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Green Cubes

VALE LEADING THE WAY IN MINE FUTURE USE

Making nature visible
Mina de Águas Claras

MAC
Uso Futuro
Mina de Águas Claras

VALE

GREEN CUBES
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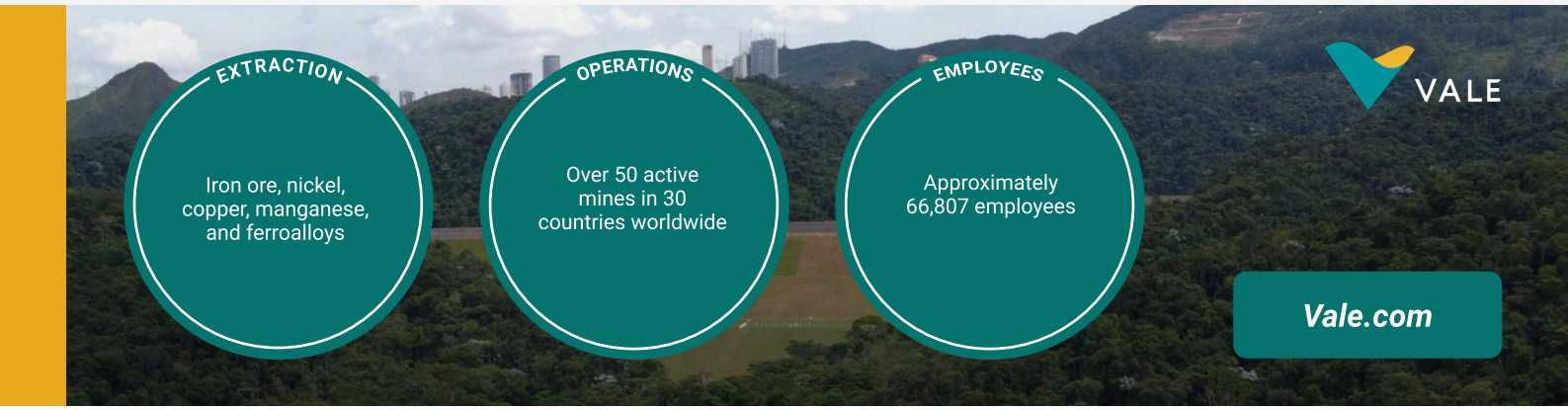
Vale, a global leader in extraction, to revolutionise forest monitoring for biodiversity with Green Cubes

Mining activities require robust strategies and effective environmental management to minimise potential impacts such as deforestation, water contamination, and biodiversity loss. Mining activities require robust strategies and effective environmental management to minimise potential impacts such as deforestation, water contamination, and biodiversity loss. However, Vale is committed to pioneering sustainable practices through its collaboration with Green Cubes. The partnership aspires to revolutionise forest monitoring around Vale's mining sites, utilising cutting-edge technology to better understand the biodiversity of the surrounding environment. By implementing Green Cubes' end-to-end Digital Reality, Vale is devoted to enhancing environmental stewardship and promoting sustainable practices – starting with the future-use project at Minas de Águas Claras.

By implementing Green Cubes' end-to-end Digital Reality, Vale is devoted to enhancing environmental stewardship and promoting sustainable practices – starting with a pilot project utilising a paralysed Vale S.A. mine (Águas Claras Mine – MAC) as a case study for the application of Green Cubes technology.



Mina de Águas Claras – The first Brazilian Vale mine to undergo the future use process

Mina de Águas Claras, located in Nova Lima, Minas Gerais, Brazil, operated for 30 years before ceasing activities in 2002, primarily extracting iron ore. As the first Brazilian mine to undergo the mine closure and future use process, MAC represents a pioneering effort in sustainable mining practices. This initiative by Vale aims to reintegrate the land into its natural habitat, fostering local development and creating shared value for both the company and the community. The post-mining land use emphasises the historical, cultural, and social significance of the region, and implementing Green Cubes in 2025 takes forest monitoring of the surrounding environment to new heights for biodiversity preservation and natural capital .

Operational Phase begin extraction of iron ore

1971

Mine closure work initiates stabilisation measures to prepare for future use

2010

Protocol of the Mine Closure Environmental Plan at the State Environmental Agency

2023

2002

Operations cease after approximately 300 million tons have been mined

2020

Future Use work begin to plan for the sustainable transition of the site and its environmental assets

2025

Green Cubes implementation - Forest monitoring, biodiversity preservation and stakeholder engagement in educational initiatives.

Making nature visible at Mina de Águas Claras and beyond

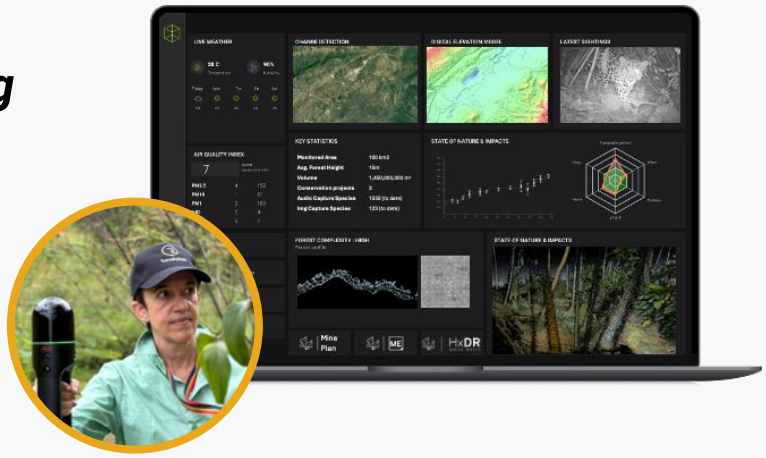
As the first Brazilian Vale mine to undergo the future use process, MAC is a priority site for Vale, showcasing their commitment to sustainable mining. The initial efforts of Green Cubes at MAC aim to activate four different experience points for initial comparison, focusing on community engagement and education to promote the significant work done at MAC and bring nature closer to society. This initiative is set within the important natural asset of the Mata do Jambreiro, a 912-hectare private preserved area with an additional 400 hectares of legal reserve, featuring a rare transition between the Atlantic Forest and Cerrado biomes. In the second phase, the goal is to activate the full area at MAC, making nature visible through data and giving value to nature via natural capital.

Shaping the landscape for robust biodiversity reporting with technology

Measuring biodiversity is challenging as complex ecosystems require extensive teams and structured efforts. Green Cubes addresses this by integrating proven methods with innovative technologies, including LiDAR and satellite to measure biodiversity at scale. The visualisation of data in the Green Cubes platform facilitates a closer connection between nature, scientists, and decision-makers, enhancing improvements to impacted state of nature and biodiversity. Vale is participating in different pilot projects to measure and report biodiversity, with the aim of shaping future reporting standards. Green Cubes is contributing to this effort through its advanced technological capabilities for measuring biodiversity.

"With Green Cubes we are bringing technology together to measure biodiversity in a very robust way."

Leticia Guimarães, nature and Biodiversity strategy/ reporting at Vale. Leading the TNFD Vale pilot project and part of Green Cubes activation 1.



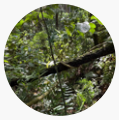
Phase 1 - 4 experience points activated with Green Cubes

In the initial phase, the Green Cubes methodology is implemented in four distinct experience points, across Mata do Jambreiro, each showcasing various natural features and states of biodiversity. This approach aims to facilitate initial comparisons and insights, while enhancing community engagement and providing educational opportunities.

Experience point 1

Biome: Mata Atlantica
Area: 10 ha

Description:
Dense forest



Experience point 2

Biome: Cerrado
Area: 10 ha

Description: Ridge impacted by wild fire

Experience point 3

Biome: Mata Atlantica
Area: 10 ha

Description:
Reforestation

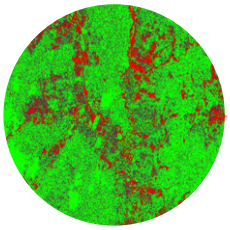
Experience point 4

Biome: Cerrado
Area 10 ha

Description:
Ridge forest

Satellite

Historical analysis, daily monitoring and change detection measuring the total surface area managed, total disturbed area and total rehabilitated area, the change of land/ecosystem-use and soil structure.



Terrestrial LiDAR - BLK2GO

Sub-1 cm resolution.
Ground truthing data for AI training, measuring flora complexity, calculating biomass and indicating state of biodiversity.

360 Camera

360 camera capture enabling the immersive forest experience in the Green Cubes experience platform. Making areas of heavy terrain accessible to society.

Audio traps

AI trained audio traps for ground truthing fauna verification through sound recording. Measuring mean Species Abundance, Potentially Disappeared Fraction, Species Threat Abatement and Restoration metric.

Minecraft integration

The MAC site and the four initial experience points are accessible through Minecraft. This integration is available both via the platform and for local educational initiatives, providing an engaging and interactive way for students and the community to explore and learn about the site.

Airborne LiDAR

Determining large scale Volume, structure & complexity. Measuring forest cover, changes in the relevant habitat, species richness and abundance, ecosystem integrity and habitat connectivity.

Terrestrial LiDAR - BLK360

Sub-1 cm resolution. Ground truthing data for AI training, measuring flora complexity, calculating biomass and indicating state of biodiversity.

Camera traps

AI trained camera traps for ground truthing fauna verification. Measuring mean Species Abundance, Potentially Disappeared Fraction, Species Threat Abatement and Restoration metric.

Platform

All data captured is integrated into the online Green Cubes platform, creating a digital window into the forest. This platform makes nature visible for both reporting data and restorative scientific analysis, while also enabling an immersive experience for internal and external engagement. It provides virtual access to the forest for the local community, society, corporate stakeholders, and decision-makers, essentially bringing nature closer.

Phase 2 - Give value to nature through scale and natural capital

By proceeding with phase two, which involves activating the entire MAC site, the aim is to bring the community even closer. Green Cubes will facilitate an easy understanding of nature, enhance the reclamation of the site, and transparently communicate the work done by Vale. Vale and MAC aspire to lead the way in biodiversity reporting through their collaboration with the Taskforce on Nature-related Financial Disclosures (TNFD), further demonstrating how technology, data, and visibility through the Green Cubes platform can support seamless, transparent, and robust biodiversity reporting. By enabling Green Cubes Natural Capital through the Green Cubes cubic metre asset class, an opportunity to attract new partners who will share ownership of the area.

"With Green Cubes we will be able to better understand the area of MAC and Mata do Jambreiro, and – help the community understand it with us"

Jussara Januario is leading the Green Cubes project from the Future Use side at MAC, Vale. With a background in environmental engineering, she drives continues progress with deep understanding of mining Future Use.

"We believe that this is just the beginning in transforming how we measure and give value to environment – for the future of all mines."

Erik Josefsson, CEO of Hexagon's R-evolution, leading the Green Cubes initiative. By putting world leading technology in action, he believes Vale and Green Cubes will achieve global impact for the mining industry.

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