Climate Week NYC 2025

Mining Together

Nature, People, and Just Transitions

Columbia Climate School
Columbia Center on Sustainable Investment

VALE

Roundtable Objectives

Explore how mining can use **Nature-based Solutions (NbS)** and **Circular Economy approaches** to deliver benefits for people, climate, and ecosystems.

Climate Resilience Focus

Understand how land stewardship throughout the mining cycle can protect operations, communities and ecosystems against climate shocks.

Mining's Potential

Understanding how the mining sector can harness NbS to turn negative externalities into a nature positive contribution.

Coming Soon

COP30, Belém

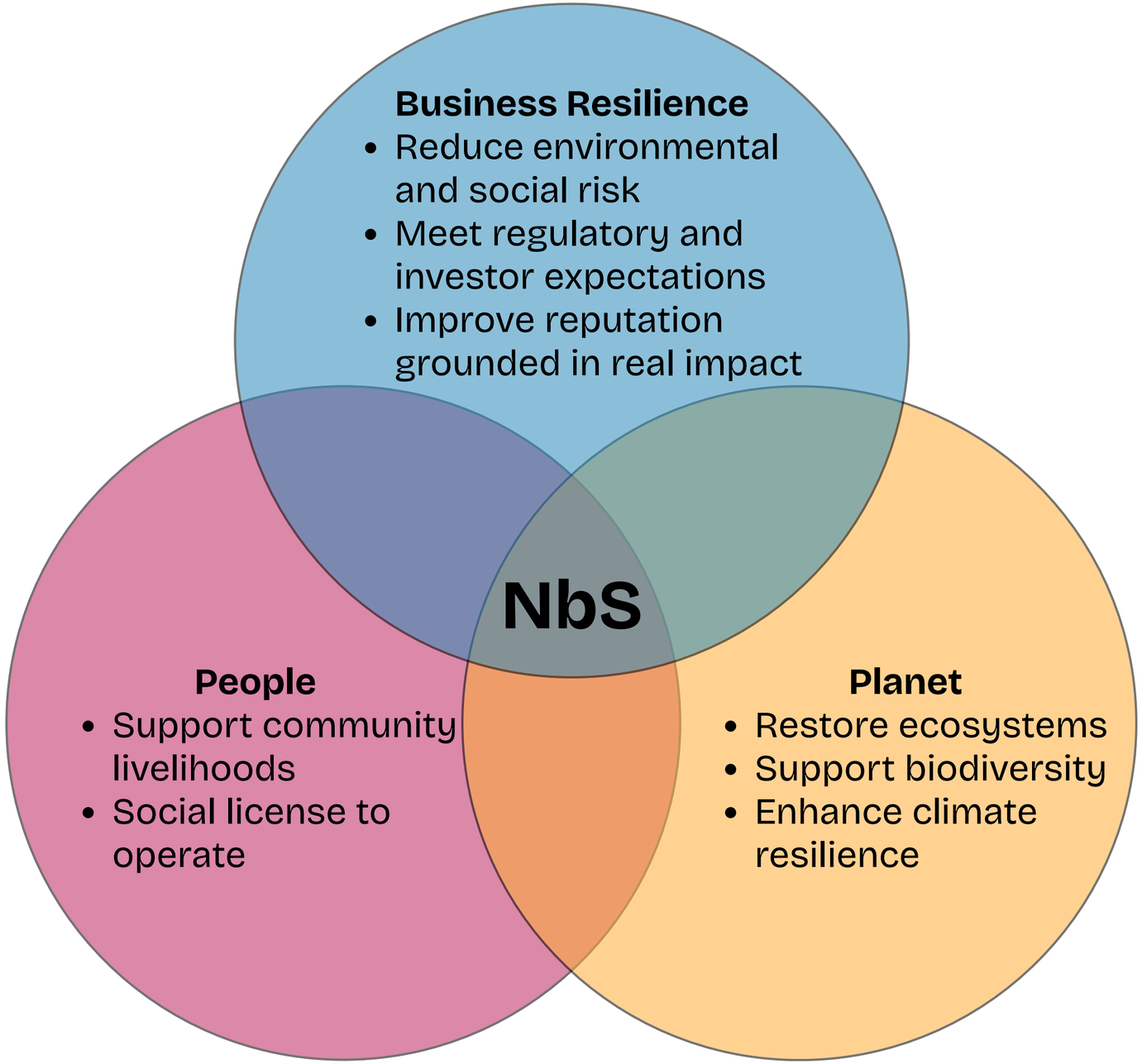
Laying the groundwork of dialogue at the "Nature COP" focusing on Brazil's socio-bioeconomy vision.

Why NbS & Mining?

Mining often overlaps with sensitive ecosystems: 7% in biodiversity hotspots, 8% in protected areas, 16% in “wilderness” areas of high ecological integrity.

Why now?

Increasing mineral demand amplifies mining’s economic, social and environmental footprint as well as its impact on decarbonization goals.



Defining NbS

"Actions to protect, sustainably manage and restore natural or modified ecosystems, which address societal challenges* effectively and adaptively, while simultaneously providing **human well-being** and **biodiversity benefits**." (IUCN, 2016)

Key Features of NbS

Addresses Societal Challenges

Eg. Lack of food and water security, public health, natural disasters.

Generates Societal Impact

NbS address societal challenges and thus center on human well-being.

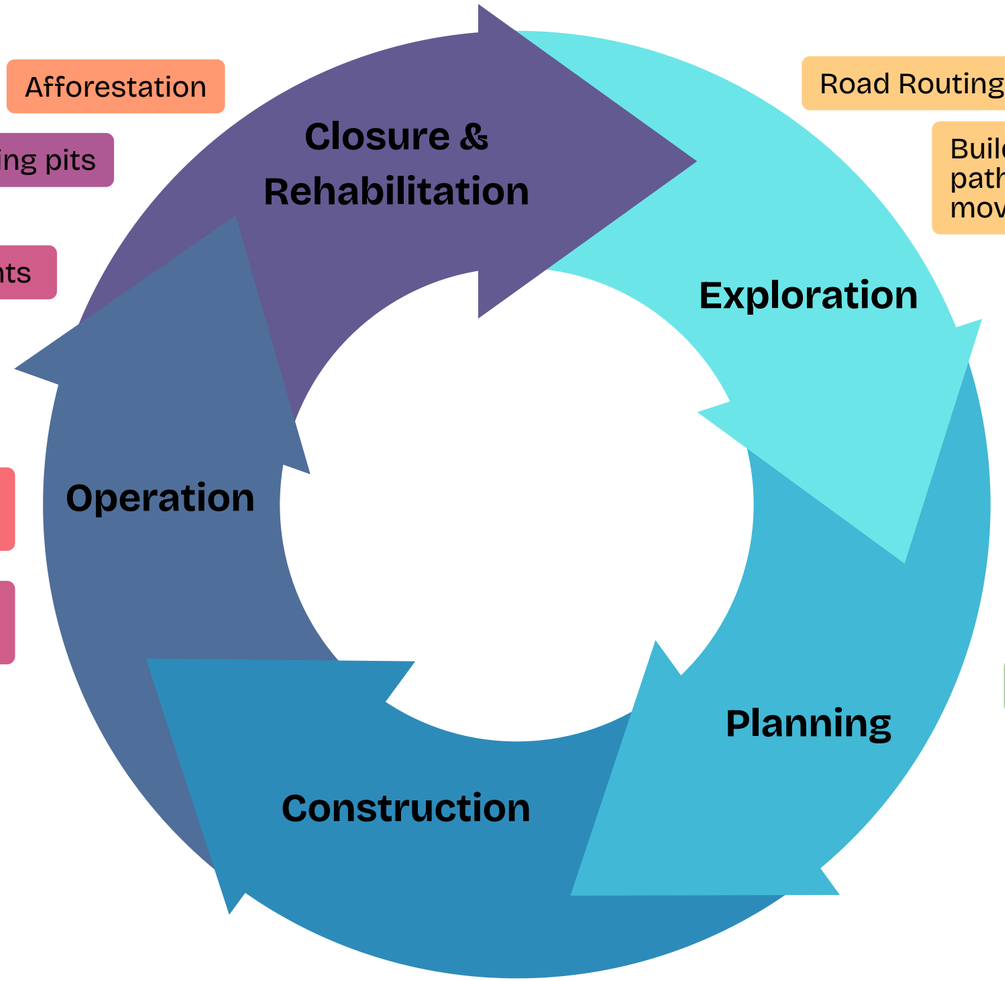
NbS Works WITH Nature

Healthy ecosystems deliver valuable services to society. Restoring nature is cost-effective.

NbS Generates Climate Co-benefits

Climate mitigation and resilience impacts generated by interrelation between nature and climate.

NbS in the Mining Lifecycle



Agroforestry

Afforestation

Quarry lakes: create reservoirs from mining pits

Phytoremediation: Plants and microbes for contaminant control in soil, water, and sediments

Road Routing

Building wildlife corridors: Designated natural pathways connecting habitats to support species movement and biodiversity

Protected areas management

Floodplain restoration: Repurposing low-lying land near the mine to hold run-off

Water bioremediation: using micro-organisms to break down contaminants

Protected areas management

Seed nursery and farming: native seedlings production for reforestation

*Cross-cutting NbS design

Revegetating drainage basins: Adding vegetation to basins for erosion control and water filtration

Vegetation screens: Planted barrier for dust, noise, erosion control, and habitat support

Fiber matting: Natural fiber mats for soil erosion control

NbS Resilience Building Function

- Water Abstraction
- Pollution Management
- Landscape Stabilization
- Landscape Recovery
- Land-use Planning
- Livelihood Management

Resilience-Building Function	NbS Example	Nature and Communities Benefits	Climate Benefits
Water Abstraction	**Quarry lakes:** Create reservoirs from mining pits	Increase water security and storage; regulate water flow	Climate resilience (drought and rainfall variability support)
	Water harvesting: Collecting and storing rainwater or stormwater to use for mining		
Pollution Management	**Soil bioremediation:** adding biological components to soil that reduce contaminants and acidity	Ecosystem and public health; reduce contaminants	Climate mitigation (carbon storage in biomass and soil)
	Treatment wetlands: artifically constructed floating vegetation (e.g. on a pit lake) that boosts acid mine drainage		
Land Stabilization	**Fiber matting:** putting natural fibers (straw, jute) on bare surfaces to prevent soil erosion	Prevent erosion; improved water and air quality	Climate mitigation (carbon capture and reduced vulnerability to extreme events)
	Cover crops: Planting crops (e.g. alfalfa, rye) to stabilize soil		
Landscape Recovery	**Afforestation:** planting native or naturalized species to restore landscapes, sequester carbon, support biodiversity, etc.	Ecosystem restoration and function	Climate mitigation and resilience (carbon sequestration and reduced flood risks)
	Reprofiling slopes: Reconstructing natural mountain topography		
Land-use Planning	**Protected areas:** Designating land as e.g. national parks, nature sanctuaries	Ecosystem preservation; tourism	Climate resilience (better ecosystem functions for carbon cycling and climate regulation)
	Wildlife corridors: Reforestation and rewilding of degraded lands		
Livelihood Management	**Agroforestry:** integrating trees into cropland and/or pastures	Income generation; support ecosystem function	Climate mitigation and resilience (carbon capture and reduced vulnerability to extreme events)

Case Studies

📍 Quarry Lake, USA

Hematite mine was rehabilitated into a quarry lake, repurposing the mining site into a reservoir.

Biodiversity: Lake supports robust ecosystem with trout density comparable to naturally occurring lakes.

Community: Recreational space for swimming, diving, and sailing.

Climate: Lake restoration buffers against floods, enhances blue carbon sequestration potential.

📍 Saltinho, Brazil

Limestone mine used **Technosols**, a synthetic soil made from mining waste and other non-organic debris.

Biodiversity: Technosols support the plant regeneration on otherwise infertile lands.

Community: Rehabilitated soils create productive agricultural land for community use, supporting livelihoods.

Climate: Promoting soil health enhances its carbon sink potential and helps buffer against floods.

📍 Vale do Rio Peixoto, Brazil

Gold mine used closed-circuit mercury recycling, soil restoration, and reforestation to limit mercury emissions.

Biodiversity: Reforestation restores habitats and soil recovery practices maintain fertility.

Community: Restoring fertile soil supports farming and livestock

Climate: Mercury recycling reduces emissions. Soil and forest restoration promotes carbon sequestration and flood buffer potential.

The Planning Phase

NbS can be implemented at any phase of the mining lifecycle — but planning is the most critical.

1

Set direction

Defines purpose, form, and implementation of NbS

2

Craft strategy

Moves beyond singular interventions to a nature-conscious framework

3

Build trust

Integrates community interests and participation

Spectrum of Community Engagement

The host community can be engaged in a mining project in various ways. The following reflect a spectrum of community participation.

Discussion Prompts

What does it mean for a mining company to be a ‘land custodian’ in practice rather than just a resource extractor? What practices and principles further this distinction?

What frameworks, practices, and planning decisions most strongly determine whether mining can deliver lasting benefits for people and nature?

What are the key challenges?

What models of landscape co-management between companies, governments, and communities can promote and maintain ecological integrity and climate benefits?

What lessons can be drawn from both successful and challenging NbS interventions across the mining lifecycle?

When NbS “fail”, what are the most common reasons?

Can we draw patterns from these factors?

How can stakeholders reconcile trade-offs when an NbS delivers ecological benefits but limited social benefits, or vice versa?

Discussion Prompts

Thank You!

Thank you for your attention, collaboration, and thoughtful insights. Please stay in touch!

Learn more about CCSI's work on mining and circular economy

Learn more about Vale's work on sustainability

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