Mine Closure Planning Must Face the Challenge of a Nature Positive Future

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Presented at the *Dig Deeper Webinar Series*

hosted by the

Cooperative Research Centre Transformations in Mining Economy
CRC-TiME, Perth

20 February 2024

Introduction and acknowledgements

UNIVERSIDADE DE SÃO PAULO
ESCOLA POLITÉCNICA

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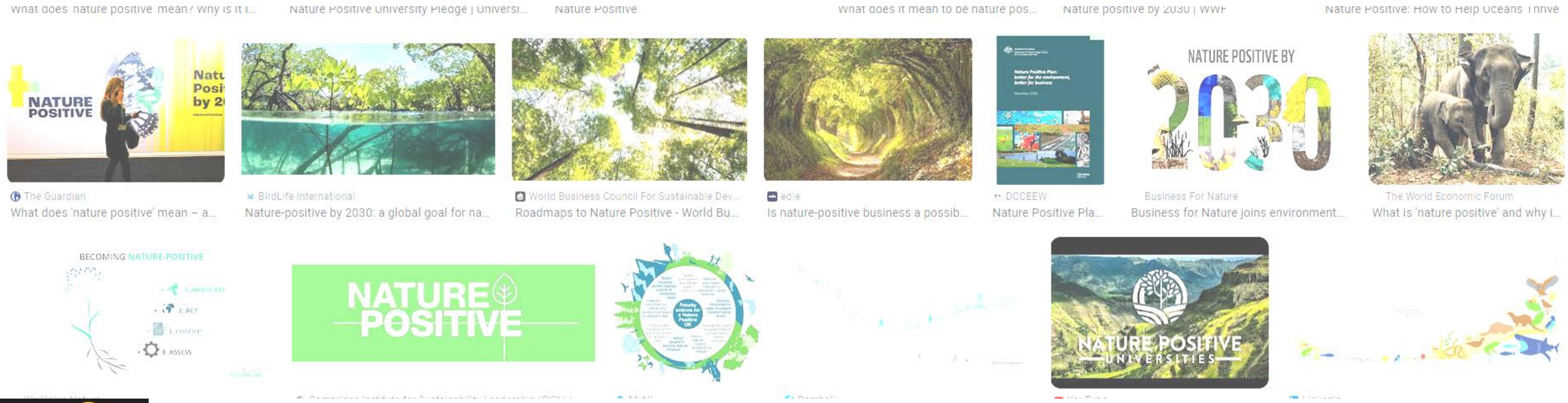
FORMANDO ENGENHEIROS E LÍDERES

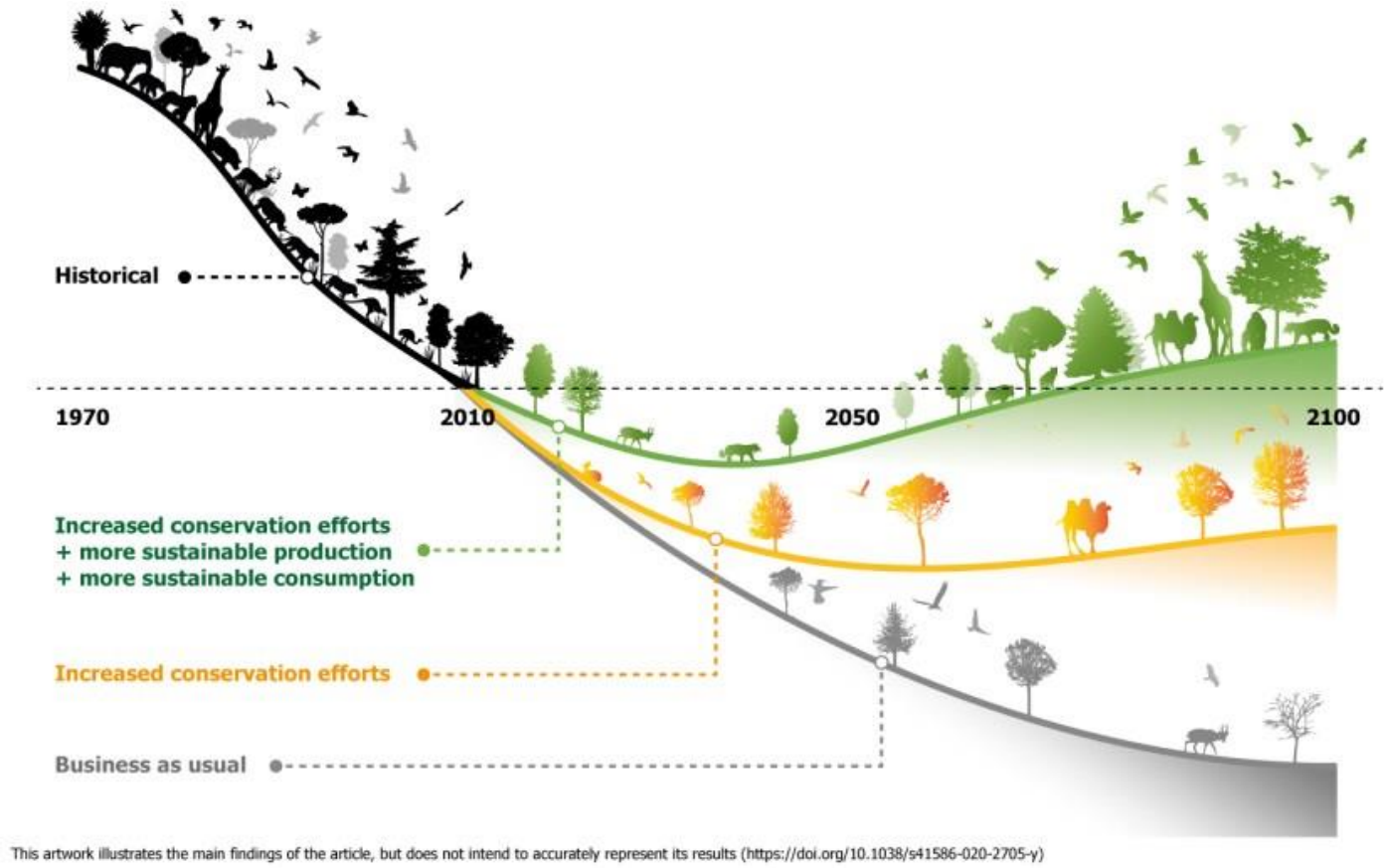
Mine closure planning and nature positive outcomes

1. **Why are Nature Positive outcomes needed?**
2. **Implications for life-of-mine planning**
3. **Lessons learned from implementing biodiversity offsets are useful**
4. **Summary and conclusions: The way ahead**



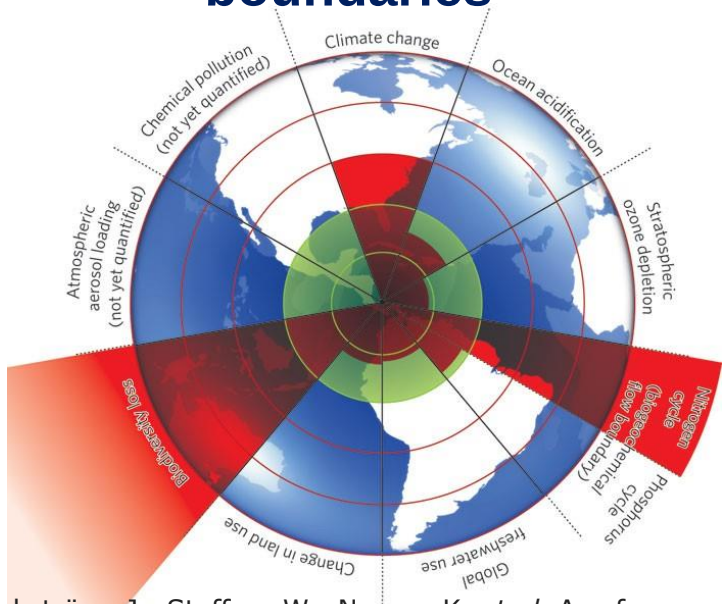
Short Introduction: Why “Nature Positive”?

Steep decline in biodiversity



Leclère, D., Obersteiner, M., Barrett, M. *et al.* Bending the curve of terrestrial biodiversity needs an integrated strategy. *Nature* 585**,** 551–556, 2020.

Going beyond planetary boundaries



Rockström, J., Steffen, W., Noone, K. *et al.* A safe operating space for humanity. *Nature* 461, 472–475, 2009.

Top 10 risks

WORLD ECONOMIC FORUM

Published: 11 January 2022

Global Risks Report 2022

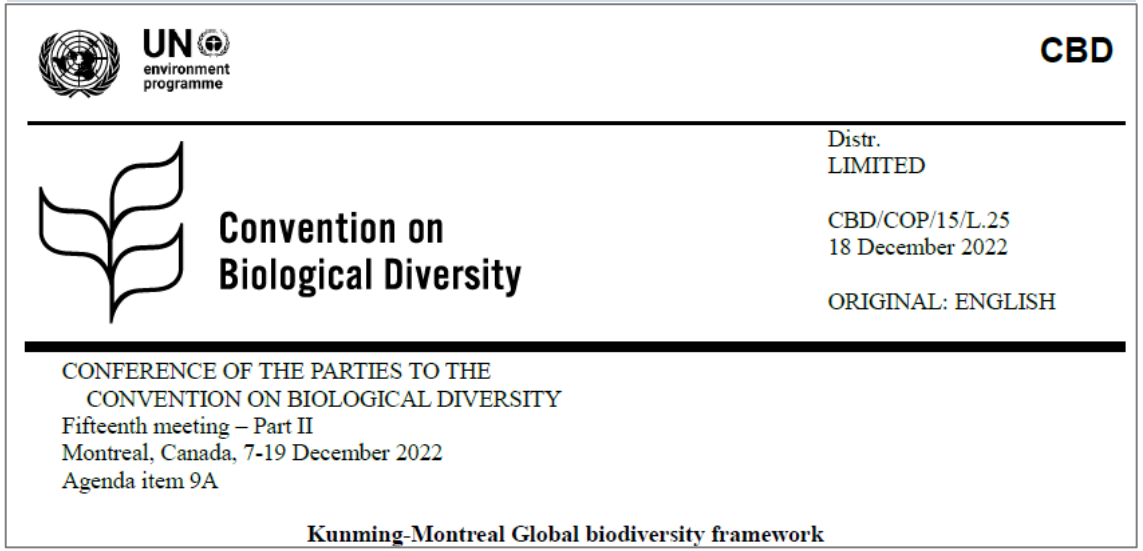
Positive action for biodiversity and ecosystems

1

30 by 30

Global targets – *Global Biodiversity Framework*

✦ **CDB Kumming-Montreal Framework**
18 dez 2022 CBD/COP/15/L.25



UN environment programme

CBD

Convention on Biological Diversity

Distr.
LIMITED

CBD/COP/15/L.25
18 December 2022

ORIGINAL: ENGLISH

CONFERENCE OF THE PARTIES TO THE
CONVENTION ON BIOLOGICAL DIVERSITY
Fifteenth meeting – Part II
Montreal, Canada, 7-19 December 2022
Agenda item 9A

Kunming-Montreal Global biodiversity framework

To meet the targets we need to protect and restore

TARGET 2
Ensure that by 2030 at least 30 per cent of areas of degraded terrestrial, inland water, and coastal and marine ecosystems are under effective restoration, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

TARGET 3
Ensure and enable that by 2030 at least 30 per cent of terrestrial, inland water, and of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem functions and services, are effectively conserved and managed through (…)

Legislation is coming of age

The Guardian
A decade of making a difference

Monday, 12 February 2024

Town and Country Planning Act

"... Biodiversity Net Gain means all new building projects must achieve a 10% net gain in biodiversity or habitat ..."

The age of extinction
Biodiversity

The age of extinction is supported by

the guardian .org

About this content

Phoebe Weston

@phoeb0

Mon 12 Feb 2024 11.01 AEDT

England brings in biodiversity rules to force builders to compensate for loss of nature

From this week, developments must result in more or better natural habitat than before, in a move hailed as one of the world's most ambitious

Flooded fields on Iford Estate farm in East Sussex, one of five farms selected as a pilot project for the biodiversity net gain scheme. Photograph: Jill Mead/The Guardian

Action is needed if we are to meet the targets…

WORLD ECONOMIC FORUM

CLIMATE AND NATURE

5 ways businesses can implement the new Global Biodiversity Framework

Feb 21, 2023

Businesses are key to implementing the GBF – target 15 calls for them to "progressively reduce negative impacts on biodiversity." The stakes are high and the risks of biodiversity loss are well documented, with half of the world's global domestic product highly or moderately dependent on nature.

McKinsey & Company

Nature-related commitments by Fortune Global 500 companies are rising, but progress is incremental and from a very low base.

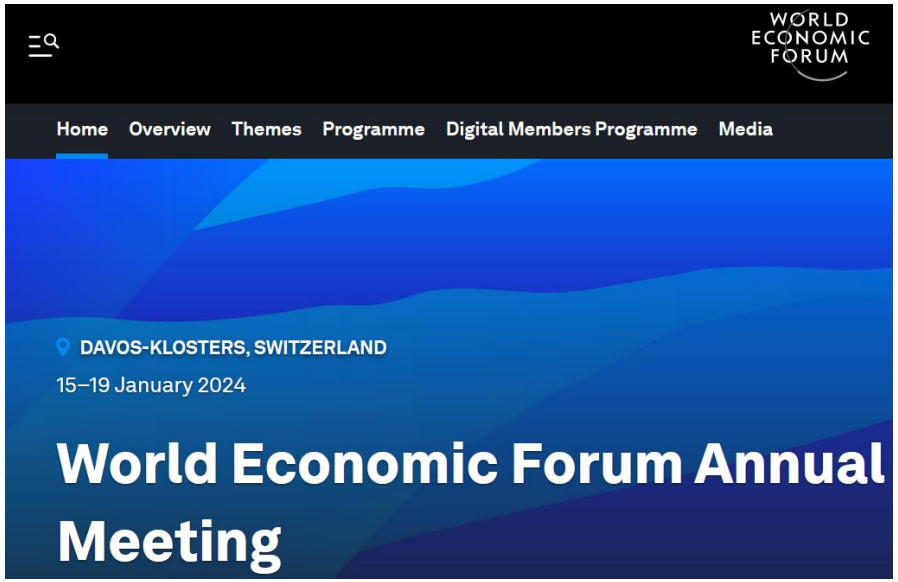
https://www.mckinsey.com/industries/agriculture/how-we-help-clients/natural-capital-and-nature/our-insights/companies-are-broadening-their-commitments-to-nature-beyond-carbon December 8 2023

New commitments by the mining industry

ICMM Mining leaders make landmark commitments to support a nature positive future

17 January 2024

Leading global mining and metals companies have today committed to take urgent action to support a nature positive future by 2030



Global Risks Report 2024

GRPS respondents disagree about the urgency of environmental risks, in particular Biodiversity loss and ecosystem collapse and Critical change to Earth systems. Younger respondents tend to rank these risks far more highly over the two-year period compared to older age groups, with both risks featuring in their top 10 rankings in the short term. The private sector highlights these risks as top concerns over the longer term, in contrast to respondents from civil society or government who prioritize these risks over shorter time frames.

New commitments

ICMM

1. **Protect and conserve pristine areas of our natural environment:** No mining or exploration in World Heritage Sites and respect all legally designated protected areas.[2]

2. **Halt biodiversity loss at our operations:** Achieve at least no net loss of biodiversity at all mine sites by closure against a 2020 baseline.

3. **Collaborate across value chains:** Develop initiatives and partnerships that halt and reverse nature loss throughout supply and distribution chains.

4. **Restore and enhance landscapes:** Around operations through local partnerships, including with Indigenous Peoples, land-connected peoples and local communities.

5. **Catalyse wider change:** Acting to change the fundamental systems that contribute to nature loss and fostering opportunities for nature's recovery.

What is “Nature Positive”?

Nature positive: “halting and reversing biodiversity loss, through measurable gains in the health, abundance, diversity and resilience of species, ecosystems and nature processes”

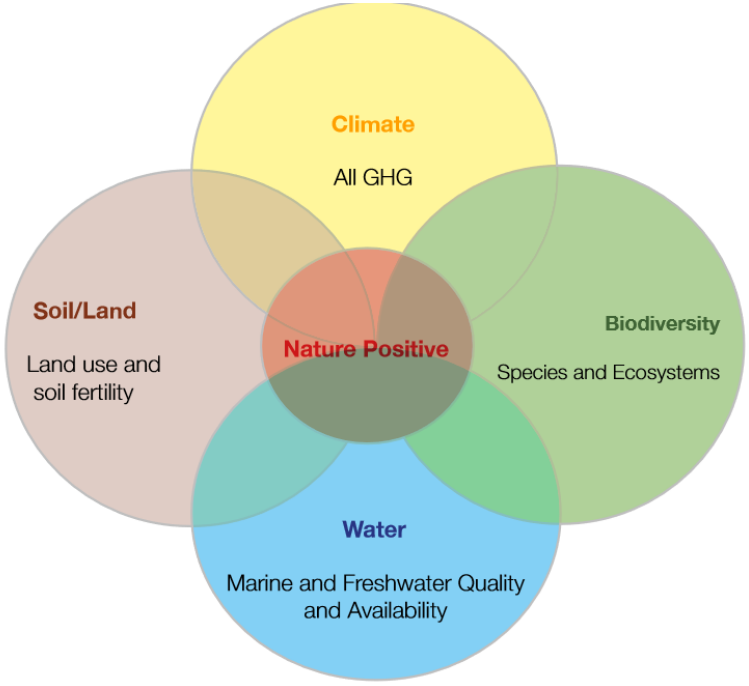
The Nature Positive Initiative (launched on 6 Sept 2023]

Nature positive:

“a global and societal goal to halt and reverse the loss of nature across all four realms (water, biodiversity, air/climate, and soil/land, for the benefit of human and planetary well-being)”

“halting and reversing is about avoiding and minimizing impacts, and in addition, restoring and regenerating nature”

IUCN



IUCN. *Nature Positive for Business*. Gland, 2023.

2 Implications for Life-of-Mine planning

Photo: L. E. Sánchez

Implications for developing and assessing mining projects

Setting the goal:

Minimize losses

Counterbalance unavoidable losses with equivalent gains

Generate net positive impact

More ambitious goals

Seeking positive legacies

Requires full application of the mitigation hierarchy and well-structured mine closure planning + post-closure goals

Issues in Nature Positive outcomes for mining projects

- Frequent overlap of mineral deposits and important biodiversity areas
- Possibilities of avoiding and minimizing harmful impacts are often limited
- Rehabilitation does not always aim at ecological restoration, but when it does:
  - Time gap
  - Limited technical and knowledge to restore certain biodiversity values
  - There are managerial risks associated with the long time frames needed

Photo: L. E. Sánchez

Challenges for mining projects to go “nature positive”

- ◊ Acknowledging no go areas
- ◊ Acknowledging mineral reserves may not be fully recovered

→ Limits to losses; NP means “halt” and restore; Not everything is “offsetable”

- ◊ Addressing the time lag in (site + offset) restoration

→ Early action is needed; Anticipating conservation measures may be necessary

- ◊ Gaining social acceptance/license to get nature positive

→ Limits to tradeoffs; Consider ecosystem services

- ◊ Ensuring permanence of biodiversity gains

→ Long-term governance of natural assets

Mine closure: A (very) short historical perspective

- Abandonment
- Mine first, think about rehabilitation later
- Plan for mine rehabilitation earlier, implement progressive rehabilitation
- Plan for closure from the outset of a new project
- Plan for post-closure

Relevant for mine closure planning (1)

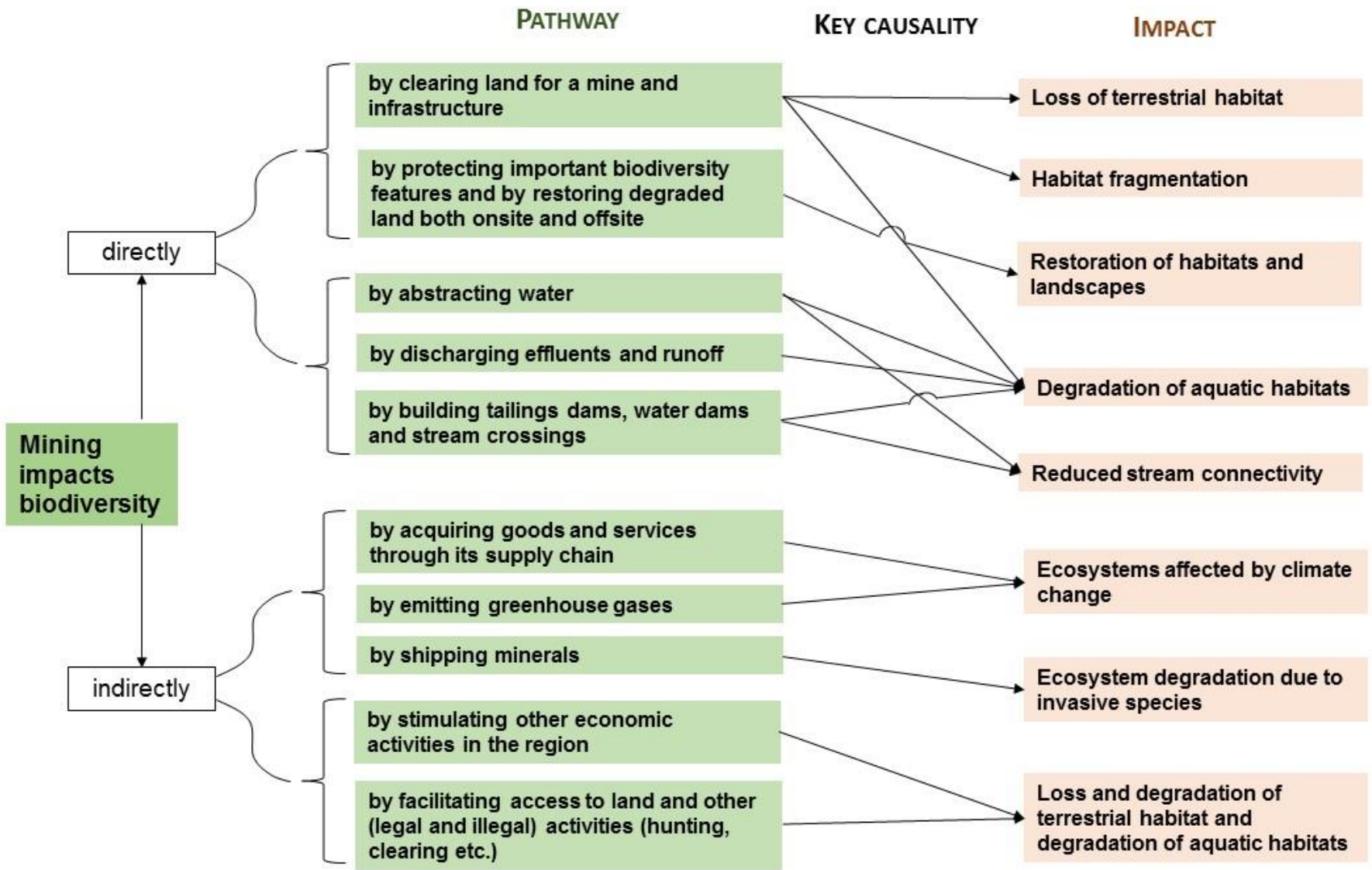
ICMM commitment:

4. Restore and enhance landscapes: Around operations through local partnerships, including with Indigenous Peoples, land-connected peoples and local communities.

What is important to note:

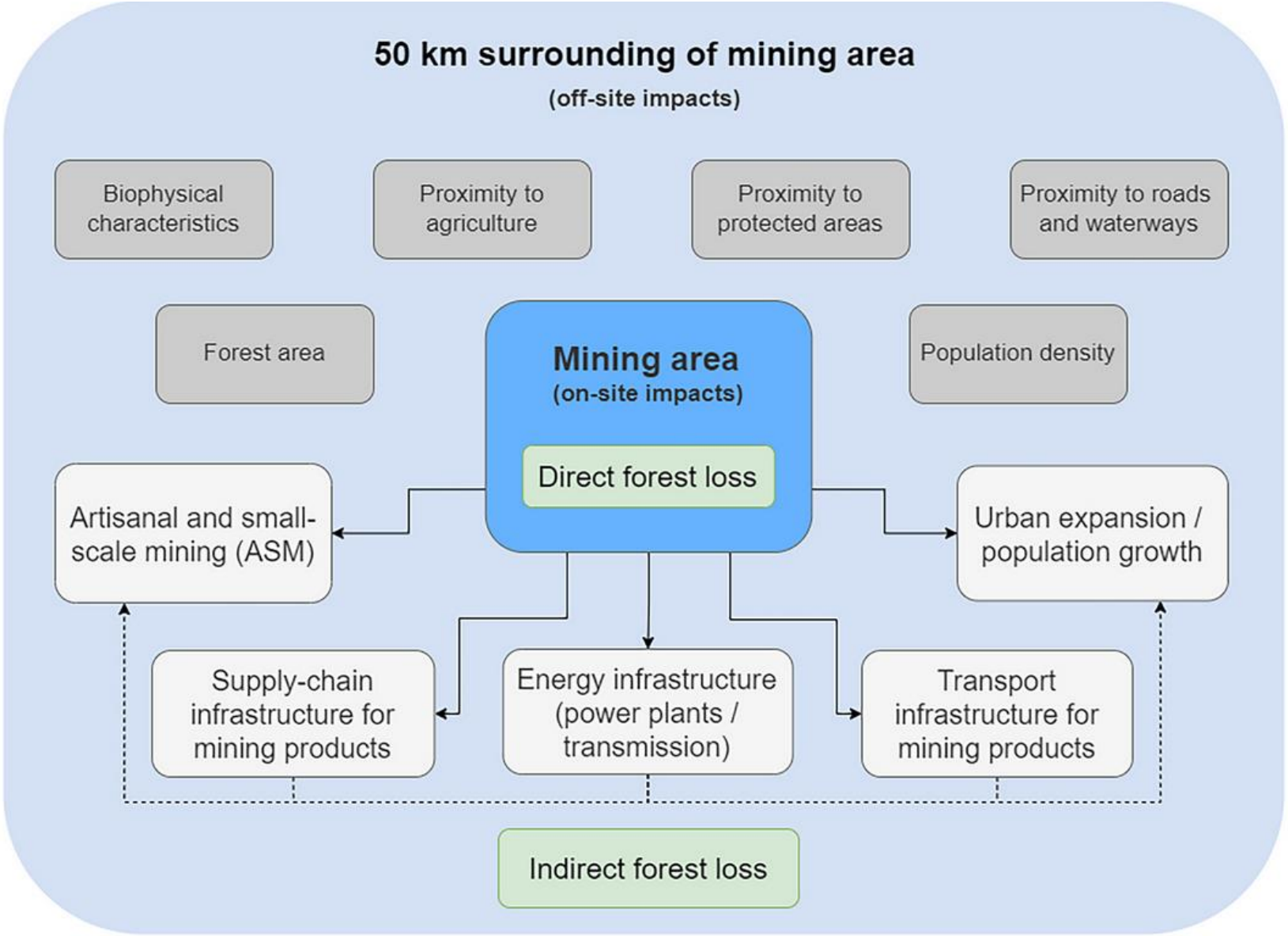
- **Mining affects or can affect biodiversity values through different pathways**
- **Mining can have effects on biodiversity well beyond the mine footprint**
- **Mining impacts on biodiversity can persist after mine closure**
- **A landscape approach is necessary to plan for offsetting residual impacts on biodiversity**
- **Partnering with Indigenous and land-connected peoples is essential**

Impact pathways



Source: Sánchez, L.E., unpublished

Effects on biodiversity beyond the mine footprint



Giljum, S.; Maus, V,; Kuschnig, N,; Luckeneder, S.; Tost, M.; Sonter, L.J. Bebbington, A.J. A pantropical assessment of deforestation caused by industrial mining. *Proceedings of the National Academy of Science*, 119 (38) e211827311, 2022. https://doi.org/10.1073/pnas.211827311

Mine + associated facilities

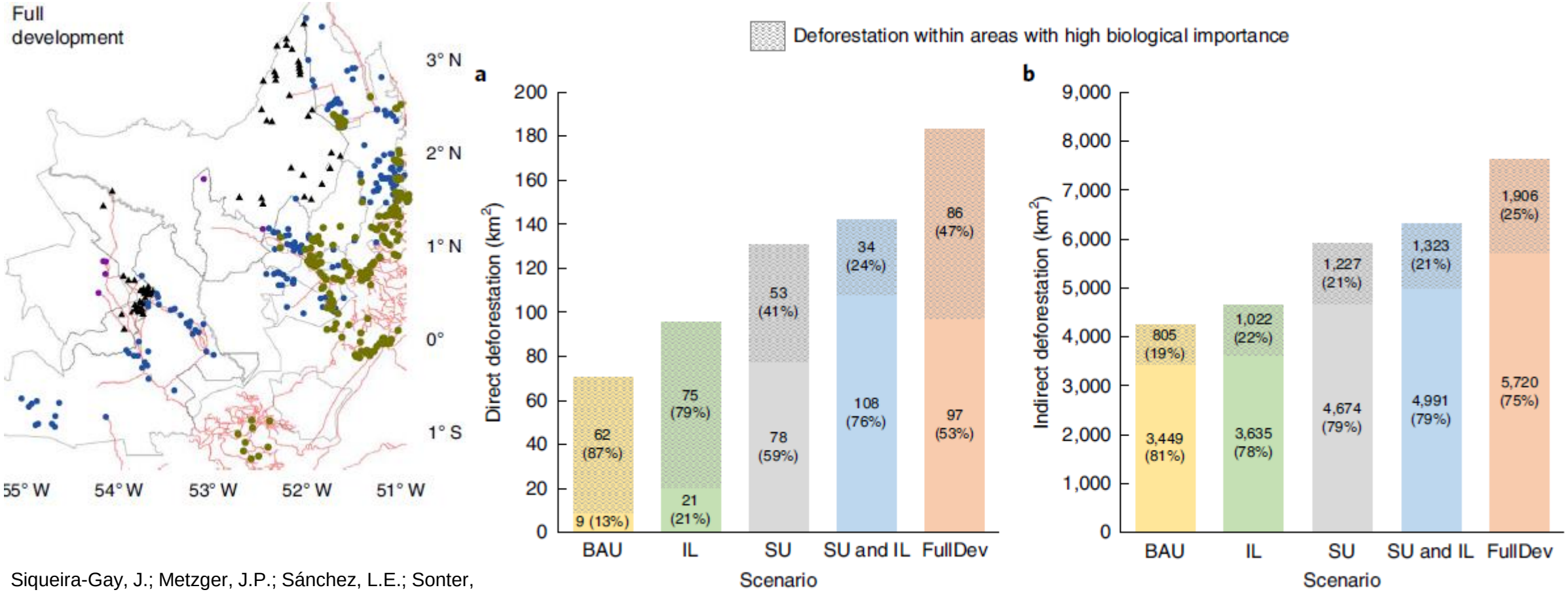
Brazil's federal environmental agency IBAMA report on a proposed ore Maritime terminal

Assim, como exposto no histórico desse parecer, o ICMBio foi consultado em fevereiro de 2014 para manifestação acerca do EIA/RIMA do empreendimento, no que se refere ao impacto sobre as tartarugas marinhas. Sendo encaminhada resposta em junho de 2014, informando que "a espécie *Dermochelys coriacea* (tartaruga-de-couro), criticamente ameaçada de extinção, tem, na região prevista para a instalação desse porto, seu único

"The selected location for the Harbour is the only regular breeding site in the Brazilian coast of the critically endangered leatherback turtle."

"We recommend further locational studies (...), which may imply in modification in the ore pipeline corridor. "

Mine + induced impacts

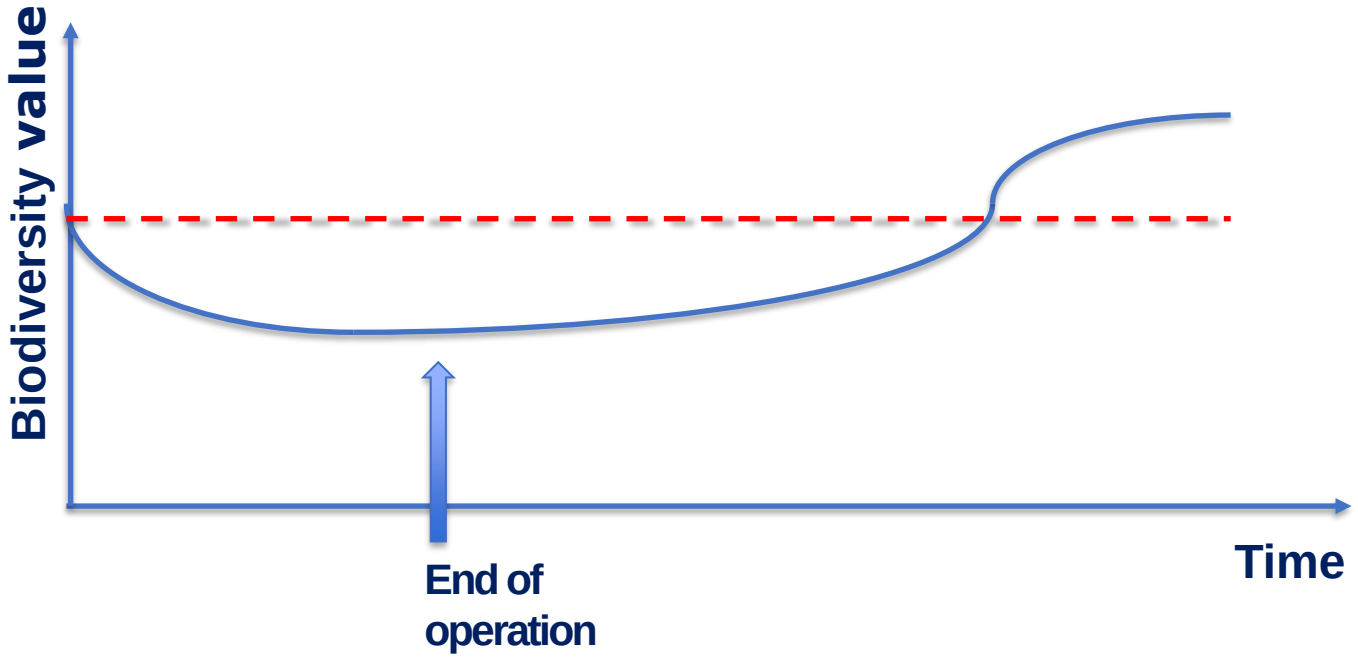


Siqueira-Gay, J.; Metzger, J.P.; Sánchez, L.E.; Sonter, L.J. Strategic planning to mitigate mining impacts on protected areas in the Brazilian Amazon. *Nature Sustainability* 5, 853-860, 2022. https://doi.org/10.1038/s41893-022-00921-9

Simulated direct and indirect forest loss in 5 scenarios of mining development in the Brazilian Amazon

Impacts on biodiversity can persist after mine closure

Long-term monitoring and maintenance may be necessary



A landscape approach to offsets / nature positive outcomes

Offsets and ACAs can improve landscape connectivity

Looking beyond de mine site

Actions aiming at nature positive outcomes may include:

1. **“Getting the most” from offsetting**
   - **Improving landscape connectivity**
   - **Improving habitats for endangered species**

2. **Additional conservation actions**
   - **Restoring vegetation in groundwater recharge areas**
   - **Restoring water sources**
   - **Restoring riparian vegetation**
   - **Improving agricultural/grazing productivity**

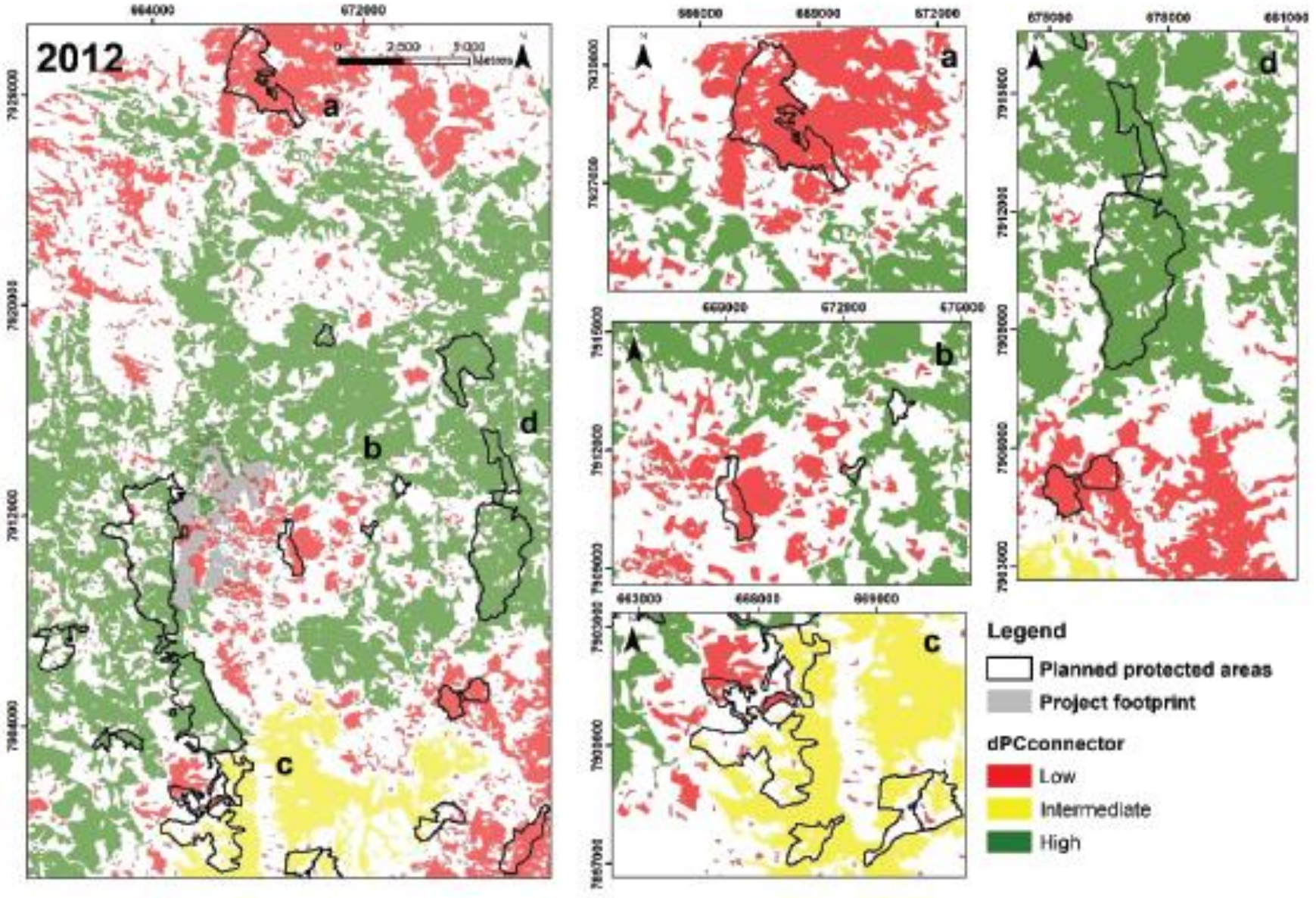
Using offsets to improve landscape connectivity

Probability of connectivity index

2012 - project construction

a b c and d offset areas

The highest the class (green) the more connected is the landscape

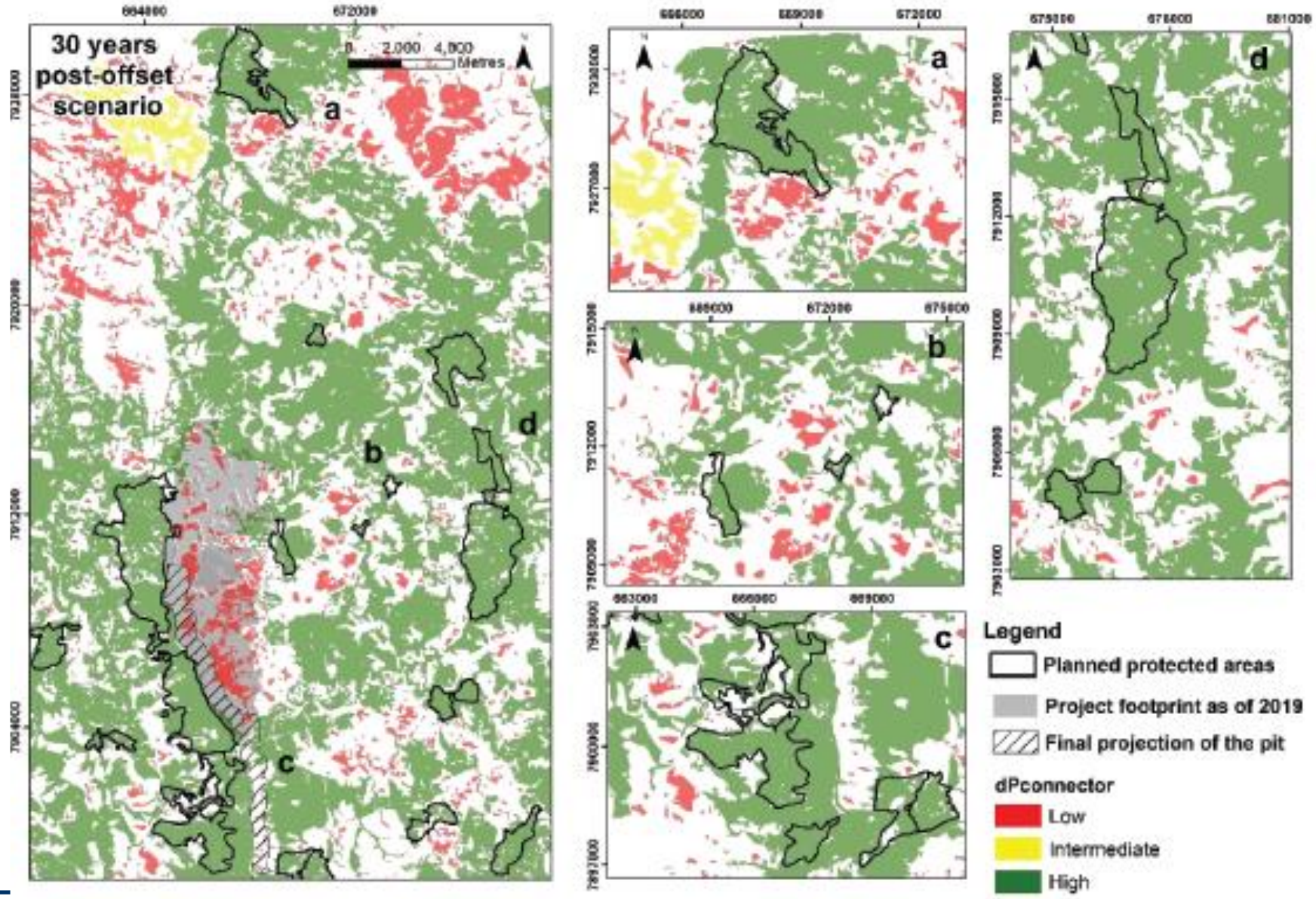


Rosa, J.C.S. et al. Enhancing ecological connectivity through biodiversity offsets to mitigate impacts on habitats of large mammals in tropical forest environments. *Impact Assessment and Project Appraisal* 41(5), 333-348, 2023. https://doi.org/10.1080/14615517.2022.2090086

Using offsets to improve landscape connectivity

Probability of connectivity index

2049 - restoration of Atlantic forest



The highest the class (green) the more connected is the landscape

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Partnering with Indigenous and land-connected peoples

ICMM
International Council on Mining & Metals

GOOD PRACTICE GUIDE
INDIGENOUS PEOPLE AND MINING

IMPACT ASSESSMENT AND PROJECT APPRAISAL, 2018
VOL. 36, NO. 6, 220–229
https://doi.org/10.1080/14615517.2018.1445175

IAIA
International Association for Impact Assessment

Taylor & Fr

Getting to 'agreed' post-mining land use – an ecosystem services approac

Josianne Cláudia Sales Rosa[a], Luis Enrique Sánchez[a] and Angus Morrison-Saunders[b,c,d]

[a]Mining and Petroleum Department, University of Sao Paulo, Sao Paulo, Brazil; [b]Centre for Ecosystem Management, School o
Edith Cowan University, Perth, Australia; [c]Research Unit for Environmental Science and Management, North West University, Potch
South Africa; [d]School of Veterinary and Life Sciences, Murdoch University, Perth, Australia

ABSTRACT

Mining companies are expected to ensure a positive legacy for communities and to engage them in defining post-mining land uses. This paper examined how an ecosystem service approach might be utilised to arrive at agreed post-mining land uses acceptable to communities and the mining company during mine closure planning. This was investigated in the context of a major bauxite mine in the Amazon region of Brazil. Data were gathered through document analysis,

Rosa, J.C.S.; Sánchez, L.E.; Morrison-Saunders, A. Getting to 'agreed' post-mining land use – an ecosystem services approach. *Impact Assessment and Project Appraisal* 36(6), 220-229, https://doi.org/10.1080/14615517.2018.1445175

Relevant for mine closure planning (2)

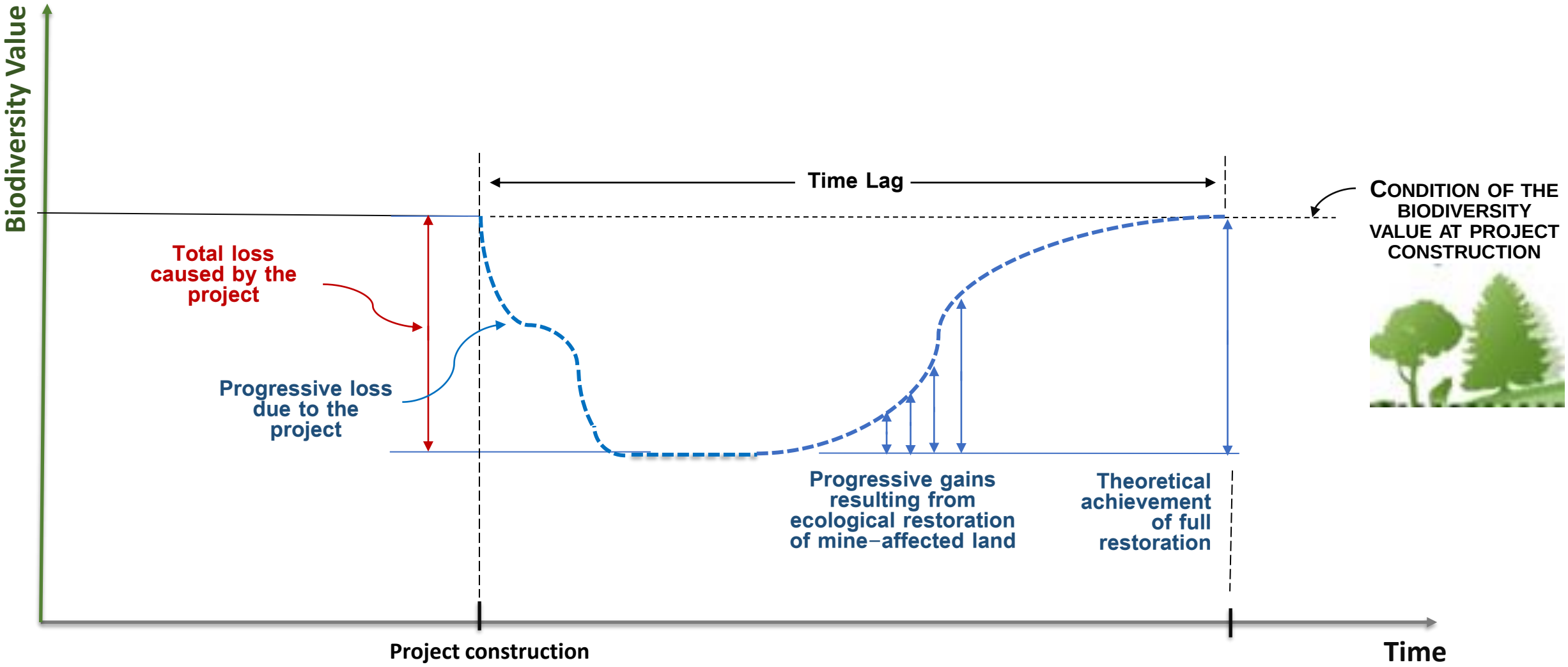
ICMM commitment:

4. Halt biodiversity loss at our operations: Achieve at least no net loss of biodiversity at all mine sites by closure against a 2020 baseline.

What is important to note:

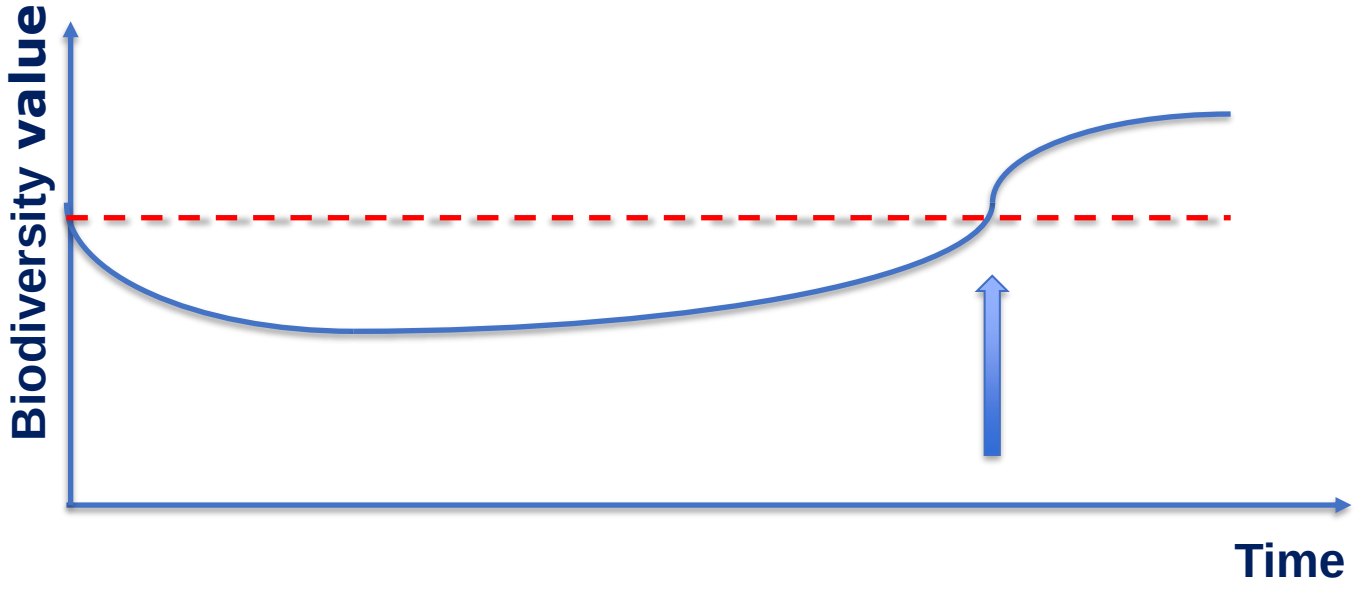
- **2020 baseline**
- **Achieving no net loss may require offsetting**
- **Achieving no net loss may require anticipation of conservation measures**
- **Restoring only “mine sites” does not account for indirect biodiversity losses**

2020 baseline? Addressing the time lag



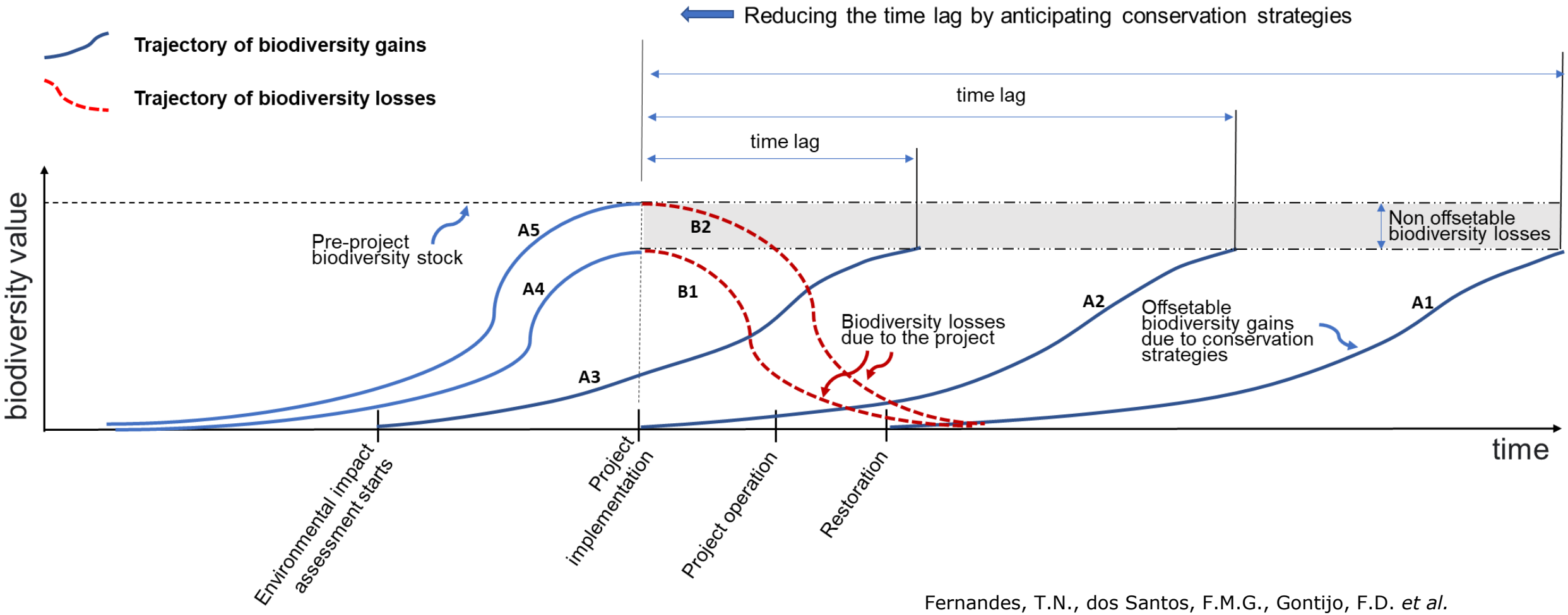
Biodiversity offsets and No Net Loss

No net loss as an outcome of offsets is a point in a trajectory towards ... permanent gains



Sanchez, LE.; Souza, BA.; Siqueira-Gay, J.; Valetich, R.; Rosa, JCS. *Pathways to achieve net positive impact on biodiversity and ecosystem services in mining*. São Paulo: FDTE, 2022.DOI:10.13140/RG.2.2.31925.55529

Anticipating conservation actions to reduce the time lag



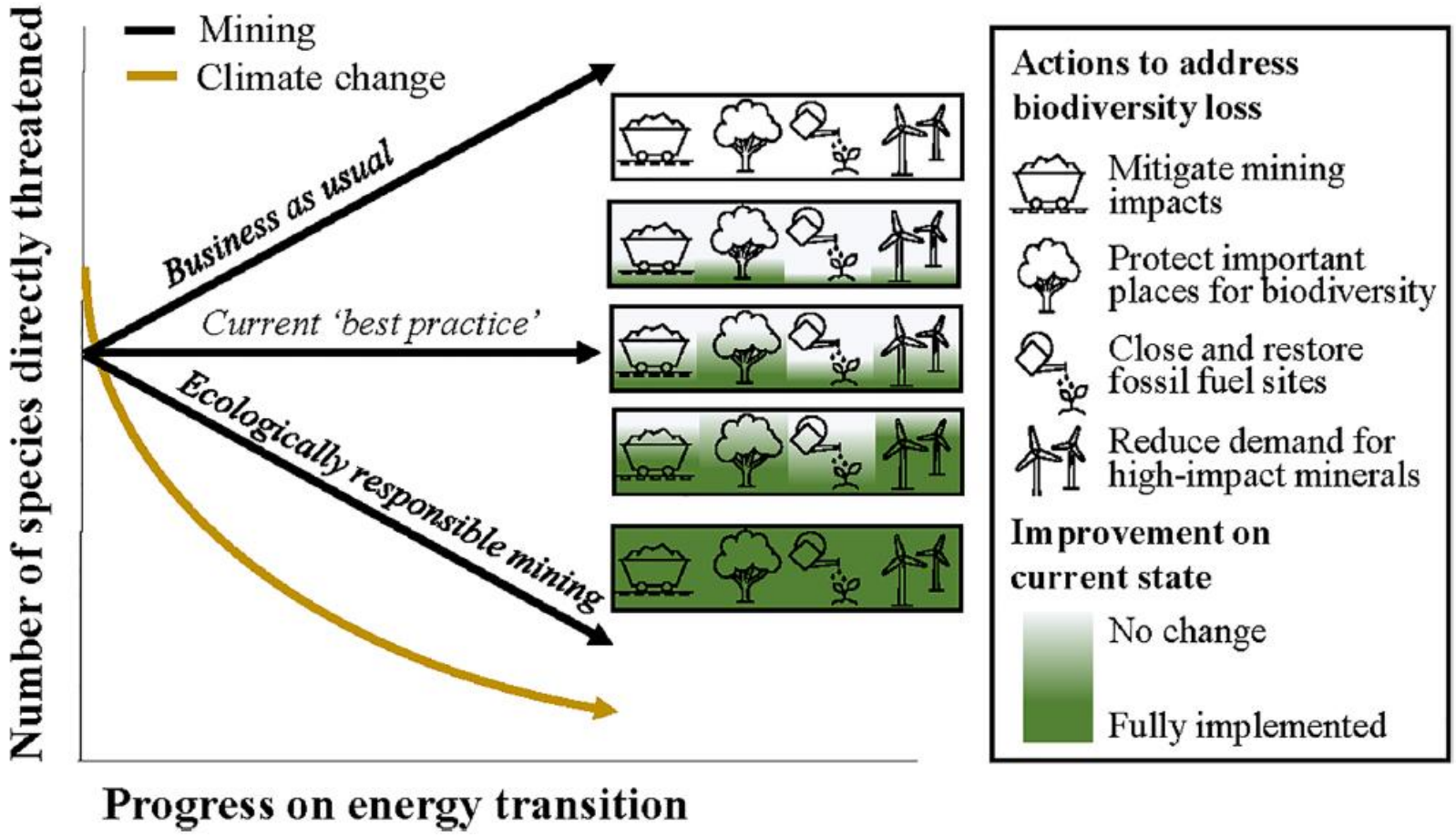
Fernandes, T.N., dos Santos, F.M.G., Gontijo, F.D. *et al.* Mainstreaming Flora Conservation Strategies into the Mitigation Hierarchy to Strengthen Environmental Impact Assessment. *Environmental Management* 71, 483–493, 2023. https://doi.org/10.1007/s00267-022-01756-y

Ecologically responsible mining

Threats are approximated by the number of species listed by the IUCN Red List as threatened (6).

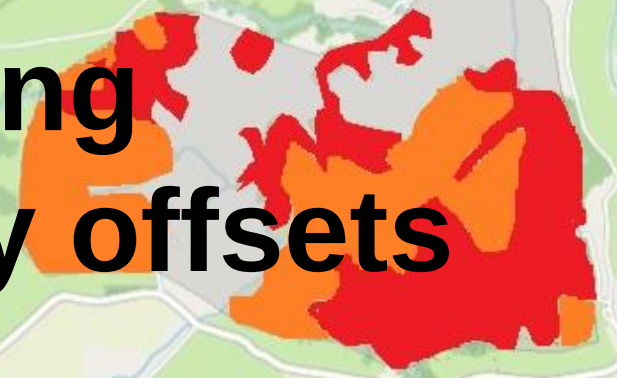
Current “best practice” represents a case where new mines achieve no-net-loss in biodiversity, through progress on a combination of actions.

Ecologically responsible mining achieves no-net-loss of biodiversity, while also restoring closed or abandoned coal mines to avert their threats.



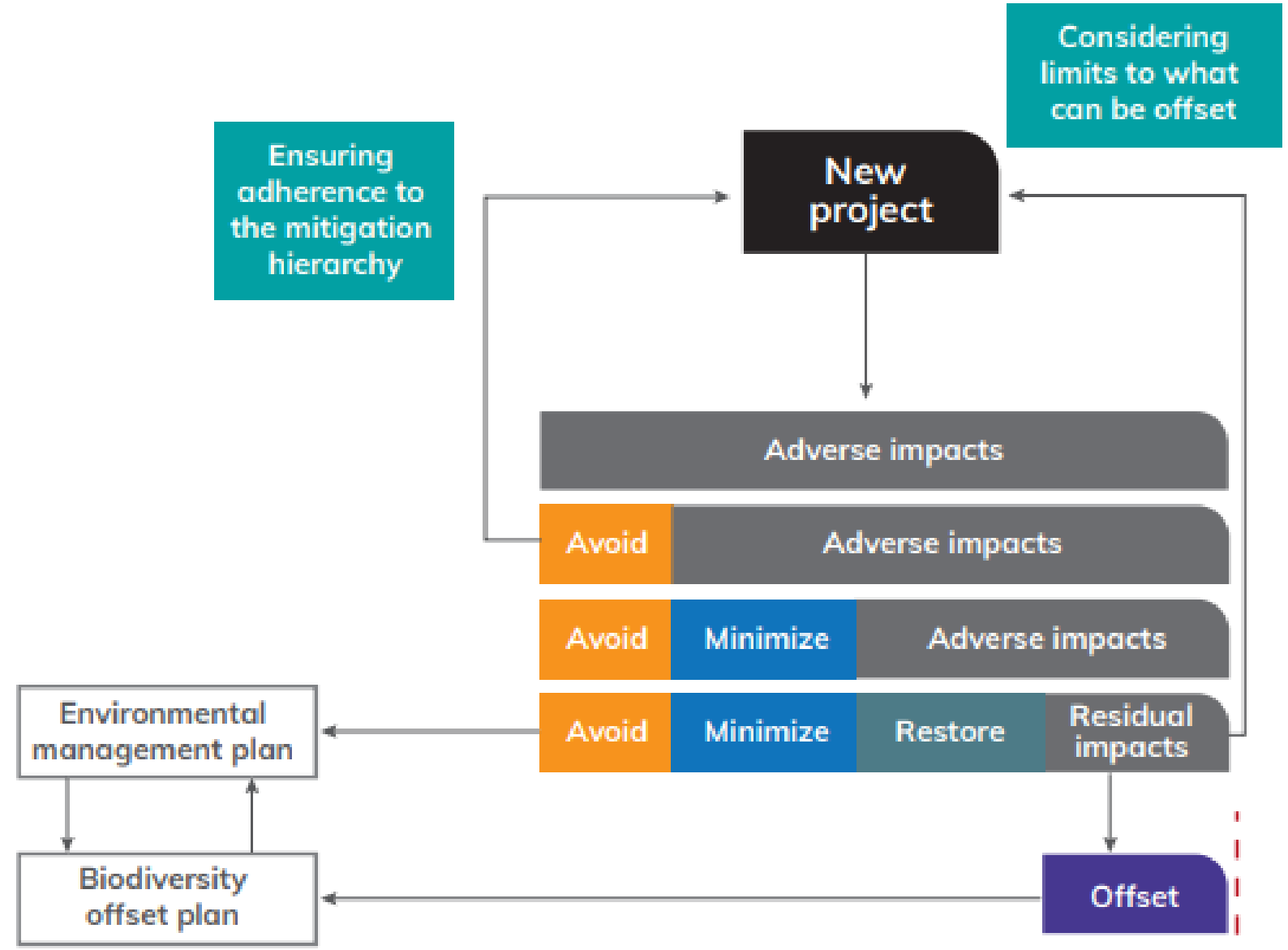
Sonter, L..; Maron, M..; Bull, J.W.; Giljum, S.; Luckeneder, S.; Maus, V.; McDonald-Madden, E,. Northey, S.A.; Sánchez, L.E.; Valenta, R.; Visconti, P.; Werner, T.T.; Watson, J.E.M. How to fuel an energy transition with ecologically responsible mining. *Proceedings of the National Academy of Science*, 120 (35) e2307006120, 2023. https://doi.org/10.1073/pnas.2307006120

3 Lessons from implementing biodiversity offsets



How to plan for net positive impact?

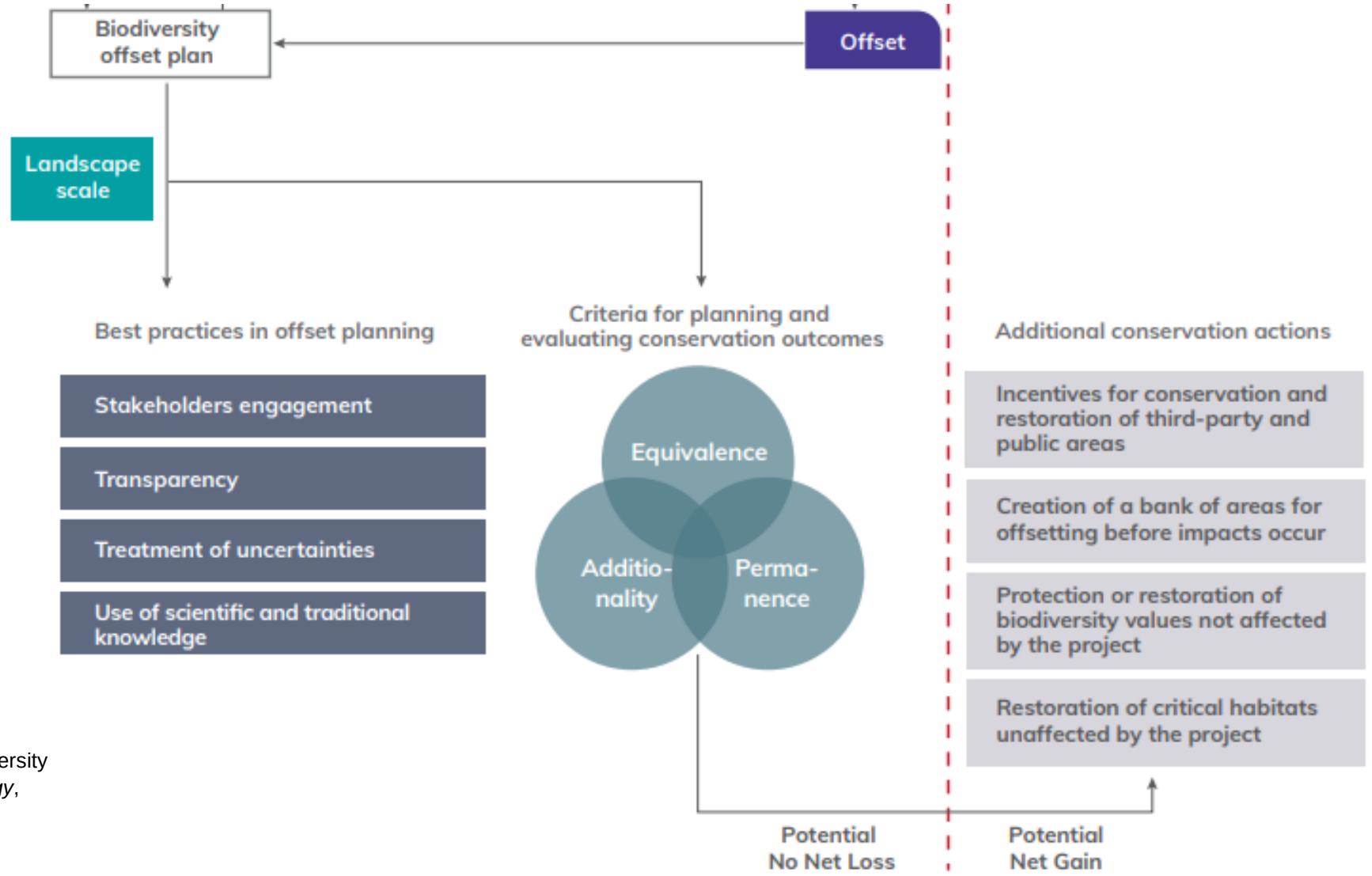
Management flow to achieve net gain of biodiversity (1/2)



Souza, B.A.; Rosa, J.C.S.; Campos, P.B.R.; Sánchez, L.E. Evaluating the potential of biodiversity offsets to achieve net gain. *Conservation Biology*, 37(4), e14094, 2023. https://doi.org/10.1111/cobi.14094

How to plan for net positive impact?

Management flow to achieve net gain of biodiversity (2/2)



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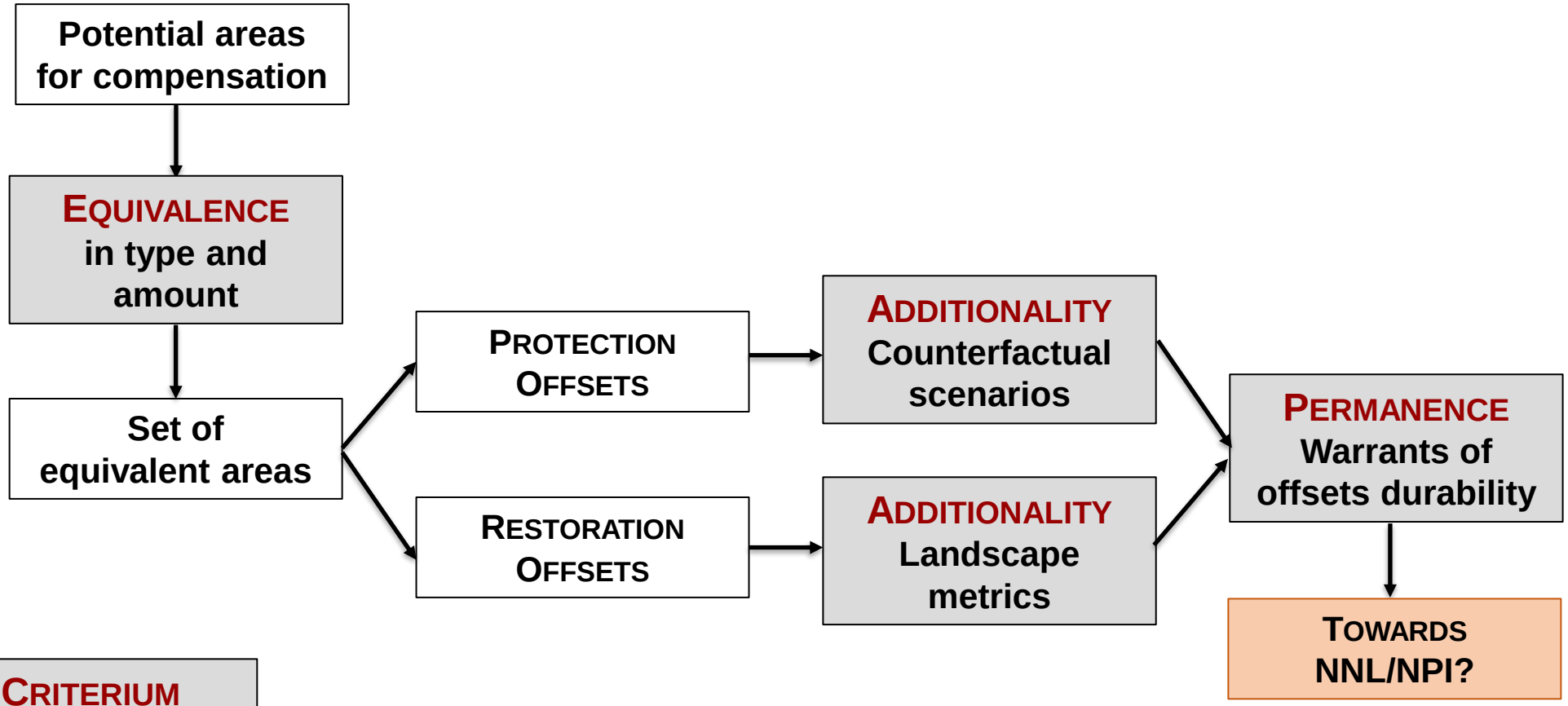
Conceptual basis for planning and evaluating offsets

- Equivalence
- Additionality
- Permanence

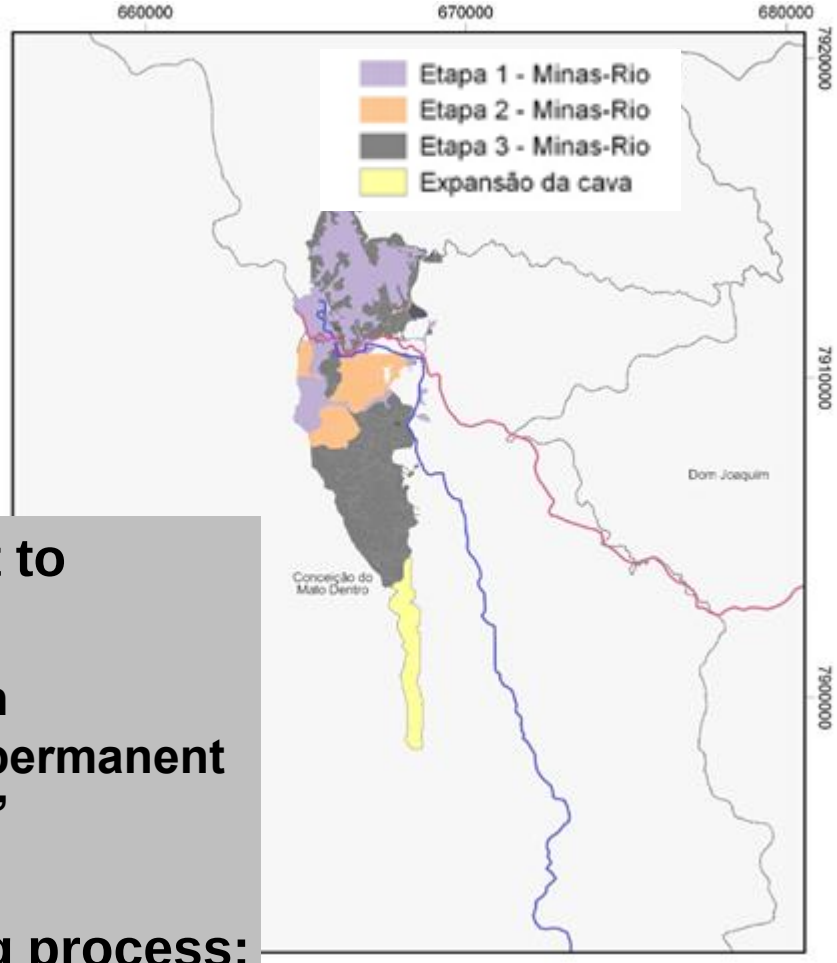
Core criteria to (plan and) evaluate biodiversity offsets



CRITERIUM
Methodological approach to plan and evaluate

Case study: Minas-Rio iron ore mine

- Iron ore mine - operating since 2014 [construction started in 2010]
- 26.5 Mt of concentrate/year
- Lifespan until 2066
- Affects rupestrian grassland and Atlantic forest



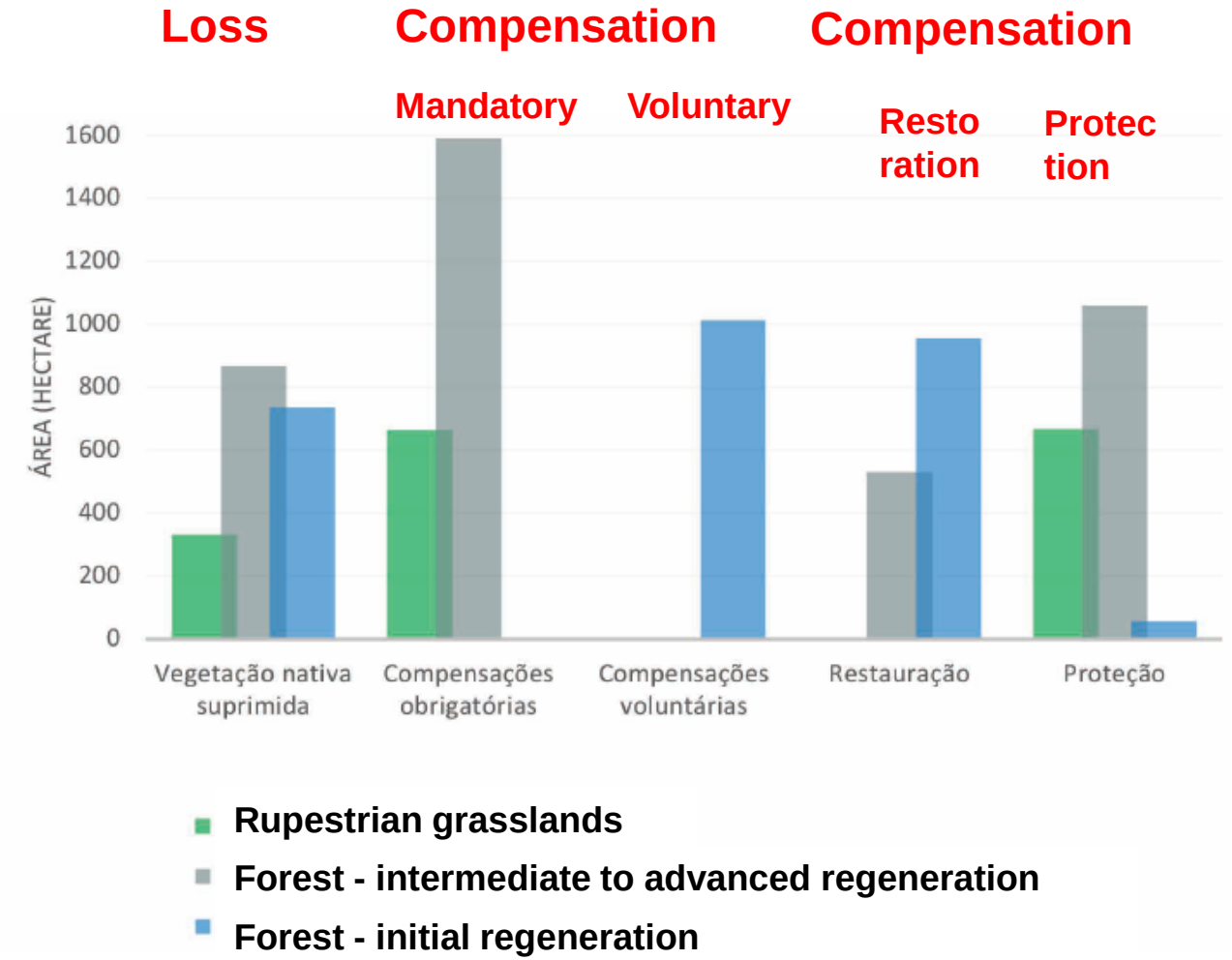
- Legal requirement to **compensate**
  - Native vegetation
  - "intervention in permanent protection areas"
  - Caves
- **EIA** and permitting process: compensation plan
- Company commitment to **Net Positive Impact**

Equivalence

"Are losses and gains of biodiversity equivalent in type and amount?"

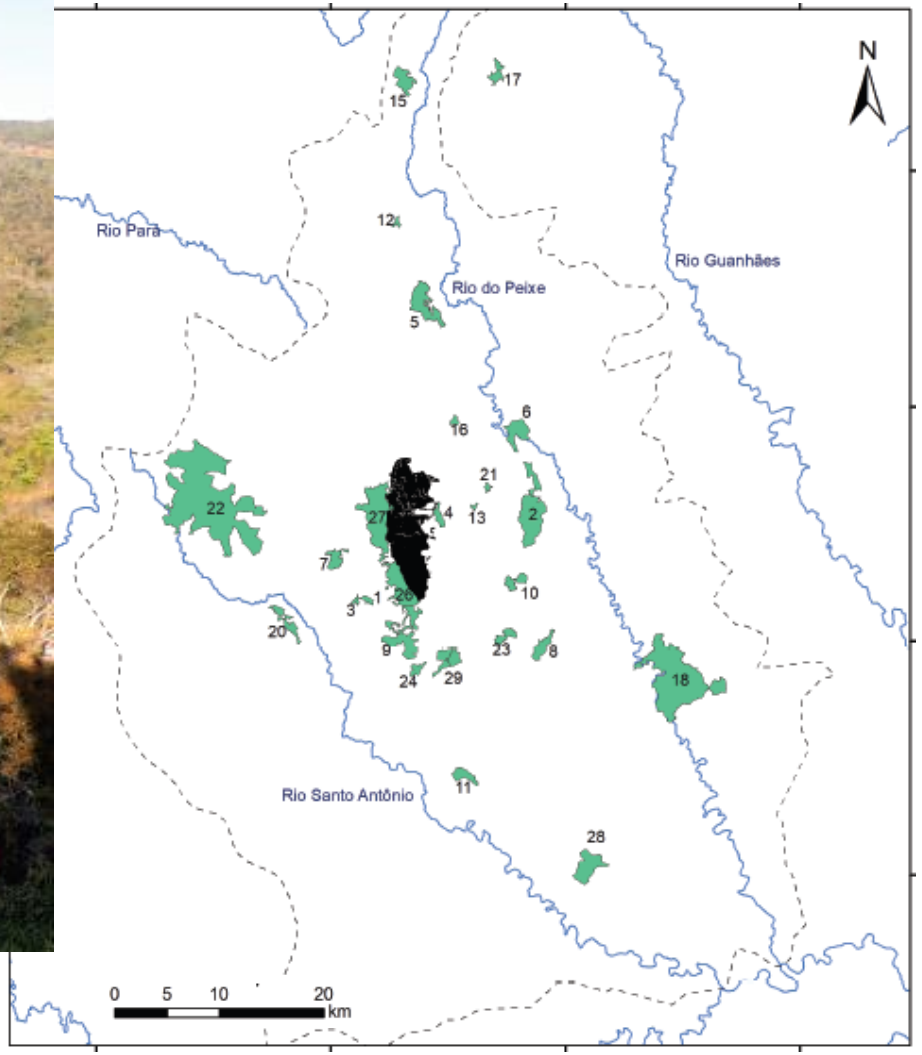
1a Area balance

- Loss = 1,937 ha (as of April 2020 – steps 1,2,3) – baseline = 2010
- Offsets = 3,270 ha, out of which 45.4% correspond to restoration or enrichment
- Land clearing started in 2010
- Offsets started being implemented in 2014

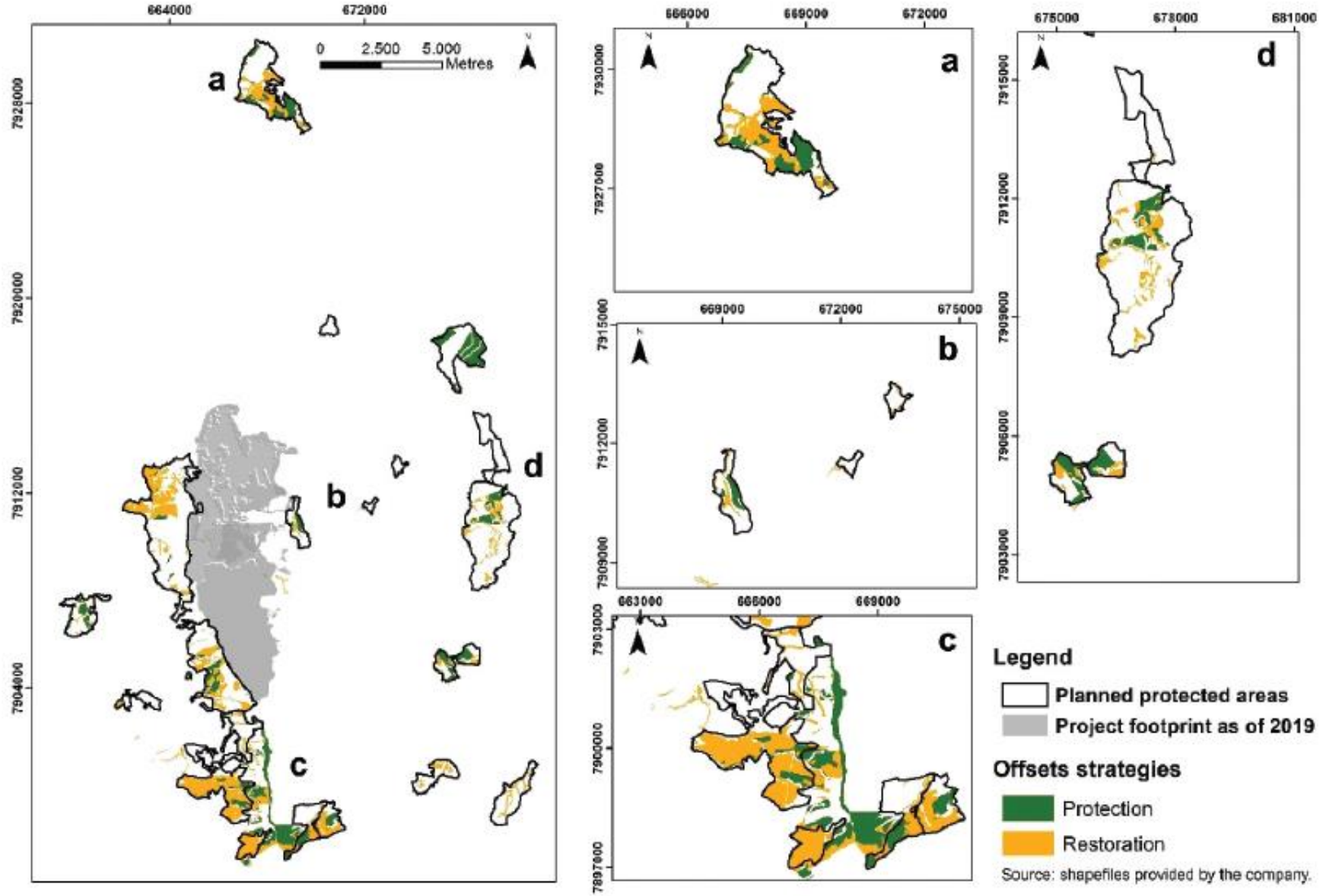


Offset areas (protection + restoration)

Fazenda Rio do Peixe, an offset area. In the foreground, seedlings of native species. In the background, an area of protected semi-deciduous seasonal forest | Photo: Luis Sánchez.



Detail of offset areas



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Permanence

“Will potential biodiversity gains last?”

- **offsets should last beyond the company's care**

GUARANTEES	EVIDENCE
Legal protection	
Risk management	
Adaptive monitoring and management	
Financial guarantees	

Permanence

“Will potential biodiversity gains last?”

- offsets should last beyond the company's care

GUARANTEES	EVIDENCE
Legal protection	5 terms of commitment for execution of a technical project for restoration of flora in the 5 municipalities.
	4 covenants to establish Private Protected Areas have been implemented.
	All covenants were linked to the property land title to ensure perpetual protection.
Risk management	
Adaptive monitoring and management	
Financial guarantees	

Permanence

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Risk management	Implementation of the Property Security and Intervention Prevention Program (to prevent intrusions, presence of cattle, fires, etc.), which requires active attention from the company.
Adaptive monitoring and management	
Financial guarantees	

Permanence

“Will potential biodiversity gains last?”

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Legal protection	5 terms of commitment for execution of a technical project for restoration of flora in the 5 municipalities.
	4 covenants to establish Private Protected Areas have been implemented.
	All covenants were linked to the property land title to ensure perpetual protection.
Risk management	Implementation of the Property Security and Intervention Prevention Program (to prevent intrusions, presence of cattle, fires, etc.), which requires active attention from the company.
Adaptive monitoring and management	Forest growth is monitored in restoration areas (Program for Monitoring of Offset Areas), including adaptive management according to the evolution of the planted areas.
Financial guarantees	

Permanence

“Will potential biodiversity gains last?”

- offsets should last beyond the company's care

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Legal protection	5 terms of commitment for execution of a technical project for restoration of flora in the 5 municipalities.
	4 covenants to establish Private Protected Areas have been implemented.
	All covenants were linked to the property land title to ensure perpetual protection.
Risk management	Implementation of the Property Security and Intervention Prevention Program (to prevent intrusions, presence of cattle, fires, etc.), which requires active attention from the company.
Adaptive monitoring and management	Forest growth is monitored in restoration areas (Program for Monitoring of Offset Areas), including adaptive management according to the evolution of the planted areas.
Financial guarantees	Although the mine closure plan contains a financial provision, the costs related to the maintenance of the offset areas are not explicitly considered in the calculation of this provision.

Some lessons from offsetting in mining

- **All biodiversity metrics imply simplification, especially for regulatory purposes, but it is important to avoid oversimplification**

- **Principles and guidance available (20+ years)**
- **Equivalence, additionality and permanence are key criteria of offset planning**
- **Risks (to biodiversity and to corporate image) of misusing offsets are real !**

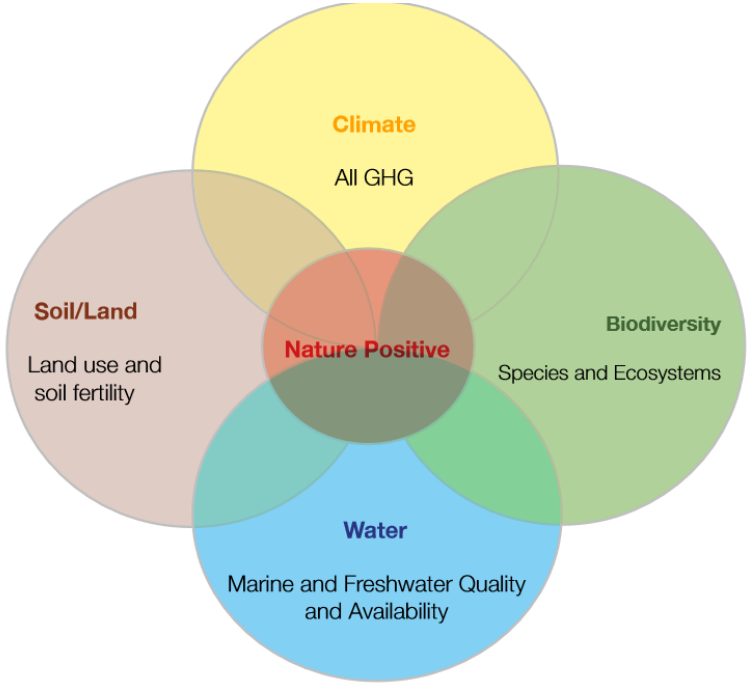
- **Offsets should not impair communities' ability to meet their needs**

► **Moving beyond area-based comparisons (e.g.** "conserving and reclaiming 2 ha for every 1 ha we affect through mining"

► **Ensure transparency (e.g.** open data, third-part audits, community-based monitoring)

► **Engage and consider communities' perspective (e.g.** incorporate ecosystem services in offset planning)

Looking beyond No Net Loss of biodiversity



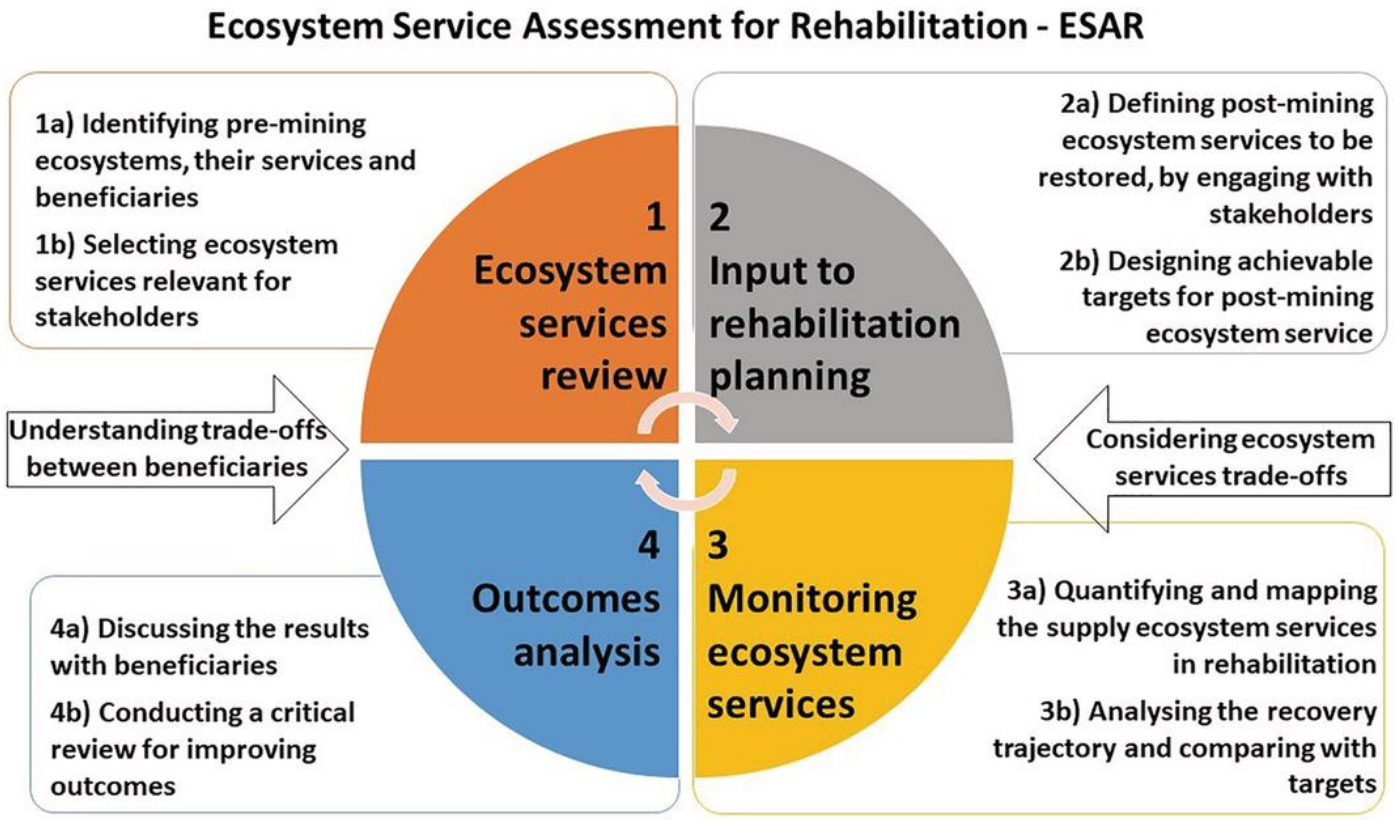
What could be a nature positive post-mining legacy?

One approach
A post-closure goal: restore and enhance ecosystem services

Ecosystem services are the benefits society obtains from ecosystems

- **Does mine rehabilitation also restore ecosystem services?**
- **How can the ecosystem services concept be used to evaluate rehabilitation outcomes?**

An ecosystem services approach for restoration - ESAR



1. Using an ecosystem services concept helps to translate the biophysical outcomes of restoration into social benefits

2. Applying the framework to mining affecting high biodiversity areas enabled community well-being to be considered.

Rosa, J.C.S.; Morrison-Saunders, A.; Hughes, M.; Sánchez, L.E. Planning mine restoration through ecosystem services to enhance community engagement and deliver social benefits. *Ecological Restoration*, 28(4), 937-946, 2020. https://doi.org/10.1111/rec.13162

4 Summary and Conclusions

Summarizing

- Halting and reversing nature loss is becoming a societal goal
- Meeting the targets of the Global Biodiversity Framework requires strong commitment from mining
- The mining industry is engaging with Nature Positive goals
- Meeting NP goals requires working along the life cycle of a mine
- To halt biodiversity loss at mine sites, offsets are often necessary
- Lessons learned from offsetting are important to meet more ambitious goals
- Mining can impact biodiversity values well beyond its footprint
- Restoring a mine site does not compensate for indirect losses
- Anticipate conservation actions is necessary
- Mine closure planning should provide for long-term lasting of conservation gains

(Some) Conclusions

Commitments to Nature Positive outcomes from mining should influence mine life cycle planning, with implications for closure planning:

- **Nature positive commitments pose several challenges to the mining industry**
- **Will mine closure planning address the direct impacts on biodiversity only?**
- **If closure planning is to address indirect/induced impacts, it is necessary to establish boundaries/responsibilities**
- **The Closure Plan needs to contain actions to guarantee long-term maintenance of offsets and other conservation assets**

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