Vale ESG Webinar

*Climate Change*

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Vale has made **bold commitments** to mitigate climate change

**Leading the transition towards low carbon mining based on our net zero strategy**

- **Reduce scope 1 and 2 emissions by 33% by 2030**
- **100% renewable electricity** in Brazil (2025) and globally (2030)
- **Reduce net scope 3 emissions by 15% in 2035**
- **Net zero scope 1 and 2 emissions by 2050**

**Examples:**
- 100% electric locomotive, EFVM railway, ES
- Sol do Cerrado solar plant, construction work site, MG
- Partnerships with customers for solutions in Iron Ore
- Electric excavator, Itabira, MG, Brazil
We are in **a unique position** to deliver them

<table>
<thead>
<tr>
<th>Vale’s competitive advantages</th>
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<tr>
<td><strong>High-quality portfolio</strong></td>
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<tr>
<td><strong>Leader in renewable energy</strong></td>
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<tr>
<td><strong>Sustainable mining</strong></td>
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*High-grade Iron Ore and Nickel portfolio*

*Karebbe hydroelectric plant, Indonesia*

*Carajás National Forest, PA, Brazil*
For that, we have a strong governance in place

- **Board of Directors and Sustainability Committee:**
  - Strategic oversight and support

- **Low Carbon Forum:**
  - C-level monthly meetings to track performance and ensure delivery

- **Climate-aligned executive incentives:**
  - Climate-related compensation: 5% of short-term (out of 10% related to Sustainability) and 6% of long-term compensation (out of 20% ESG-related)
Vale’s road towards net zero mining

Maria Luiza Pinto e Paiva, Sustainability VP
How will Vale reach net zero by 2050?

Prioritization of operational emission reductions
- Continuously reduce scopes 1 and 2 emissions through innovative processes, technologies and partnerships

Nature-based solutions with socioenvironmental co-benefits
- Vale differentials – Fundo Vale forestry expertise, leveraging on Brazilian and Indonesian local opportunities
- Portfolio based on cost x benefit of different forestry types

High-integrity carbon markets
- Guarantee of additionality and permanence
- Positive socioenvironmental impact, contributing to SDGs
- Careful accountability based on international best practices
- Transparency on credits used and projects supported

Scope 1 and 2 absolute emissions (Mt CO₂ eq.)

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2030 Business as usual</th>
<th>2030 goal</th>
<th>2050 goal</th>
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</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>14.1</td>
<td>18.4</td>
<td>9.5</td>
<td>0</td>
</tr>
<tr>
<td>Net zero</td>
<td>-100%</td>
<td>-33%</td>
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¹ Baseline 2017.
We have a path to deliver our
**Scopes 1 & 2 emission reduction targets by 2030**

**Scope 1 and 2 emissions by process – BAU¹ (%)**
- Pelletizing & Metallurgy: 57%
- Mining, Railway & Others: 32%
- Scope 2: 11%

**Target to reduce 33%¹ of scope 1 and 2 absolute emissions by 2030 (Mt CO₂ eq.)**
- 2017: 14.1
- 2030 BAU: 18.4
- Pelletizing & Metallurgy: 9.5
- Mining, Railway & Others: -33%

**Main technological routes to drive decarbonization**
- Energy efficiency and renewables
- Bioenergy
- Electrification
- New processes

¹ Baseline 2017. BAU stands for business as usual.
We are leading with our **PowerShift and renewable power projects** for Scopes 1 & 2

<table>
<thead>
<tr>
<th>Electricity</th>
<th>Mining and logistics</th>
<th>Processing: metallurgy &amp; pelletizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>11% of Vale’s emissions</td>
<td>32% of Vale’s emissions</td>
<td>57% of Vale’s emissions</td>
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- **Folha Larga Sul** wind project
  - 45 MWm for Vale’s operations (minimum)
  - Long-term energy supply contract
  - Power cost cut up to US$ 15 million/year

- **Sol do Cerrado** solar project
  - 193 MWm for Vale’s operations
  - US$ 500 million investment, start-up Oct/22
  - Power cost cut by US$ 70 million/year

- **Conveyors to replace haul trucks for long distances**
- **30 BEVs operating underground in Canada, with 40+ by the end of 2021**
- **Piloting electric shunting locomotive at Northern operations**
- **Partnerships (suppliers/peers) such as the “Charge On” challenge for electrical trucks charging system**

- **Continuity of bioenergy industrial tests and developments in our pelletizing plants**
- **New processes such as in innovative iron ore products (agglomerates)**

¹Source: Casa dos Ventos. Note: In accordance with the 2021 Scope 1&2 Roadmap (annually reviewed). Baseline 2017
We are relying on **robust tools** to align our **capital allocation**

- **US$ 4-6 billion investment by 2030** for GHG reduction
- **US$ 50/tCO2e** shadow price for all capital allocation decisions

**Portfolio of GHG reduction opportunities:** marginal abatement cost curve updated on an annual basis, in order to prioritize most cost-efficient projects to pilot and scale up

- ~80% of initiatives mapped are **NPV positive¹** at the considered shadow price, with increased technological maturity due to piloting and studies

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¹ As of June 2021. Values include assumptions for low maturity technologies, carrying uncertainties.
We are advancing with our **pioneer scope 3 net emission reduction target**

- **Baseline 2017.**

- **2018**
  - 586 MtCO₂e

- **2035 - BaU**
  - 641 MtCO₂e

- **2035 - target**
  - 496 MtCO₂e

- **~98% of total emissions associated to our value chain**
  - Steelmaking (94% of scope 3)
  - Shipping (3% of scope 3)

- **Vale’s own initiatives (15-25%)**
  - High-quality portfolio and new technological solutions
  - Robust and credible carbon offsets

- **Partnership and engagement with clients and suppliers (75-85%)**
  - Leveraging steel industry decarbonization
  - Supporting a **reduction in shipping emissions** intensity in 40% by 2030 and 50% absolute emissions by 2050 (ref 2008), aligned with the IMO targets
  - **EcoShipping program**: open innovation hub to set a pipeline of pilots, with 65+ initiatives identified

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1 Baseline 2017.
Fostering steel decarbonization
Rogério Nogueira, Ferrous Marketing Director
Steel is produced using two main processes and they have different challenges.

1. **Integrated steelmaking (BF-BOF)**
   - Steelmaking share of global CO₂ emissions: 8%
   - CO₂ restrictions
   - Aging plants

2. **Electric Arc Furnace steelmaking (EAF)**
   - Increase in global steel demand by 2050¹: +33%
   - Decrease in steel industry emissions required by 2050¹: -50%
   - Increase of obsolete scrap
   - Shift to high quality products

- Capex required to decarbonize steel industry: +$1T

¹ IEA Iron and Steel Technology Roadmap
Steel industry transformation started, strongly driven by GHGE reduction regulations

Phase 1
Pathway Definition

Phase 2
Decarbonization Run

Phase 3
Mainstream Adoption

Conceptual view of GHGE reduction in steelmaking
(100% basis)

GHGE reduction curve before China’s announcement
Possible GHGE reduction curve after China’s announcement
Steelmakers public commitments
(15+ DRI plants to be built by European steelmakers alone over the next 20 years)
Winning tech(s) will be proven in Pathway Definition phase


Regulatory pressure
-30% CO₂

2020
2030
2040
2050
2060

54% required GHGE reduction in Steel and Iron to meet Paris Agreement

Vale’s own initiatives to meet its scope 3 emission target

- **Vale’s main initiatives**
- Low to zero CO₂ iron ore agglomerates
- Dry concentration technology to produce high Fe (>68%) product to support electric steel making
- HBI
- Biomass in client (PCI)
- Tecnored (Pig Iron 100% Biomass)
Decarbonization adds cost, creates pressure for higher productivity and increases VIU of high-grade ores.

**2020**
- Business as usual: Integrated Route
  - 64% Fe
  - Fines, pellet & lump ore
  - Blast Furnace
  - BOF
  - US$ 375/t steel

**2030**
- European Steel Co Announcements
  - 68% Fe
  - Pellet
  - Direct Reduction HDRI Europe (H₂ @ 2.3 $/kg)
  - EAF
  - US$ 540/t steel

**2030**
- Alternative Solution
  - 64% Fe
  - Cold agglomerate
  - Direct Reduction BFBI, Middle East (NG @ 2 $/Mmbtu)
  - Tecnored Melter (Biocarbon)
  - BOF
  - US$ 390/t steel

Higher fuel costs lead to higher quality premia

**Fuel Cost (US$/ton coal eq.)**
- Coal
- Blue Hydrogen
- Green Hydrogen
- Biocarbon
- Natural Gas w/ CCS

Source: Vale Analysis
Assumptions: Biochar @$250/ton; Electricity @$30/MWh; CCS @$60/ton CO₂
Vale is naturally well positioned for a market that values high quality and low CO\textsubscript{2} emission products

Vale will benefit from the decarbonization trend by:

1. Developing low to zero CO\textsubscript{2} iron ore agglomeration products for the BFs at an accelerated pace.
2. Using proprietary technology to offer more of the top-end premium products (>68% Fe) necessary to the EAF production route.
3. Establishing, together with partners, an asset-light services company with rights to use some of the leading technologies to help accelerate the transition away from BFs to lower CO\textsubscript{2} iron-making routes.

Iron ore quality premia will be pushed higher by:

- Higher fuel costs per ton in ironmaking
- Demand for high productivity, resulting from bottlenecks in low CO\textsubscript{2} iron production capacity
Base Metals powering a low carbon economy

Mark Travers, Base Metals VP
Vale Base Metals’ products are critical to low-carbon technologies

Vale Base Metals’ products are critical to low-carbon technologies.

Charging Stations and Infrastructure
Renewable Energy

Copper (Cu)

Cathode Material
Cell and pack
Electric Vehicle

Nickel (Ni)
Cobalt (Co)

High-impact minerals: used in critical technologies
Lithium
Cobalt

High-impact, cross-cutting minerals
Aluminum

Medium-impact minerals
Silver

Cross-cutting minerals: used in a variety of technologies
Nickel
Copper

2050 demand increase vs 2018 production

Coverage: usage in different energy technologies

When it comes to EV, at least half of the carbon footprint comes from the **battery** - being **low carbon** is critical for the business.

**Share of Emissions¹ by Components (% of Total)**

- Battery: 50%
- Steel: 25%
- Aluminum: 10%
- Plastics & rubber: 8%
- Others: 7%

**Lifetime CO2 Emissions from Passenger Cars**

*Stated as gr. CO2/km*

- Production
- Tank to Wheel (Use Phase)
- Well to Tank (Use Phase)

**Diesel (Ni from NPI)**

- Production: 120
- Well to Tank: 40
- Tank to Wheel: 80

**EV 1 (Conventional)**

- Production: 120
- Well to Tank: 40
- Tank to Wheel: 80

**EV 2 (Conventional)**

- Production: 120
- Well to Tank: 40
- Tank to Wheel: 80

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¹ Source: McKinsey, Trafigura. Including all upstream emissions from raw material extraction to the OEM, including logistics. ²Including e.g. glass, copper, electronics, textiles, logistics.
We have taken a strategic positioning in this market…

First movers…

- Long-term off-take agreement signed with major North Atlantic EV Producer
- Recycling EV batteries (Black mass)
- Alternative routes and products for EV industry

… and lower carbon

Vale Class 1 Nickel products:

- Among the lowest carbon intensive

Voisey’s Bay

- High-grade open pit mine, transitioning to underground mine, +15-year life and exploration potential
- Substituting diesel for electricity by wind and potential transmission line

Long Harbour Processing Plant

- Hydrometallurgy processing plant with benchmark nickel and cobalt refining technology

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… with sustainable operations

**We have already done**

- US$ 1.5 bn investment
- Reduction in emissions
  - 40% GHG from the smelter
  - 85% sulphur dioxide
  - 40% metals particulate

**Copper Cliff Smelter in Sudbury**

**We are evolving...**

- 30 BEVs operating underground
  - 40+ by the end of 2021
  - Reduces diesel exhausts and particulates
  - Reduces underground heat and noise

**Underground electric vehicles**

**...and we will deliver**

- Decarbonization of the RKEFs
- Clean energy electrification
- Use of biofuels and biomass
- Scope 3 reduction roadmap

**Base Metals Low Carbon Agenda**

**Source:** Epiroc Mechanical Rock Excavator - Sudbury Superstack, Canada; Sorowako, Indonesia; Coleman Mine, Canada; Sudbury Superstack, Canada; Mechanical Rock Excavator - Garson mine; Coleman Mine, Canada; Sorowako, Indonesia; Low Carbon Agenda; Base Metals Low Carbon Agenda; Agend

**Sudbury Superstack, Canada**

**Coleman Mine, Canada**

**Sorowako, Indonesia**
At Vale, we’re changing how we mine to serve a changing world.