

Nature Positive Initiative State of Nature Metrics: Terrestrial Pilot Case Study - Vale

Vale S.A is a global mining company, with operations that include iron ore extraction in Brazil. At its Carajás operations, Vale applied state of nature metrics to strengthen how it measures ecosystem impacts, recovery and biodiversity performance.

A) Where Vale applied the metrics

Location	Carajás, Pará, Brazil, within the Carajás National Forest (sustainable use protected area)	
Pilot site	N4N5 Mine (Amazon biome), characterized by an advanced pit area illustrating iron ore mining in the Carajás region	
Pilot area size	10,462 hectares (mine site plus buffer. Restoration/compensation areas outside the buffer were not fully included)	
Ecosystems covered	Dense and open submontane forest, plus ferruginous rocky fields (“canga” vegetation) on iron-rich outcrops with high biodiversity and endemic species.	
Metrics piloted & granularity	<ul style="list-style-type: none"> - Ecosystem extent and classification, site ecosystem condition and species extinction risk - All tested at low granularity level 	
Piloting partner(s)	TNFD, GRI	

Figure 1: Carajás, Pará (Brazil), N4N5 Mine. Credit: Vale.

B) How and why the piloting project was completed

Vale joined the terrestrial metrics pilot to support implementation of its nature and biodiversity strategy, where identifying robust, science-based, and operational metrics was a key challenge. The project had three key objectives: (i) refining the methodology used by the Vale Technological Institute (ITV), (ii) strengthening robustness and alignment with corporate reporting needs (including TNFD impact assessment and GRI 101 Biodiversity reporting), and (iii) supporting its No Net Loss/Net Gain journey.



Figure 2: Diversity of ecosystems and habitats. Credit: Vale.



Vale built on its existing Forest Carbon Emissions and Removals Inventory, which tracks annual land-use and vegetation cover change. This monitoring was extended to assess the area and condition of vegetation impacted by operations, as well as areas protected or restored by the company.

C) Key measurement approaches and tools used

	<i>Ecosystem (condition and extent)</i>	<i>Species</i>
<i>Approaches</i>	<ul style="list-style-type: none"> - IND1: Classified and mapped ecosystem types using a combination of land use/land cover and national vegetation typologies; validated and adjusted classifications using local expert knowledge and higher resolution imagery; - IND3: Developed a tailored condition index based on locally relevant degradation drivers, including fire frequency, distance to edge, and secondary forest age 	<p>IND6:</p> <ul style="list-style-type: none"> - Compiled site-level records of threatened flora and fauna species (IUCN and national lists) from annual monitoring and rescue/collect actions; - Complemented with external occurrence data where available; - Integrated calculations into Vale’s internal biodiversity risk analysis platform Biolink
<i>Tools / data sources</i>	<ul style="list-style-type: none"> - IND1 and 3: MapBiomas Collection 9 land cover data (Landsat-based, 30m); Instituto Brasileiro de Geografia e Estatística Brazilian (IBGE) Vegetation map (phytoecological regions); - IND3: MODIS fire data; - IND1 and 3: Expert review/verification with field knowledge and high-resolution imagery 	<p>IND6:</p> <ul style="list-style-type: none"> - Site monitoring datasets used for GRI endangered species indicator; - IUCN red list - GBIF - Biolink proprietary platform

D) Key challenges encountered and how the framework was adjusted to ensure practicality



► *Ecosystem classification:* Due to very high levels of endemism and diversity in the project region, it was found that national ecosystem maps were more accurate than standard global datasets, so Vale utilised these instead.



► *Ecosystem condition:* Vale tested several recommended forest integrity tools but found they misclassified transition forests and iron-rich outcrops. Vale aggregated relevant data sources based on local degradation drivers to develop a tailored condition index, scoring from 0-100.



► *Boundary setting:* Vale noted that defining an adequate buffer for a site’s area of influence can be challenging and sometimes need extra time and/or iteration.

NPI notes: How feedback was incorporated

► Flexibility was maintained in the ecosystem classification guidance to use the IUCN Global Ecosystem Typology Level or national equivalent, enabling users to apply the most accurate dataset for their site.

► Clear criteria were incorporated into the guidance for selecting robust ecosystem condition datasets. This helps to ensure there is sufficient flexibility to measure locally specific drivers of condition whilst ensuring robustness and comparability.

► Additional guidance was developed advising companies to align their site metric boundaries with their direct operations and incorporating area of influence into their landscape buffer boundary. Reporting area of influence separately is noted as best practice.



E) Why is it important for companies to measure state of nature metrics?

Vale emphasized that the state of nature metrics are science-based, yet practical and can be implemented across sites with different levels of maturity, helping companies understand ecosystem extent and condition over time and improve biodiversity management performance.

Vale also highlighted that results are strengthened by transparent decision-making and calibration, especially in megadiverse contexts where coarse global datasets can miss critical local habitat variation.

- Decision-useful tracking: Measuring ecosystem extent, condition, and extinction risk supports monitoring performance and informs biodiversity management decisions.
- Scalable starting point: Companies can begin with existing or public datasets, then improve robustness as knowledge and site data evolve
- Credibility through transparency: Tracking and documenting methodological decisions helps reduce greenwashing risk and supports trustworthy disclosure.



“Start with the data that you have now.. The most important thing is to start.”

Letícia Guimarães
Head of Biodiversity, Vale



Learn more about the State of Nature Metrics: naturepositive.org/metrics

