76.66	0.85	0.17	77.68	77.89	1.23	0.15	79.27
Oxides of Nitrogen (NOx)	32.90	0.12	2.23	35.25	34.23	0.32	2.30	36.85
Total Particulate Matter (PM)	9.31	0.22	0.73	10.26	13.26	0.33	0.65	14.25
Fluoride	0.05	-	-	0.05	0.04	-	-	0.04

INSTALLATION OF SEMI-DRY FLUE GAS DESULPHURISATION PLANT AT MAHAN AND ADITYA CPP

To reduce SO₂ and SO₃ emissions and comply with environmental regulations, we have commissioned a Circulating Fluid Bed Scrubber (CFBS) technology based Semi-Dry flue gas desulphurisation (FGD) system at CPP plants in Mahan and Aditya. Our third system at Renusagar is being installed. We are one of the first companies to install this technology. The technology comes with additional benefits such as less water consumption and no liquid wastage.

In the FGD process, reactive adsorbents like sodium carbonate, hydrated lime (Ca(OH)₂), and activated carbon are added to the scrubber vessel. There, it interacts with SO₂ and SO₃ pollutants in the flue gas to produce a solid by-product.

Further, water is added to the flue gas to regulate the temperature, bringing it down to the ideal temperature of 85°C. The by-product is separated from the flue gas using a fabric filter, allowing the cleaned flue gas to be released through

the stack into the atmosphere. Due to the commissioning of the FGD system, we witnessed an 85% reduction in sulphur concentration in flue gas along with a reduction in PM emissions.



REDUCTION IN SPECIFIC ALUMINIUM FLUORIDE CONSUMPTION

In the Hirkud plant, we used thermography and advance condition monitoring techniques in the fluoride treatment plant (FTP). To reduce fluoride emissions, we replaced the ducts and filter bags older than four years and improved pot room's hooding efficiency from 70% to 90%. With the help of these activities, Alumina's Fluoride enrichment was increased, and the consumption of AlF₃ was reduced.

This resulted in annual savings of 265 MT of AlF₃ which translated to a cost saving of approximately ₹2.6 Crore.

ROTARY BAGHOUSE REPLACEMENT

At Novelis, we started the process of replacing Uhrichsville's 20-year-old shaker-type baghouses with newer, more dependable pulse jet baghouses in FY 2021–2022.

The extra volume of air collection for each new baghouse is 8,000 cubic feet per minute or a 13% increase. With this upgrade, we gained two advantages: a drop in the amount of lime reagent feed that went into the baghouses, and a reduction in the amount of waste that was disposed of in landfills.

The project's first phase has already been commissioned, and the second phase will be commissioned in FY 2023–2024. The overall investment for this project is \$7.5 million.



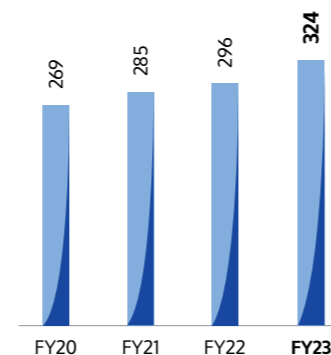
Perfluorocarbon Emissions (PFCs)

PFCs are potent GHG gases emitted during the anode effect that occurs when alumina content of the electrolytic bath falls below the levels optimal to produce aluminium. It is therefore crucial to avoid the anode effects to increase efficiency and productivity.

We are pursuing several upgrades to lower the PFCs considering the 9.45% increase in emissions from FY 2021-22 which is attributable to operations growth and technological problems in the smelter potlines.

Direct PFC emissions (kg PFC/MT of aluminium)

324



Ozone Depleting Substances (ODS)

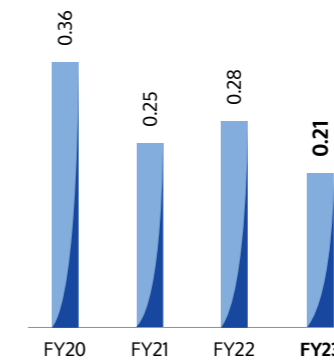
ODS are mostly utilised in air conditioners, chillers, refrigerators, and dryers as gas refills. We are committed to phasing out ODS from all the manufacturing units by FY 2025-26.

In FY 2022-23, our operations accounted for 0.21 kg of CFC-11eq which is a reduction of 24% from FY 2021-22.

We have started replacing R22 with zero ODP refrigerants. We have prepared a phase-out plan for the plants at a capex of ₹62.17 Crore.

Ozone Depleting substances (kg of CFC-11eq)

0.21



Initiatives Taken to Reduce Energy Use and Emissions

We continuously strive to optimise energy consumption and reduce emissions at all our operations.

At Hindalco, we have invested ₹255.20 Crore in 108 projects during FY2022-23, which helped us save 649,419.8 GJ of energy and prevented 129,123.21 MTCO₂e emissions. In addition, under the Perform, Achieve and Trade (PAT) scheme, we hold a total of 228,128 Energy Saving Certificates (ESCs) of which 41,575 certificates are from Cycle-1. At Novelis, we took up 59 projects at an investment of \$15.2 million (₹122.09 Crore) which helped us save 317,030 GJ of energy and prevented 18,367 MTCO₂e emissions.

Projects undertaken at Hindalco & Novelis

167

Energy Saved (GJ)

966,449.80

Emissions Saved (MTCO₂e)

147,490.21

Cost Saving (₹ Crore)

195.05

Energy consumption optimisation

Designated Consumers	Cycle-2	Cycle-3
	Target: 4.7% reduction in specific energy consumption	Target: 6% reduction in specific energy consumption
Renukoot	Achievement: 8.9% reduction in specific energy consumption	
Mahan		
Hirakud		
Muri		
Belagavi		
Taloja		
Mahan		
Aditya		Achievement: 8.8% reduction in specific energy consumption

OPTIMISING SPECIFIC OIL CONSUMPTION IN BOILER OPERATION

To improve the operational efficiency of the boiler, we initiated a project to reduce the specific oil consumption (SOC) at Renusagar CPP.

Specific oil is an important factor in determining the cost of operating the boiler. Boilers with higher SOC require more fuel to operate, which increases the operating costs.

To reduce the SOC, we undertook several measures. This included preheating the boiler water up to 100 °C during the boiler cold start-up, developing a soft dry test button in the boiler for testing the oil gun, changeover of turbines, and installation of moisture traps in the boiler service lines to absorb line moisture. A detailed study was also conducted to optimise the oil gun hole size for effective oil atomisation.

With all the efforts, we were able to reduce SOC from 0.203 ml/kWh to 0.189 ml/kWh which is the lowest ever since the commissioning of the plant.



OPTIMISATION OF AUXILIARY POWER CONSUMPTION AT RENUSAGAR CPP

With an aim to reduce the auxiliary power consumption in the CPP unit at Renuagar, we undertook several initiatives to optimise current process and energy conservation projects. The initiatives included:

- Installation of air seal on the penthouse area of boilers to reduce air ingress in the boiler.
- Replacing the old ash slurry pump with new efficient pumps.
- Operating the spare boiler with a single fan instead of two fans.
- Replacing the impeller of the ID fans with efficient ones.

- Replacing the blades of the cooling tower to reduce auxiliary power consumption.
- Stoppage of standby lube oil pumps and closing the BCW valves to avoid the unnecessary flow of raw water.

As a result, Renuagar CPP has been able to achieve the lowest auxiliary power consumption of 7.68% against the target of 8.02%. This amounted to a reduction of overall power consumption by 234.4kW. The plant is committed to further improve its efficiency and performance.

ADOPTION OF NEW METHODOLOGY TO IDENTIFY APH LEAKAGE

In Renukoot plant, Air Preheater (APH) in the boiler heats the air before it is used in the combustion of coal. The boiler is paired with two primary fans having capacities of 530 kW and 375 kW that would supply an adequate amount of air to the air preheater.

Due to leaks in the APH tubes, there was an increased load on the induced draft (ID) fan. This resulted in problems such as a bottleneck at the boiler, high dry flue gas losses, and inadequate heat transfer in the air preheater.

During each overhaul, we identified defective tubes through a smoke test. This was unsafe and unreliable as leaks were being identified from outside, leaving a chance for error. To solve this problem, we changed the standard operating procedure (SOP) to pressurise the primary air duct up to 100 mmWC to detect leaky tubes in APH. This method accurately identified leaks in defective tubes in the flue gas path and eliminated smoke. Thus, the damaged APH tubes were rectified, and air optimisation was done during boiler operation. This resulted in a reduced APH outlet flue gas temperature and made it possible to run the boiler with the 375 kW motor fan, resulting in savings in auxiliary power.

With the help of this initiative, we were able to achieve a reduction of 5,038 CO₂ MT/annum and save ₹2.46 Crore per annum.

We prioritise water management at all our operations by conserving, recycling, reusing, and preventing the pollution of water bodies.



Water Management

Water Stewardship is at the core of our business and is encouraged by the Aditya Birla Group's Water Stewardship Policy and Hindalco's Environment Policy. To ensure water security, we have set targets and aim to achieve them.

Hindalco

- To achieve 20% reduction in specific freshwater consumption by 2025 against the baseline of FY 2018-19.
- To achieve water positivity across our mining sites by 2025 and across all our operations by 2050.
- To achieve Zero Liquid Discharge (ZLD) status by 2025 across all our plants.

Novelis

- To reduce water use by 10% at all our operations by 2026 from the base year of 2020.

We prioritise water management at all our operations by conserving, recycling, reusing, and preventing the pollution of water bodies. We also track the consumption of water for each process and non-process against the set targets.

At Hindalco, the Water Management Task Force (WMTF) comprising members from operations, utilities, and environment functions, reviews the performance at frequent intervals and reports to the senior management every month.

The WMTF focuses on maximising the 3Rs (Reuse, Reduce, Recycle) and developing risk mitigation plans in alignment with long-term physical, regulatory, stakeholder, and financial considerations. We are also planning to implement a dashboard and digital monitoring system across all locations for effective monitoring. We are also training our employees in water management.

To implement strategic plans in coordination with overall company-level priorities, Novelis has appointed regional representatives in each of the areas. These representatives are a part of our global water committee, which meets monthly. At Novelis, we track water use for each of our plants monthly.

We prioritise water management at all our operations by conserving, recycling, reusing, and preventing the pollution of water bodies. We also track the consumption of water for each process and non-process against the set targets.

Using WBCSD's India Water Tool (IWT) and WRI Aqueduct Tool, we did a thorough water risk assessment of all our plants in India to forecast future changes in water availability.

It included a risk assessment for the following variables: baseline water stress, annual variability, seasonal variability, flood frequency, severity of drought, upstream storage, and groundwater stress.

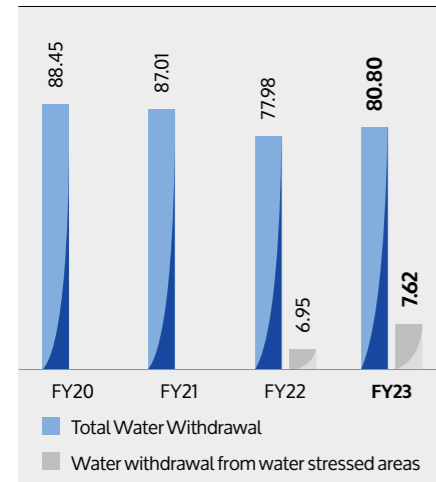
The assessment helped us to identify that 4 of our 19 plants-Dahej, Belagavi, Asoj and Kuppam lie in the water stress areas. None of our Novelis sites lies in water stress areas.

Natural Capital

Water Withdrawal

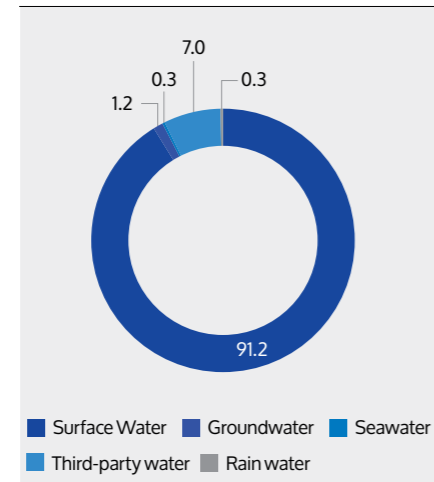
Our sources of water withdrawal are surface water, groundwater, rainwater, and water from third parties and municipalities. To decrease the water withdrawal from freshwater sources we have invested in a desalination plant at Dahej that is set up by Gujarat Industrial Development Corporation (GIDC) and have committed to withdraw 10 MLD from the plant.

Water withdrawal
(Million m³)



Water withdrawal at Hindalco and Novelis was 93.26 million m³ in the FY 2022–23, with Hindalco accounting for 80.80 million m³ and Novelis for 12.46 million m³. At Hindalco, 91.2% of water was withdrawn from surface water, 7% from municipalities, and only 0.25% from groundwater. Our water extraction from the water-stressed areas in FY 2022–23 was 7.62 million m³ which is 9% of the total water withdrawn by Hindalco.

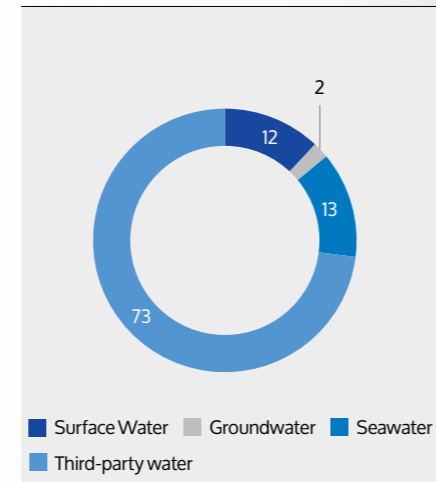
Total water withdrawal by Source
(%)



We are evaluating the infiltration potential and creating a methodology for estimating water credits to attain water positivity. Our Samri Mine has received third-party verification on water positivity.

At Novelis, 40% of water was withdrawn from surface water, 35% from municipalities, and 25% from groundwater.

Water withdrawal from water stress areas
(%)



Water Withdrawal (Million m³)

Source	FY 2021-22			FY 2022-23		
	Aluminium+ Mines	Copper	Total	Aluminium+ Mines	Copper	Total
Surface Water	70.92	-	70.92	73.70	-	73.70
Groundwater	0.09	-	0.09	0.10	0.10	0.20
Seawater	-	-	-	-	0.95	0.95
Third-Party Water	0.13	6.27	6.40	0.10	5.59	5.69
Total	71.14	6.27	77.41	73.90	6.64	80.55
Rainwater	0.57	-	0.57	0.25	-	0.25
Total water withdrawal	71.71	6.27	77.98	74.16	6.64	80.80

Water withdrawal from water stress areas (Million m³)

Source	FY 2021-22	FY 2022-23
Surface Water	0.68	0.95
Groundwater	-	0.13
Seawater	-	0.95
Third-Party Water	6.27	5.59
Total water withdrawal	6.95	7.62

*Water withdrawal for Novelis is the same as water consumption.



Our sources of water withdrawal are surface water, groundwater, rainwater, and water from third parties and municipalities.

Natural Capital

Water Consumption

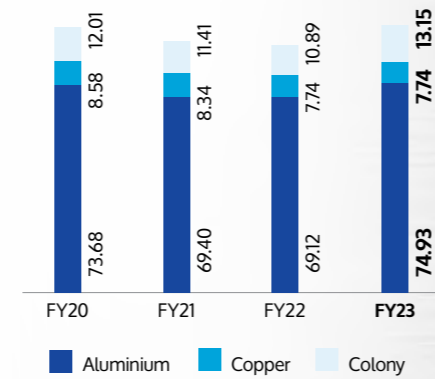
Though water is consumed at all stages in the manufacturing process, most of it is used in cooling towers. At Alupuram, we are taking significant steps to achieve water efficiency in the operations such as replacing the GI pipes with PVC pipes to reduce leaks.

By constructing rainwater harvesting ponds at Mouda, we have reduced the dependency on other resources, making it self-reliant. Mouda is our first plant to apply for accreditation as a water-positive facility.

We consumed 8.10 million m³ from the water stress areas during the reporting period.

By constructing rainwater harvesting ponds at Mouda, we have reduced the dependency on other resources, making it self-reliant. Mouda is our first plant to apply for accreditation as a water-positive facility.

Water consumption – Freshwater and recycled water
(Million m³)



Freshwater consumption Aluminium, Copper, and Mines (Million m³)

Parameter	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Total municipal water suppliers (or from other water utilities)	5.60	7.96	4.99	4.55
Fresh surface water (lakes, rivers, etc.)	61.11	49.29	55.32	59.88
Fresh groundwater	0.07	0.05	0.07	0.17
Rainwater consumption	0.09	3.55	0.44	0.21
Total Net freshwater consumption	66.87	60.85	60.82	64.81

Water consumption from water stress areas (Million m³)

Parameter	FY 2021-22	FY 2022-23
Total municipal water suppliers (or from other water utilities)	6.46	6.07
Fresh surface water (lakes, rivers, etc.)	0.68	0.95
Fresh groundwater	-	0.13
Seawater	-	0.95
Total consumption	7.14	8.10

At Novelis, we consumed 12.46 million m³ of freshwater, which is a 1.58% rise from FY 2021-22. We are constantly exploring options to enhance water quality and have taken initiatives for the same. Some initiatives are the installation of a filtering system at the Novelis Yeongju plant, to reduce pollution and meet the regulatory requirements.

Fresh water consumption – Novelis (Million m³)

Parameter	FY2019-20	FY2020-21	FY2021-22	FY2022-23
Total municipal water suppliers (or from other water utilities)	2.28	3.17	3.44	3.15
Fresh surface water (lakes, rivers, etc.)	3.26	4.35	4.22	4.88
Fresh groundwater	3.92	4.69	4.61	4.44
Total Net freshwater consumption	9.46	12.21	12.27	12.46

We are focusing on optimising water use at cooling towers, blowdown water recovery and onsite water recycling to further reduce water intensity in our operations.



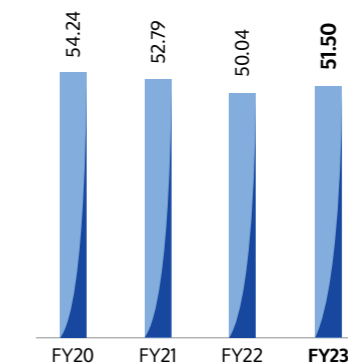
Water Intensity

In FY 2022-23, our specific freshwater consumption in our aluminium and copper operations was 51.50 m³/MT and 17.22 m³/MT. At our India operations, the water intensity with respect to turnover accounted for 1,297.07 GJ/₹ Crore in the reporting period and 1,233.28 GJ/₹ Crore in the previous year. At Novelis, our specific water consumption was 3.26 m³/MT of FRP sales.

To further reduce the water intensity, we are focusing on optimising water use at cooling towers, blowdown water recovery and onsite water recycling.

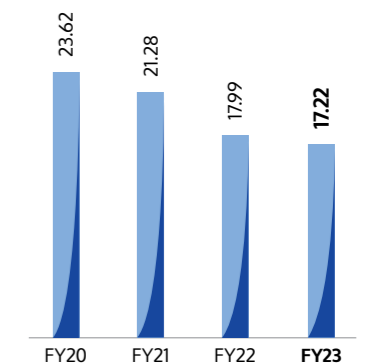
Specific freshwater consumption-Aluminium
(m³/MT)

51.50



Specific freshwater consumption-Copper
(m³/MT)

17.22



Natural Capital



We are constantly adopting new technologies to achieve water circularity.

Water Recycling

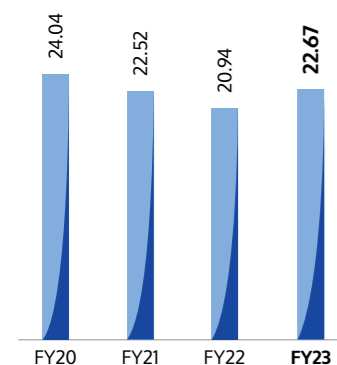
To reduce freshwater consumption, enhance water security and mitigate water scarcity risks, we are constantly adopting new technologies to achieve water circularity and Zero Liquid Discharge.

We have increased our recycling capabilities and recycled 18.08 million m³ of wastewater in FY 2022-23.

Water recycled – Aluminium (%)

(%)

22.67



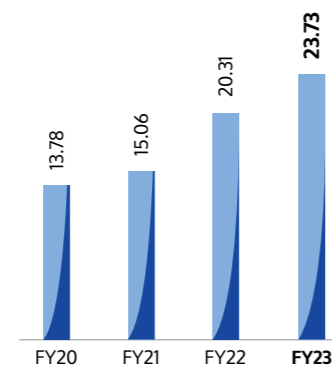
Aluminium and copper plants recycled 22.67% and 23.73% of effluents respectively.

To conserve water and achieve resource efficiency, we have adopted water recirculation projects at our operations. We are introducing a seawater reverse osmosis system with mechanical vapour recompression technology at Dahej to recover and recycle water from existing RO reject.

Water recycled – Copper (%)

(%)

23.73



In Belagavi, we built a sizeable pond that serves as both a rainwater collection system and a holding area for water before treatment.

This initiative led to an increase in water recycling and reduced freshwater consumption by 40% from FY 2018-19 baseline.

We are also installing Effluent Treatment Plants and Sewage Treatment Plants to further enhance water recycling and reusing capabilities. At our Kuppam site, we are installing a water recycling facility of 60 KLD.

At our Novelis Ulsan facility, we installed an RO system in the hot mill operations to reuse wastewater from the pre-existing hot mill RO system. The RO system's ability to recycle treated water has led to annual water savings of roughly 23 KT/year.

We have expanded the Yeongju wastewater treatment plant to meet the regulatory requirements and to include chemical and biological treatment. The capacity of the treatment plant increased from 1,000 m³/day to 1,289 m³/day.

Effluent Management

Management of effluents is of paramount importance to us considering the nature of our operations and their impact on the environment.

Proper disposal of effluents prevents pollution, minimises risks of non-compliance, and reduces environmental impact. We at Hindalco adhere to the regulatory requirements of effluent discharge and ensure that we meet the necessary quality criteria.

In FY 2022-23, total discharge accounted for 7,035,336 m³, of which Novelis accounted for 97% and Hindalco 3%. We discharged 166,175 m³ into deep sea at Dahej which lies in the water stress area.

At Renukoot, we installed a 4000 m³ Process Water Recycling Plant (PWRP) system to treat wastewater during the previous year and as a result there was no effluent discharge during the reporting period. Our total effluent discharge reduced from 340,370 m³ in the previous year to 215,951 m³ which translates to approximately 37% reduction.

In addition to the above, our sewage discharge accounted for 1,817,716.38 m³.

We are taking initiatives to reduce the effluent discharge and achieve ZLD for all our sites in Hindalco. Our Renukoot and Talaja ZLD projects are currently under execution with state-of-the-art RO membranes and MVR-based evaporators.

At Novelis, we have implemented ZLD for automotive processing lines at the Changzhou plant and process water treatment at the Zhenjiang plant.

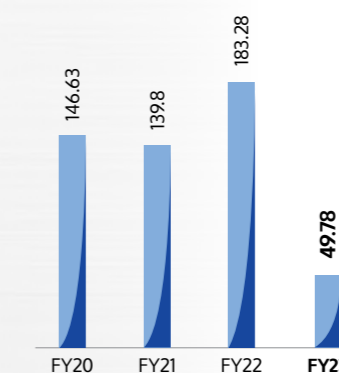
Total Effluent Discharged (m³)

Discharge Outlet	Aluminium	Copper	Hindalco	Novelis
River/Surface water	-	-	-	3,731,728
Industrial drainage system	15,746	-	15,746	-
Deep-sea	-	166,175	166,175	-
Sanitary sewer	-	-	-	-
Municipal WWTP	34,030	-	34,030	-
Third parties	-	-	-	2,654,543
Groundwater	-	-	-	433,114
Total discharged effluent	49,776	166,175	215,951	6,819,385

In FY 2022-23, total discharge accounted for 7,035,336 m³, of which Novelis accounted for 97% and Hindalco 3%.

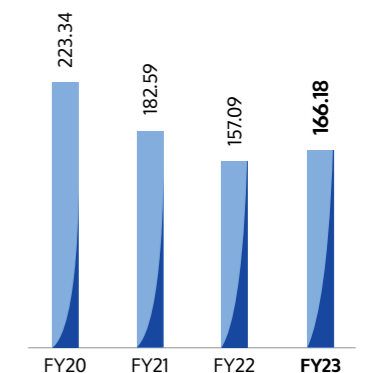
Total Effluent Discharge - Aluminium ('000 m³)

49.78



Total Effluent Discharge - Copper ('000 m³)

166.18



Natural Capital

INSTALLATION OF DISSOLVED AIR FLOATATION AT YEONGJU PLANT

The Yeongju plant uses cooling water to cool and solidify molten aluminium after recycling. The cooling water is recirculated and reused. When the cooling water chemistry is no longer fit for reuse, it is discharged to the wastewater treatment system. To extend the life of cooling water and reduce usage, we at Novelis installed

Dissolved Air Flootation (DAF) system to remove suspended solids and oil and grease. The system has 80% efficiency in removing suspended solids. The wastewater discharged from the operation is reduced from 185 tpd to 80 tpd. The make-up water usage in casting has reduced from 480 tpd to 350 tpd.



ELECTRO-COAGULATION SYSTEM FOR TREATING EMULSIFIED WASTEWATER FROM ETP AT TALOJA PLANT

Effluent treatment is a critical aspect of industrial operations. The incomplete splitting of an emulsion into water and oil layers due to the variation in the quality of spent emulsion used to be a problem. To address this issue, it was important to implement a comprehensive treatment system that can effectively separate the emulsified oil from the wastewater.

The effluent treatment plant at Taloja is designed to manage a capacity of 10 m³/day of spent emulsion, with an electro-coagulation process for the treatment of spent emulsion. Electro-coagulation is a process that uses an electrical charge to remove contaminants from wastewater. The electro-coagulation process has advantages over conventional treatment methods, such as the ability to remove

an Emulsified Oil COD, and suspended solids. At Hindalco, this process has proven to be a highly efficient and cost-effective method for spent emulsion treatment.

With the help of this system, the Taloja plant has successfully reduced the emulsified oil to less than 5 ppm and the COD value to less than 100 ppm from 1 lakh ppm.

PINDA LAKE RECOVERY

Novelis' Pinda factory is situated near the Preto River in Pindamonhangaba, São Paulo, Brazil. The factory relies on water from the Preto River to cool down equipment and use it in the processes. A thorough assessment revealed that sediment and algae in the adjacent lake required significant water treatment prior to use in operations. The sediment was also reducing the storage capacity of the lake. To address this issue, the Pinda factory devised a comprehensive plan to restore the lake's water quality and enhance its water storage capacity.

The plan comprised several key components, namely the removal of sediment from the lakebed, implementation of algae control system, and the planting of trees around the lake. These measures were driven successfully, resulting in a significant improvement in the water quality of the lake. Additionally, the lake's water storage capacity increased by 40%, expanding from 24,000 m³ to 40,000 m³. The algae control system has been installed to ensure continuous monitoring and maintenance of the water quality.

Furthermore, 1,416 trees of native/indigenous species were planted in a designated preservation area surrounding the lake. This tree planting initiative aimed to prevent erosion, enhance water quality by filtering pollutants from both air and water, and provide a habitat for various wildlife, including birds, fish, and insects. Native tree species were chosen as they are well-suited to the local climate conditions.

Raw Material Management

We believe in responsible raw material consumption and are committed to finding ways to reduce costs and improve the bottom line while protecting the environment. In FY 2022-23, we consumed 12,497 KT of raw materials. As we are expanding our business, there is an increase in bauxite consumption.

Our overall consumption of packaging material was 6.06 KT, whereas wood and paper accounted for 3.43 KT and 0.61 KT, respectively. In fiscal year 2022-23, 0.06% of the total input material from aluminium scrap was recycled or reused.

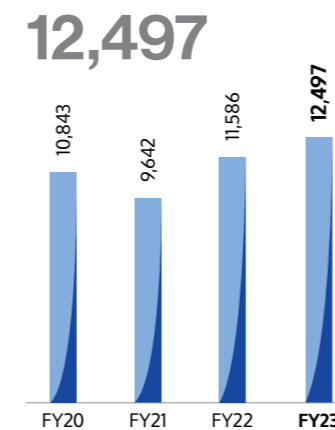
Novelis is a global leader in the production of aluminium rolled products, and its use of recycled scrap aluminium helps to reduce the environmental impact of its operations. In FY 2022-23, we consumed 2,325 KT of scrap aluminium and 1,556 KT of other materials that include primary sheet ingots and alloys. Around 61% of the total material used in production at Novelis was from recycled aluminium scrap.



Material type - Hindalco (KT)

Material type	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Bauxite	8,511.77	8,097.12	9,598.77	10,386.73
Aluminium fluoride	19.44	17.82	21.78	18.27
Calcined petroleum coke	518.99	447.70	465.67	497.60
Caustic soda	222.49	206.24	254.36	254.23
Pitch	113.05	100.69	137.77	112.30
Ammonia	56.10	1.02	0.02	-
Rock phosphate	363.77	-	-	-
Copper concentrate	1,037.30	770.90	1,108.06	1,227.62

Raw material consumption-Hindalco (KT)



Waste Management

We embrace the philosophy of "Creating Value from Waste". We acknowledge the substantial amount of waste generated from our operations and take the initiatives to efficiently manage and utilise the waste.

Our strategy is aligned with UN SDG 12 and follows the 5R+1S approach, Reduce, Redesign, Recover, Rehabilitate, Recycle and Storage. We are committed to achieving Zero Waste to Landfill by 2050. At Novelis, our target is to reduce waste-to-landfill intensity by 20% by 2026.

At Hindalco, we have a dedicated Waste Management Task Force (WaMTF) in each unit for streamlining the waste management process.

The WaMTF's focus is on effective waste utilisation and disposal. The task force comprises team members from different line functions and their key responsibilities include complying with legal requirements related to waste, accurately identifying and quantifying waste, setting specific targets, understanding associated risks, and developing mitigation plans.

Natural Capital

We collaborate with educational institutions and think tanks to explore and develop alternative applications for waste utilisation. Our corporate sustainability team, including the Chief Sustainability Officer (CSO), conducts half-yearly reviews of waste-related practices and projects and assesses them against their targets.

There is a global committee at Novelis responsible for developing and implementing and monitoring waste management policies and procedures. The committee is composed of representatives from production, engineering, environment, and sustainability functions.

At Novelis, all the waste-related data is entered into the EtQ management

database monthly. The corporate EHS team validates the quarterly entries and conducts annual onsite audits of the Performance Standards. To ensure proper waste management, we have a Supplier Code of Conduct for upstream suppliers.

Throughout Hindalco's value chain, waste is generated at various stages, starting from the sourcing of raw materials to the delivery of finished products to our customers.

In our aluminium business, significant waste materials include bauxite residue (red mud), ash, spent pot lining, aluminium dross, and vanadium sludge. In the copper business, copper slag is generated in copious quantities.

At Novelis, the inputs into the process include primary aluminium, scrap

aluminium, alloying agents, and processing agents. The primary waste outputs include dross, salt cake, filter wastes, baghouse wastes, and waste refractory materials, among others.

In FY2022-23 total waste generation at Hindalco and Novelis was at 12.94 million MT out of which 12.56 million MT was by Hindalco and 0.38 million MT by Novelis.

The details of the waste generated and waste utilised at our Hindalco operations is given in the following table. The other hazardous waste includes used oils, anode butts, spent pot lining, hazardous dross, among others and other non-hazardous waste includes bauxite residue, ash, non-hazardous dross, copper slag, phospho gypsum, etc. Further details on waste are given in the hazardous and non-hazardous waste sections.

Waste generation and utilisation - Hindalco (in MT)

Type of waste	FY2021-22				FY2022-23			
	Waste Generated	Recycled and reused	Waste to Landfill	Incinerated	Waste Generated	Recycled and reused	Waste to Landfill	Incinerated
Other non-hazardous waste	11,142,494.78	9,608,850.05	407.26	-	12,079,749.38	10,712,826.49	437.58	6.1
Plastic waste	1,793.04	1,056.98	-	-	2,406.74	2,582.09	-	-
Municipal Solid Waste	2,929.84	1,677.62	417.34	865	3,811.35	1,981.68	689.3	0
Construction and demolition waste	366.34	154	208.34	-	769.49	64	705.29	8
Other hazardous waste	453,346.17	368,046.33	95,062.31	276.3	476,802.46	363,190.82	115,553.95	1,735.35
E-waste	191.52	155.53	-	-	195.5	161.11	-	-
Bio-medical waste	17.27	2.17	0.13	34.67	16.99	181.57	-	2.69
Battery waste	66.32	59.92	-	-	111.31	68.45	-	-
Total	11,601,205.28	9,980,002.60	96,095.38	1,175.97	12,563,863.22	11,081,056.20	117,386.12	1,752.14

We adhere to Plastic Waste Management Rules specifically Extended Producer Responsibility (EPR) guidelines. As brand owners, we are registered and fully comply with the relevant EPR regulations.

In the reporting period, under EPR, our waste recycled accounted for 3,084.89 MT.

Till FY2022-23, 12 of our sites have been certified SUP-free by the Confederation of Indian Industry (CII). We plan to complete the certification for rest of our sites by FY2023-24.

With continuous efforts at Hindalco and Novelis, we were able to recycle 88% of the total waste generated.

Three of our sites in India operations – HiraKud FRP, HiraKud Power, Belur and two in Novelis - Ohle and Nachterstedt succeeded in achieving Zero-Waste-to-Landfill.

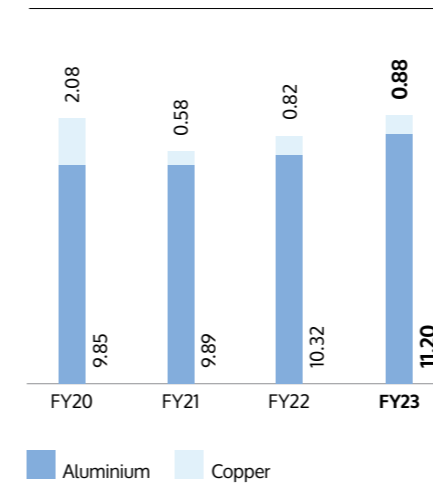
Non-Hazardous Waste

In FY 2022-23, Hindalco and Novelis generated 12.40 million MT of non-hazardous waste. At Hindalco, 11.20 million MT of non-hazardous waste was generated from the aluminium business whereas 0.88 million MT was from the copper business. At Novelis, 0.32 million MT of non-hazardous waste was generated of which 91% of the waste was recycled and reused.



A majority of the non-hazardous waste is made up of high-volume low-effect waste like bauxite residue and ash. In our bauxite mining process, we do not have a beneficiation plant, hence no tailings are generated. Due to this absence, we have not yet devised a tailing management plan. In our alumina refining process, bauxite residue is formed as a by-product.

Non-hazardous waste generation (Million MT)



We achieved more than 100% fly ash utilisation in the reporting period.

Non-hazardous waste diverted from disposal

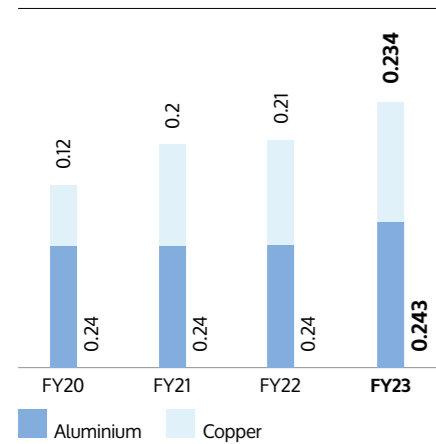
Type of utilisation (Million MT)	Hindalco				Novelis		Total
	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2021-22	FY 2022-23	FY 2022-23
Recycled and reused	7.78	9.31	9.61	10.72	0.29	0.29	11.01
Landfill/Tsfd	0.01	0.01	-	-	0.03	0.026	0.03
Stored in approved structures	4.28	2.14	2.31	2.20	-	-	2.20
Incineration	-	-	-	-	-	0.002	0.002
Total	12.07	11.46	11.92	12.92	0.32	0.32	13.24

Natural Capital

Hazardous Waste

We have a robust strategy for managing hazardous waste due to its effects on the environment and human health. We have created SOPs for the collection, storage, and transportation of waste, and all our facilities and offices adhere to them.

Hazardous waste generation (Million MT)



We have created SOPs for the collection, storage, and transportation of waste.

Regular inspections are carried out by the Waste Management Task Force (WaMTF) to ensure efficient waste management.

The Waste Management Performance Standards and Spill Avoidance Performance Standards serve as the foundation for Novelis' handling of hazardous waste.

The total amount of hazardous waste produced by Hindalco and Novelis in FY 2022-23 is 0.54 million MT, of which 0.48 million MT is by Hindalco and 0.06 million MT by Novelis. We are continuously taking initiatives to recycle and utilise the generated waste.



Waste Recycled
0.41 Mn MT
(76% of the waste)

Waste Incinerated
0.003 Mn MT
(1% of the waste)

Waste to Landfill and Storage
0.12 Million MT

Hazardous waste diverted from disposal (Million MT)

Type of utilisation	Hindalco				Novelis		Total
	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2021-22	FY 2022-23	FY 2022-23
Recycled and reused	0.24	0.28	0.37	0.36	0.05	0.05	0.41
Landfill/TSFD	0.09	0.08	0.10	0.12	0.007	0.006	0.12
Stored in approved structures	0.03	0.08	0.01	0	0	0	0
Incineration	0	0	0	0.002	0	0.002	0.003
Total	0.36	0.44	0.48	0.48	0.06	0.06	0.54

INSTALLATION OF SPENT POTLINE CRUSHER

The Mahan SPL Crusher Project is the first-of-its-kind in India meant to recycle hazardous Spent Pot Lining (SPL) in the smelter. SPL is generated during the de-lining process of electrolytic pots where alumina is converted to aluminium.

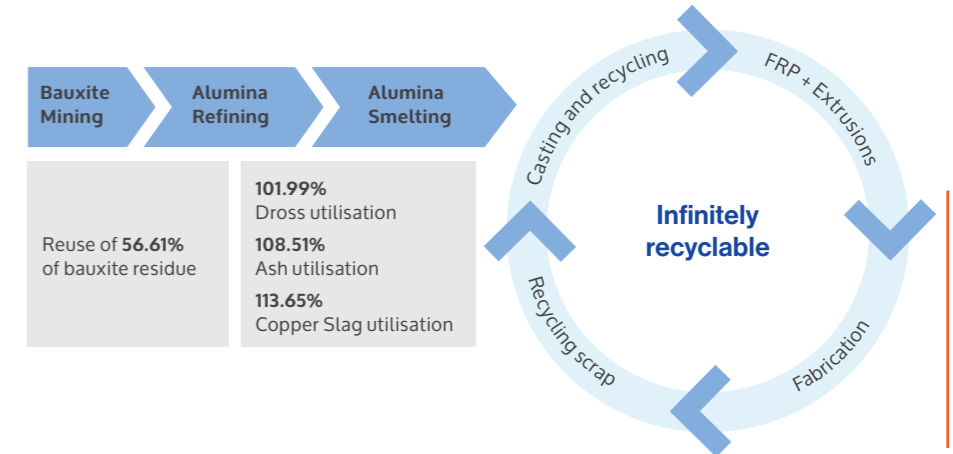
In the project, large chunks of SPL are crushed into smaller particles that can be used as an alternate fuel resource in cement industries. The carbon portion of SPL is used as an alternate fuel (replacement of fossil fuels) because of its high calorific value. The fluorides in SPL act as mineralisers which help in slowing the rate of hardening of cement. The sodium content acts as a fluxing agent lowering the temperature for clinker formation, saving fuel, and reducing greenhouse gas emissions.

The project has two phases. In the first phase, the refractory portion of SPL is sent to cement industries for co-processing. In the second phase, the carbon portion of SPL is planned to be sent to cement industries by the end of 2023.

The Mahan SPL Crusher Project is a valuable addition to Hindalco's assets and the cement industry. It will help to reduce environmental impact by recycling hazardous waste and enable the cement industry to reduce its reliance on fossil fuels.

Embedding Circularity

Aluminium is infinitely recyclable and ideally suited for circular manufacturing processes. We have embedded circularity into every aspect of our business, from mining to producing aluminium to recycling scrap.



To ensure responsible management of by-products, we have developed a utilisation strategy in line with Central Pollution Control Board (CPCB) guidelines. To create value from waste we have adopted in-house processes

and also partnered with cement manufacturing companies to utilise bauxite residue, ash, spent pot lining and bulk waste from copper slag. We are also collaborating with research institutes to explore the effective utilisation of waste.

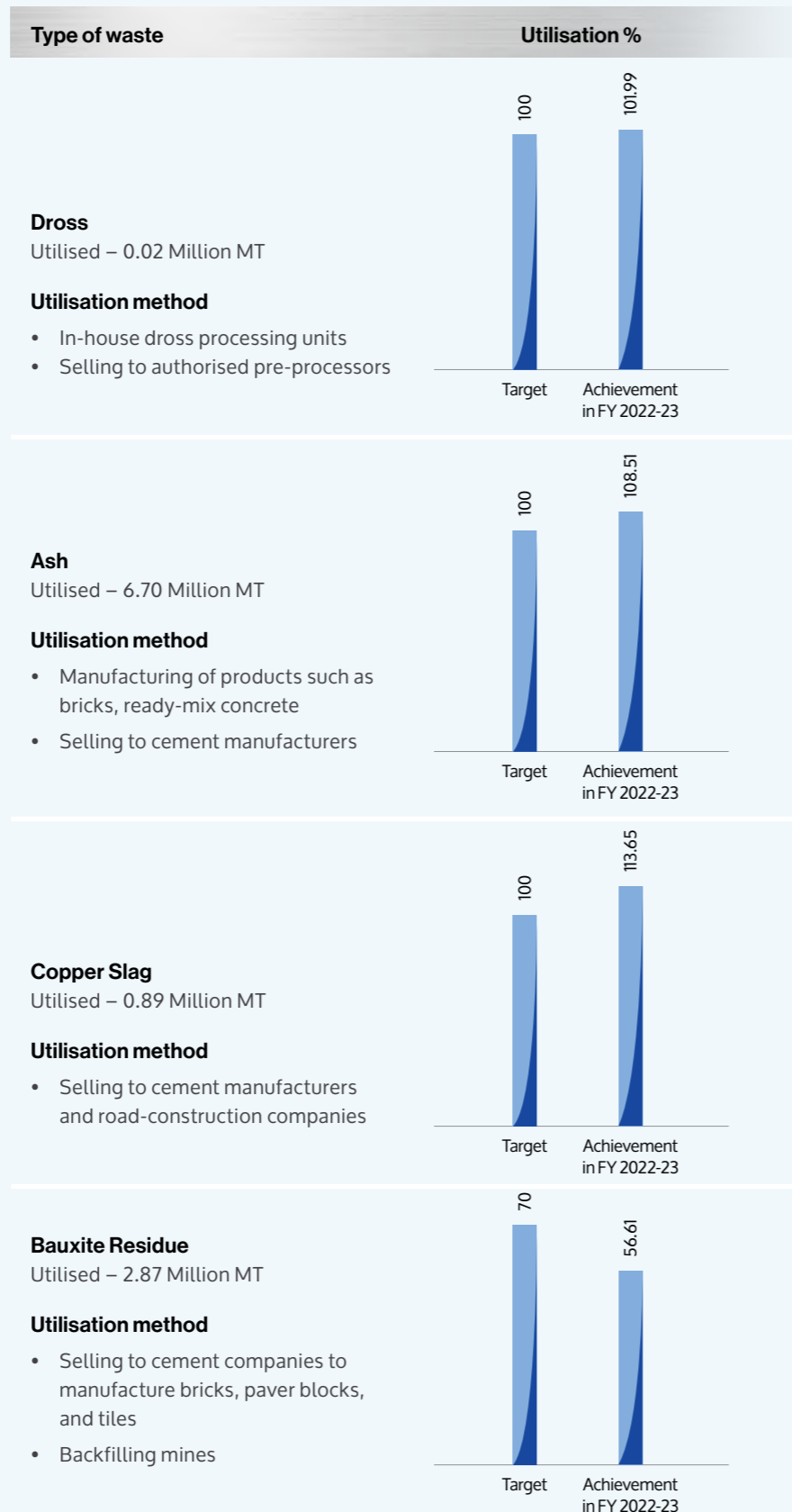


We have embedded circularity into every aspect of our business.

Natural Capital

At Novelis, we have developed an innovative closed-loop production system with supply chain partners and customers. We are accelerating our efforts to lower the carbon footprint by creating and executing innovative circular business practices and increasing our capability to process more types of scrap and improve sortation and segregation technologies.

At our Pinda plant, we have installed separation and briquetting equipment to recover aluminium fines from the recycling process. Further, we have also identified suppliers to recycle our refractory waste, which was previously sent to the landfill.



From Extraction to Restoration: Sustainable Mining for a Greener Future

At Hindalco, we believe that growth and sustainability are intertwined. Through sustainable mining, we aim to transform mining into a force that adds value to businesses, the environment, and communities.

We are aware of the impacts of our operations on our surroundings and our constant focus is on minimising it. We have 21 operational mines covering 7,474.99 hectares across India. The mines are in different geographic locations and have diverse habitats. To reduce the impacts while operating, we have taken initiatives like restoring the void mines by backfilling them with bauxite residue.

Pre-mining

- Developing socio-economic baseline studies
- Planning of mining activities
- Mine closure plan and activities

Mining area details (hectares)

Parameter	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Total mining area leased (Operational)	9,278	9,133	8,569	7,474.99
Total area mined out	132	80	106	104.10
Total area reclaimed	112	86	92	117.87
Total area rehabilitated	102	57	85	62.22

SUSTAINABLE MINING CHARTER

Hindalco has implemented a comprehensive Sustainable Mining Charter to guide sustainable practices throughout the mining process, from mineral exploration and extraction to transportation and closure. Our sustainable mining framework is based on two fundamental pillars: environmental stewardship and social performance leadership. Environmental stewardship focuses on minimising, mitigating, and offsetting the environmental impacts associated with mining operations. Social performance leadership aims to enhance the resilience of the communities in which we operate. These pillars are supported by a robust governance mechanism that guides the designing, execution, and monitoring of sustainability initiatives at the mines.

In our charter, we have identified seven key thematic areas through which we capture the vital environmental and

societal impacts of our operations. These areas include sustainable land use, water management, waste management, emissions reduction, biodiversity management, health and safety, and local economic development.

The Sustainable Mining Charter has enabled us to develop a mine-level sustainability roadmap, guiding our mining team to align their goals with our corporate sustainability objectives. We have developed a mine lifecycle approach from the pre-mining phase to the mining, and then to post-mine closure. For all the mines, we continuously engage and consult with all the stakeholders. We conduct capacity-building and economic diversification programmes for the local communities. We also have social closure plans and social closure impact assessment.

Mining

- Implementing progressive reclamation of land
- Monitoring stability and impact of operations
- Deploying mechanisms to ensure safety

Mine Closure

- Land enrichment goals and targets
- Environmental baseline with associated risks and mitigation plans
- Mine closure monitoring with regular reviews
- Handover

Natural Capital

Conserving and Preserving Biodiversity

Recognising and integrating biodiversity concerns in business decisions is essential for minimising the impact and contributing to responsible development. We derive several benefits from biodiversity in the form of the ecosystem services that they provide. The most important service is climate change mitigation. By mainstreaming biodiversity in our operations, we have committed to achieve No Net Loss (NNL) by 2050. We are also committed to achieve No Net Deforestation by 2030. To further strengthen our commitment, we have adopted a [Biodiversity Policy](#) and have established technical standards at the Group level. We adhere to all the local laws and regulations while conducting operations.



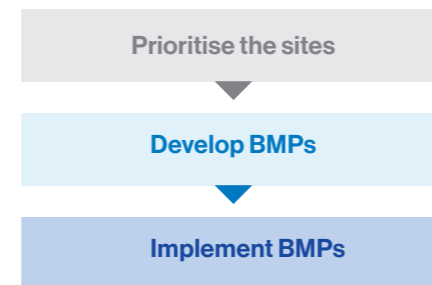
Our Biodiversity Management Plans encompass a multiseason study conducted in partnership with the International Union for Conservation of Nature, among other agencies.

At Hindalco, there is a three-pronged approach towards biodiversity management which starts with categorising sites as high, medium, and low priority.

After the prioritisation, we develop Biodiversity Management Plans (BMPs) if any threatened species, protected areas, or Key Biodiversity Areas (KBAs) are discovered within a 10 km radius of the site. We have prepared 10 BMPs for high and medium priority sites and 4 BMPs for low and medium priority sites.

Our BMPs encompass a multi-season study which is conducted in partnership with the International Union for Conservation of Nature (IUCN) and other national and international agencies. We follow a location-specific approach to identify risks to biodiversity and associated ecosystem services from existing and planned activities using the Integrated Biodiversity Assessment Tool (IBAT). Considering our dependency on natural resources, we use both dependency and impact-related biodiversity risks and carry assessments

for our operations and areas adjacent to the operations. Habitat loss is critical and we have taken steps to mitigate the risk.



Priority sites with BMPs

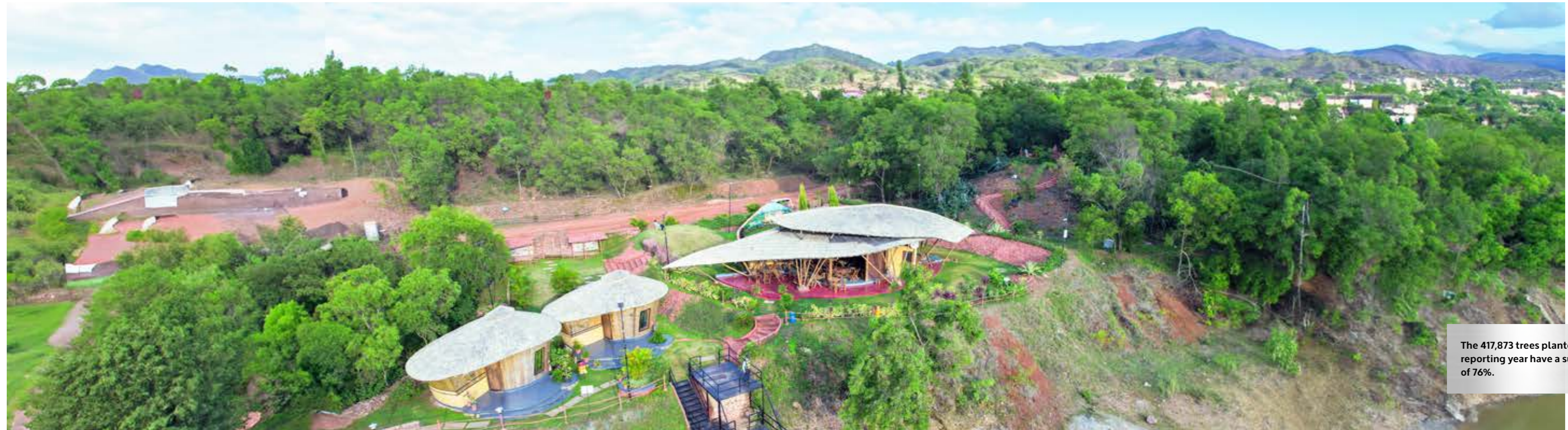
Parameters	Number	Operational Area (hectares)
Total Sites	51	16,428.39
Sites where biodiversity impact assessments conducted	44	15,226.88
Sites in close proximity to critical biodiversity	34	9,581.20
Sites in the close proximity to critical biodiversity and for which biodiversity management plans are prepared	10	6,920.78
Other low priority sites for which biodiversity management plans are prepared	4	4,004.62

Following are the actions taken to curb the impacts of our operations.

Avoid	Minimise/Reduce	Regenerate
<ul style="list-style-type: none"> Avoid operating in ecologically sensitive areas and in critical habitats These include World Heritage sites and IUCN Category I-IV protected areas 	<ul style="list-style-type: none"> Minimising the impact on biodiversity transplanting trees than cutting down 	<ul style="list-style-type: none"> Community biodiversity livelihood programmes - Organic farming and orchard development
Restore	Offset	
<ul style="list-style-type: none"> Restoration by developing green belts using native species Enhancing the quality of green belt and butterfly conservation Development of wetlands and riparian habitat 	<ul style="list-style-type: none"> Miyawaki plantations Identification of degraded land for plantation Partnerships with IUCN to prepare BMPs Collaboartion with industry experts impact on business operations on biodiversity. 	



Restoration is undertaken by developing green belts using native species.



The 417,873 trees planted during the reporting year have a survival rate of 76%.

A study was conducted for Comprehensive Biodiversity Assessments and Ecosystem Services Review using the Integrated Biodiversity Assessment Tool (IBAT) and a proximity study of 51 of our sites. Out of the locations evaluated, 24 sites had medium exposure and 10 sites had high exposure to key biodiversity.

We have finished one-season BMP field studies and are currently working on BMPs for five sites and plan to implement the BMP for all active sites. To go beyond, we have collaborated with industry experts to assess the performance of business operations on biodiversity and ecosystem services and carbon sequestration using the IBBI (Indian Business & Biodiversity Initiative) Biodiversity Index for six of our sites. The assessment is based on 25 indicators of native biodiversity (flora & fauna), regulatory requirements,

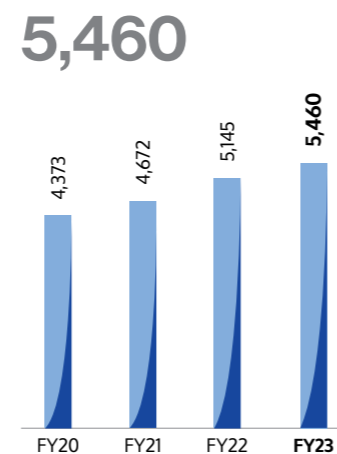
awareness level within employees, supply chain management and relation with critical stakeholders.

Further, we have developed green belt management plans for 12 non-BMP sites. Under these plans, we develop greenbelts which act like living walls and offset emissions. We consult the state forest departments to plant native species as per the local climate conditions. To monitor the survival rates and health of the trees we follow Company-wide Standard Operating Procedures and provide training sessions on monitoring processes.

We have a cumulative green cover of 5,460 acres. The 417,873 trees planted during the reporting year have a survival rate of 76%. At Aditya, we have planted 5,000 saplings of an endangered species, Indian rosewood (*Dalbergia latifolia*).

This plantation technique will result in the development of a forest ecosystem and provide habitat and food for birds, insects, and small mammals. This will help in restoring the threatened native flora and fauna in the region.

Green Area Plantation (acres)



TREE TRANSPLANTATION AT ADITYA AND TALOJA

To avoid the felling of fully grown trees while expanding our operations at Aditya and Taloja, we decided to relocate and transplant trees.

First, we carried out a survey to select which trees would be transplanted. After this, trees were sprayed with anti-termite, anti-bacterial, anti-fungal, and root hormones to help them survive the transplantation process. Finally, with the assistance of skilled arborists, the trees were replanted at new locations.

During the reporting year, we relocated 438 fully grown trees, contributing to Hindalco's goal of No Net Deforestation.

VALLEY OF FLOWERS

We have reclaimed a degraded mine site in Bagru by building a vibrant flower garden on it.

As part of the project, we planted 1,400 saplings of flowering species in an area of 0.75 hectares.

The plants were selected for their ability to thrive in the local conditions. Some of the species planted are Chinese Rose, First Love (*Xanthostemon Chrysanthus*), Gerbera, Peace Lilly, Begonia, Geranium, and Rongon (Flame of Jungle).

This initiative will benefit in improving air quality, reducing noise pollution, increasing aesthetic value, and enhancing biodiversity.

