



# Metrics and data for bauxite mining to progress towards No Net Loss of biodiversity

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## Acronyms

Acronym	Full name
<b>AoI</b>	Area of Influence
<b>BAP</b>	Biodiversity Action Plan
<b>BBOP</b>	Business and Biodiversity Offsets Programme
<b>BMEP</b>	Biodiversity Monitoring and Evaluation Plan
<b>BOMIP</b>	Biodiversity Offset Management and Implementation Plan
<b>CHA</b>	Critical Habitat Assessment
<b>CHQS</b>	Critical Habitat Qualifying Species
<b>ESIA</b>	Environmental and Social Impact Assessment
<b>GRI</b>	Global Reporting Initiative
<b>IBAT</b>	Integrated Biodiversity Assessment Tool
<b>ICMM</b>	International Council on Mining and Metals
<b>IFC</b>	International Finance Corporation
<b>MH</b>	Mitigation Hierarchy
<b>NG</b>	Net Gain
<b>NNL</b>	No Net Loss
<b>PS6</b>	Performance Standard 6
<b>PSR</b>	Pressure State Response framework
<b>QH</b>	Quality hectare
<b>RIA</b>	Residual Impact Assessment
<b>SON</b>	State of Nature
<b>STAR</b>	Species Threat Abatement and Restoration metric
<b>TBC</b>	The Biodiversity Consultancy
<b>TNFD</b>	Task Force of Nature-related Financial Disclosures
<b>TSM</b>	Towards Sustainable Mining
<b>WB</b>	World Bank
<b>WBG</b>	World Bank Group

## 1 Executive Summary

Bauxite mining is critical to meeting rising aluminium demand for the energy transition, but the sector's future depends on managing biodiversity risks in some of the world's most important ecosystems. This report, developed with International Aluminium Institute (IAI) members in Australia, Brazil, Guinea, and India, draws on the experiences of bauxite mining in these countries to provide tools that support the industry in working towards a standardised approach to report on no net loss across sites, companies, and jurisdictions.

The experience of bauxite mining operations in the different countries varies. Australia has strong regulation and advanced tools but struggles with comparability across sites. Brazil combines rich datasets with high deforestation risks, but monitoring is not always tied to no net loss targets. Guinea has high biodiversity but limited national data and regulatory capacity. India operates in biodiversity hotspots where monitoring is often indicator-heavy and lacks a common process to identify priority features.

This report recommends a more standardised approach. This begins with identifying priority biodiversity features - those species, habitats, or ecosystems most at risk within a given area - and applying clear principles for doing so. Country-level workshops showed that improved standardisation of this process, coupled with guidance on good practice for defining biodiversity features, would help companies target monitoring (and therefore insights and actions) where it matters most.

We then distilled a core set of biodiversity metrics useful and relevant to bauxite mining contexts, from a long list of over 100 metrics across existing guidance. These metrics are organised within a Pressure–State–Response framework, ensuring balance between indicators of pressures driving change (Pressure metrics), condition over time (State metrics), and results of actions taken (Response metrics). Because many companies already measure biodiversity using different methods, the report also provides guidance for selecting appropriate State metrics and determining when habitat extent and condition can be used as a proxy for species abundance. While condition metrics are tailored to site-specific biodiversity, they also provide a harmonised approach to quantifying impacts that enables No Net Loss (NNL) targets to be tracked, and reported on, at varying scales.

Many global and national datasets are available to compute some metrics, and in some cases, can help support site-level NNL reporting by filling data gaps and providing landscape context to aid in interpretation of results. We present a review of a sample of key global datasets highlighting their value for NNL reporting based on their resolution and update frequency. However, site-level reporting of biodiversity values for corporate performance purposes will require at least some data that is collected or validated on site to ensure the necessary accuracy and resolution of the results.

Finally, we identified a series of common challenges, and recommendations to cost-effectively address these, including: (1) clear principles for defining priority biodiversity features; (2) developing a standardised tool for inputting and tracking no net loss metrics and measures, and

(3) cross-site reporting guidance that balances ecological complexity with practical implementation. Going forward, IAI can help drive this process by coordinating shared frameworks, developing and piloting a no net loss tracking tool, and facilitating company exchanges to refine and harmonise metrics and reporting systems.

## 2 Introduction and objectives

Bauxite is the world's primary source of aluminium: a metal essential for sustainable development and the global transition away from fossil fuel dependence. As demand for lightweight materials, renewable energy infrastructure, and electric vehicles grows, aluminium's versatility, recyclability, and energy efficiency make bauxite strategically significant for global supply chains. Global aluminium demand is projected to increase by nearly 40% by 2030, requiring the sector to produce an additional 33.3 Mt to meet demand across industries, from 86.2 Mt in 2020 to 119.5 Mt in 2030 (IAI 2022). Major bauxite deposits, exploration, and production are concentrated in a few key regions - Australia, Brazil, Guinea, and India - where implementing responsible mining practices will be critical to ensuring both global supply security and environmental integrity across shared landscapes.

Bauxite mining both impacts and depends on nature, and these interactions are expected to intensify as exploration for new deposits expands and climate variability increases. Bauxite mining operations invest heavily in biodiversity mitigation measures and innovative technologies such as tailings dry backfill help mitigate environmental impacts. However, despite mitigation the sector relies on access to large areas of land, water, and energy, and extraction can cause habitat loss, soil erosion, and altered hydrological processes. Bauxite mining can fragment ecosystems and threaten endemic species and ecological communities, while poorly managed residues may pose long-term pollution risks. Aluminium production is also associated with considerable carbon emissions, primarily from processing, although carbon intensity per tonne of metal produced is declining over time (IAI 2024). At the same time, healthy ecosystems underpin the industry's resilience by providing essential natural services, such as clean water, erosion control, and local climate stability. The biodiversity features at risk, and the challenges and requirements for mitigating negative impacts, vary widely across countries and sites, reflecting differences in ecological conditions, data availability, and governance frameworks.

Many global risk disclosure frameworks and performance standards, including those required by, for example, the Taskforce on Nature-related Financial Disclosures (TNFD), the Global Reporting Initiative (GRI) and the International Council on Mining and Metals' (ICMM) Nature Position Statement, encourage mining and mineral processing projects to manage their impacts on nature through application of the Mitigation Hierarchy (avoid, minimise, restore, offset) and to demonstrate progress toward achieving no net loss of biodiversity. Significant guidance exists on implementing the Mitigation Hierarchy, including establishing baselines, prioritising biodiversity values in the planning phase, selecting metrics to monitor losses and gains (CSBI 2015; IFC 2019, 6) and establishing offsets and other conservation actions to mitigate residual impacts. However, the bauxite sector still lacks clear, sector-specific standardised approaches to tracking net outcomes at the site and corporate level, including guidance on selecting appropriate metrics and datasets for planning, benchmarking, and reporting.

Although no single "silver bullet" metric applies across the diverse contexts of bauxite mining globally, a standardised approach to metric selection – one that harmonises planning and reporting requirements across the sector – has been identified by IAI members as a key priority to strengthen accountability and alignment with global biodiversity goals. This report lays the

groundwork to respond to this gap, covering three main components, 1) identifying a core set of metrics for tracking biodiversity losses and gains, 2) reviewing global and national datasets that may be available to compute these metrics and 3) developing national guidance to improving decision support tools based on a series of workshops held with IAI members from each of the four regions (Figure 1).

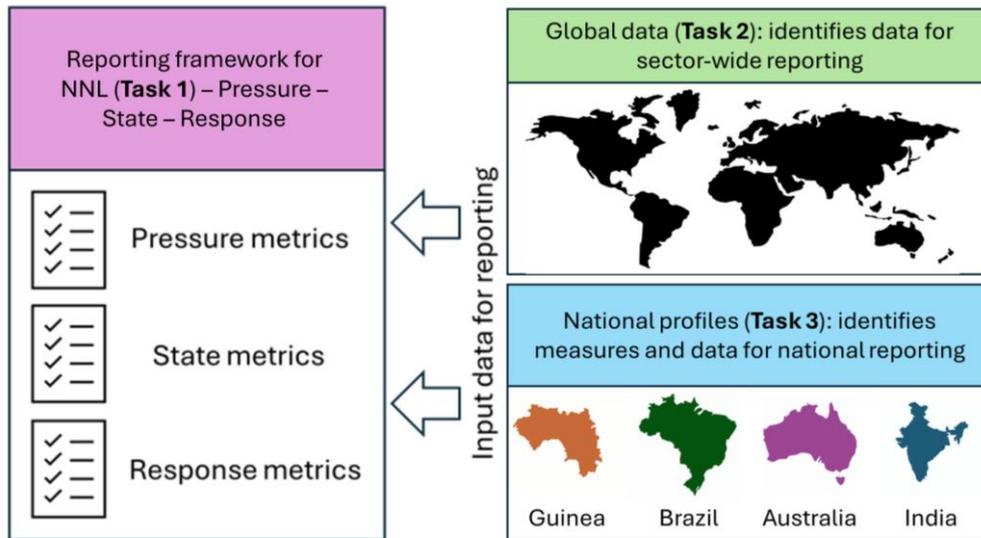


Figure 1: Project focal areas and tasks.

This report synthesises findings and recommendations across the following five sections:

- **In Section 3**, we set out general and standardised key steps that should be undertaken to establish and track no net loss outcomes, some of which were flagged as major barriers to implementation in national workshops.
- **In Section 4**, we synthesise the wide range of metrics already recognised in existing guidance as potentially useful for tracking no net loss progress, identifying a core set most relevant to bauxite mining contexts and organising them within a Pressure–State–Response framework. We also provide guidance on when and how these metrics can inform site, national and corporate management decisions and feed into no net loss reporting at these scales.
- **In Section 5**, we review global datasets that can be used to compute this core set of metrics, and we assess their usefulness for no net loss planning and reporting. We identify how these datasets can help fill gaps at the site level, provide benchmarking across peers and the sector, and offer contextual information for no net loss assessments. We also highlight their limitations and outline the guardrails needed to ensure data quality and relevance when using them to inform decisions, and that site level verification is often required to achieve confidence in reporting.
- **In Section 6**, we present national profiles for Australia, Brazil, Guinea, and India, summarising each country’s mining and biodiversity context, the approaches currently

used by mining companies to measure biodiversity, set no net loss targets, and evaluate and report on performance. The content of this section draws from the discussions during country-specific workshops with IAI Members as part of this project as well as some additional literature review and as such are not exhaustive. We identify key implementation challenges and practical recommendations of opportunities for the International Aluminium Institute (IAI) to support its members across diverse contexts.

- **In Section 7**, we summarise key recommendations for how IAI members can further strengthen alignment with corporate, regional and global biodiversity goals, including providing commentary on key issues such as standardised approaches for identifying priority biodiversity features, tracking progress against no net loss and reporting on biodiversity progress across operations.

In addition to the findings and guidance provided in this report, we also provide two additional decision-support tools in an accompanying Excel workbook:

1. A metric framework which collates and evaluates a non-exhaustive list of metrics relevant for bauxite mining to support metric selection and reporting; and
2. A curated list of relevant global datasets and an assessment of their usefulness in computing the metrics described in the framework.

This guidance focuses on the selection of biodiversity metrics, and how that should be done. We assume that projects are mitigating their impacts on biodiversity according to the mitigating hierarchy and have established an appropriate Area of Impact (AoI) for their project.

### 3 A standard approach needed to track no net loss outcomes

Establishing a standardised approach to tracking no net loss outcomes for biodiversity is essential to ensure that appropriate metrics are selected, and to support reporting across operations, and even across organisations within regions should sector-wide performance at the national level be tracked. Importantly, a standardised approach will also ensure that only necessary data is collected to track no net loss progress, avoiding the risk of unnecessary or over complicated data collection measures.

We recommend that a five-step approach be undertaken.

#### 1 Identify priority biodiversity features

Biodiversity metrics should be selected to track losses and gains in the specific biodiversity features for which no net loss targets are set. In some cases, these features are defined by regulatory or financing requirements. For example, IFC Performance Standard 6 (PS6) and its Guidance Note set out clear, quantifiable approaches for identifying priority biodiversity features and classifying species and ecosystems as either *critical habitat* or *natural habitat*, based on a

project's Area of Influence and known species distributions. Note, additional national or regional guidance is likely to be available in many jurisdictions which can provide, and may require, alternative approaches for defining priority biodiversity features; for example, the Environment Protection and Biodiversity Conservation Act (EPBC) in Australia.

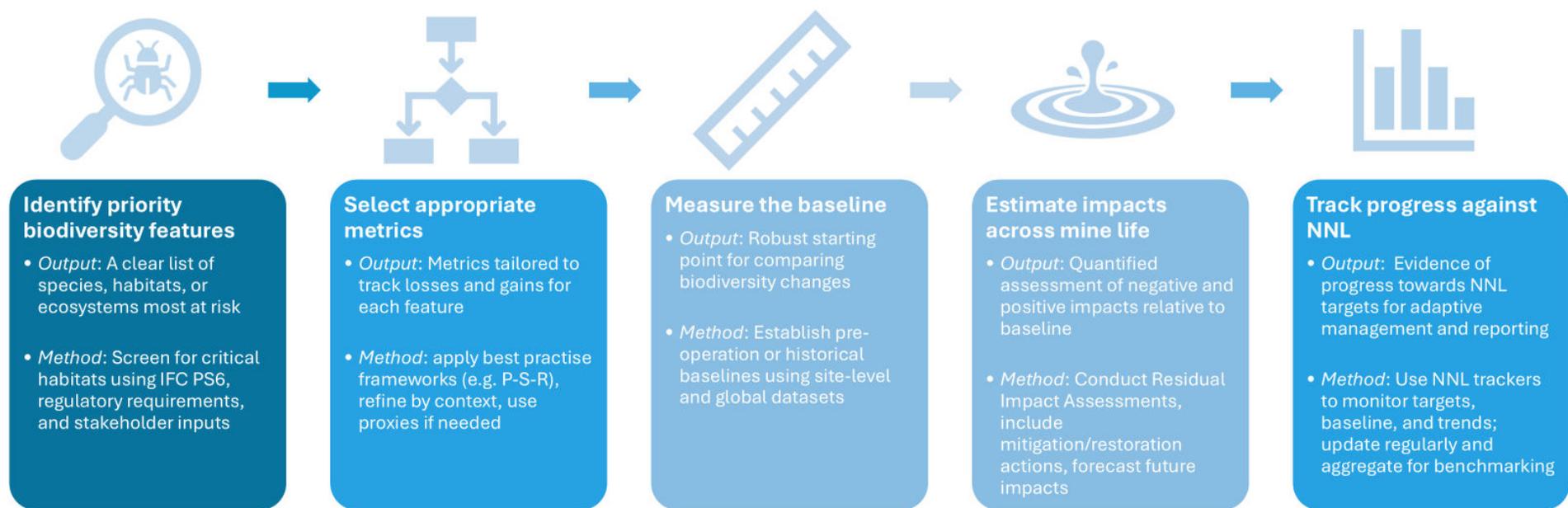


Figure 2: Summary overview of the five-step approach to track No Net Loss outcomes

The Critical Habitat Screening and Assessment process outlined in PS6 enables companies to determine whether their operations are likely to have significant impacts on biodiversity, and to identify which features are affected. However, other biodiversity features beyond those captured by PS6 may also warrant inclusion in no net loss targets, for example, ecological communities or species that may not be critically endangered but are of cultural significance and importance to Indigenous Peoples and local communities. Existing protocols and guidance for engaging local or indigenous communities include Towards Sustainable Mining's Indigenous and Community Relationship's Protocol, IFC Performance Standard 1 and 7, and ICMM's Indigenous People and Mining Position Statement. National legislation may also define species or ecological communities that need to be protected.

A standardised approach to identifying priority biodiversity features is therefore an important prerequisite for selecting appropriate metrics to set targets and track losses and gains in these features over time. National workshops revealed that companies currently apply widely varying methods and, in some cases, lack a standardised approach altogether.

## **2 Select appropriate metrics**

Once the priority biodiversity features likely to be affected have been identified, the next step is to select appropriate metrics. These should align with best-practice guidance for *State of Nature* metrics and draw on the core metric framework developed for IAI (see Section 4 and the accompanying Excel worksheet).

This core set of metrics can then be further refined and tailored according to the specific biodiversity features identified. For example, Section 4.3 illustrates how species abundance (population) can be compared with species habitat extent and condition, which may serve as proxies for changes in species abundance. Establishing a standard approach for such refinements is important, as decisions on the most suitable metrics will vary across contexts and biodiversity features.

Certain high-risk species or those of high stakeholder concern, such as great apes, will always require species-specific approaches. Similarly, species that are not strongly tied to habitats (e.g., generalist but threatened bird species) or those that are rare and range-restricted may also require individualised methods to accurately measure impacts. However, for many species, using habitat condition and extent as a proxy could provide an efficient and cost-effective means of tracking the negative impacts of bauxite mining and the positive impacts of mitigation measures.

## **3 Measure the baseline**

Establishing a robust biodiversity baseline provides a consistent starting point to measure progress, providing confidence that biodiversity losses and gains can be accurately quantified relative to an established baseline. As with identifying priority biodiversity features, adopting a common or standardised approach to defining baselines would greatly improve consistency in sector-wide reporting against net loss targets. However, baseline requirements vary considerably across jurisdictions and performance standards.

The ICMM Nature Position Statement requires that all new projects and major expansions since its adoption in 2024 use a pre-impact baseline, meaning that baseline and no net loss metrics should be established using data from the year prior to project commencement. It also requires that existing operations set no net loss targets using 2020 or an earlier year as the baseline, aligning with the Convention on Biological Diversity's Global Biodiversity Framework.

Obtaining suitable biodiversity data for selected metrics, can be challenging for sites already in operation, that did not previously measure the data required to compute the metrics needed to retrospectively track progress towards no net loss targets for priority biodiversity features. In such cases, global or national-level datasets can provide an important source of supplementary information to fill gaps in site-level data (see Section 5 for further discussion).

#### **4 Estimating impacts throughout life of mine**

Impact estimation should take the form of a Residual Impact Assessment to quantify the impacts on all priority biodiversity features (identified in Step 1) throughout the entire life of mine, until closure. This assessment should measure any impacts that have already occurred, or forecast those that are yet to occur, relative to the established biodiversity baseline (Step 3), using the appropriate metrics for each identified feature. It should encompass all sources of negative impacts arising from mining activities, as well as positive impacts resulting from implemented mitigation and restoration measures.

#### **5 Tracking progress against no net loss.**

Once priority biodiversity features have been identified (Step 1), metrics selected (Step 2), baselines established (Step 3), and impacts estimated (Step 4), no net loss can be tracked through a dedicated tracker tool. While the specific scope and design of these trackers will vary by project, the underlying framework could be standardised to support consistency across the sector.

In general, no net loss trackers should include four key components: a no net loss target for each priority biodiversity feature, based on the project's expected residual impacts and corresponding need for compensation; baseline data representing the condition and extent of each feature prior to impact; current data on the actual State of Nature for each feature, updated at appropriate intervals to monitor restoration progress; and a mechanism for assessing trends and progress towards achieving no net loss over time. Together, these elements provide a transparent, evidence-based means of evaluating performance and informing adaptive management where progress is not on track.

If implemented at a sector-wide level, such trackers could also be used to generate meta-metrics, for example, the number and proportion of sites that have established a biodiversity baseline for all identified priority biodiversity features, or the number and proportion of sites on track to achieve no net loss across all impacted features by site closure.

## 4 Biodiversity metrics for bauxite mining

### 4.1 A core set of biodiversity metrics for no net loss assessments

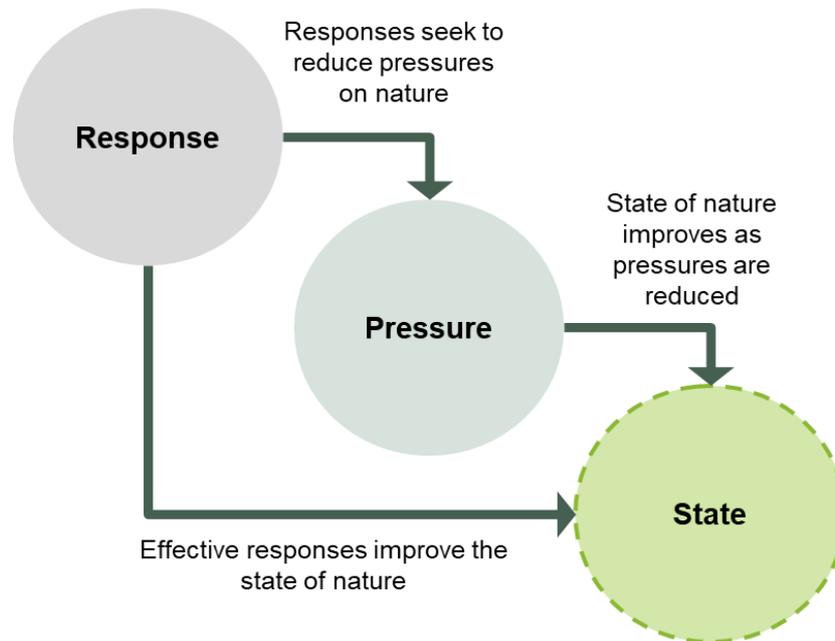
A growing number of guidance documents and initiatives have identified and collated biodiversity and nature-related metrics. Some of these are directly relevant to bauxite mining and some are also useful in planning, monitoring and interpreting no net loss outcomes at both sites and broader landscape and portfolio scales. Our analysis produced a short list of potentially useful metrics, following the process outlined below:

1. We reviewed the five major guidance documents, 1) TNFD (2025) – Additional Sector Guidance, Metals and Mining, 2) Nature Positive Initiative’s draft State of Nature Metrics, 3) ICMM’s best practice guidance on Achieving No Net Loss and Net Gain, 4) Global Reporting Initiative (GRI) 101, 2024 Topic Standard for Biodiversity and 5) Science Based Targets Network (2024) Summary of Data Requirements for the SBTN Methods, extracting and collating 103 unique biodiversity metrics in total.
2. We retained metrics if there was a clear impact pathway between bauxite mining and local biodiversity change. For example, metrics related to greenhouse gas emissions were excluded, as these fall outside the scope of biodiversity-focused no net loss targets.
3. We excluded metrics unlikely to be of relevance to bauxite mining contexts – e.g. metrics relating to biodiversity features, such as coral, which are unlikely to be impacted by mining activities.
4. We further excluded metrics not directly related to assessing site-level mining or biodiversity impacts, such as those addressing corporate-level financial instruments (e.g. green bonds, sustainable investment indicators and the value chain).

Removing duplicates and standardising descriptions resulted in 38 unique metrics, which were then organised within a Pressure–State–Response (PSR) framework (Figure 2):

- **Pressures** include the threats affecting biodiversity (both those related to a project and external factors).
- **State** includes to the status of the biodiversity (e.g., extent x condition, or species population). State indicators are typically the same as the metrics used to quantify losses/estimate gains.
- **Responses** are actions to reduce pressures/threats. These are broadly the project level mitigation measures and the management actions identified.

This framework supports companies with site-based impacts to identify appropriate metrics in a consistent, transparent way, facilitating adaptive management toward no net loss outcomes and a clear theory underpinning metric selection and evaluation.



*Figure 3: Pressure-State-Response framework*

Using this framework, we identified a core set of metrics for the bauxite mining sector (see accompanying XLS). This set ensured balanced representation across the PSR framework; aligns with globally recognised knowledge syntheses and industry consensus efforts; and addressed identified data gaps through consultation with IAI members.

## 4.2 Selecting metrics and data for robust no net loss assessments

Section 4.1 identifies a core set of metrics for reporting no net loss at the site level and forms the basis of a reporting template to combine metrics that track both changes in biodiversity state (State of Nature metrics) and actions taken to address them. For example, where mining affects lowland tropical rainforest, State metrics such as habitat extent and condition can be paired with Pressure metrics (e.g. area converted to mining) and Response metrics (e.g. area restored or offset). These metrics are designed to be flexible, covering a range of biodiversity features and impact types, from infrastructure-related pressures to species-specific impacts under IFC PS6 or national legislation requirements. Importantly, this process enables clear justification for the kinds of data that are collected, to ensure that data collection is efficient and accurate.

Selecting appropriate combinations of metrics (see Box 1) is critical for setting and reporting on no net loss or net gain targets. This process should start by identifying a State-based metric aligned with the priority biodiversity features within scope of the no net loss commitment (e.g.

extent and condition of a key habitat, or population of a specific species), then selecting relevant Pressure metrics based on expert or conservation assessments of key drivers of loss and finally choosing Response metrics suited to the decision context (e.g. restoration or offset activities). Good practice requires no net loss reporting to always include a state of each biodiversity feature (i.e. habitat quality and extent, or species population) in the baseline year and to track losses and gains (separately and combined) for each feature throughout the project life until the no net loss target date. Pressure and Response metrics should be reported too but are considered supplementary to the reporting of State based metrics in evaluating no net loss performance, instead they are useful in understanding performance and informing adaptive management requirements.

**Box 1:** *Selecting Appropriate No Net Loss Metrics*

State, Pressure and Response metrics encapsulate what is happening (State), why it is happening (Pressure), and what is being done (Response).

**1. Choose a State Metric** (that describes the habitat or species)

For example:

- Habitat extent & condition (for e.g., lowland evergreen forest)
- Species population or occupancy (for e.g.

**2. Add Pressure Metrics** (describing the main drivers of loss)

For example:

- Area converted to mining or infrastructure
- Levels of disturbance or degradation

**3. Add Response Metrics** (describing the mitigation response)

For example:

- Area restored or offset
- Improvement in habitat condition

**Good practice:**

No net loss accounting should be part of a holistic strategy underpinned by application of the mitigation hierarchy to manage biodiversity impacts. Projects should undertake appropriate environmental and social assessments to define contexts and baselines and set targets. Biodiversity Monitoring and Evaluation Plans should set out appropriate State, Pressure and Response metrics along with their timing, duration, roles & responsibilities.

This project provides the structure for no net loss reporting but not a detailed manual for no net loss planning or performance monitoring. Achieving no net loss requires upfront investment and consideration to establish readiness—completing Environmental and Social Impact Assessments, rigorously applying the Mitigation Hierarchy, and engaging stakeholders to ensure appropriate targets, avoidance measures, and offset feasibility. Corporate or Sector-level decisions are also required to enable appropriate metric selection by defining the scope of the no net loss

commitment (no net loss of what), baseline conditions (no net loss compared to what), and timeframe (no net loss by when).

Ultimately, each site will have unique biodiversity features, targets, and mitigation requirements, requiring bespoke metric selection. Guidance on biodiversity baseline setting is provided by various guidance notes, including ICMM's Guidance on No Net Loss and Net Gain, IFC PS6 Guidance Note 6, World Bank Biodiversity Offsets: A User Guide. Preferably baselines should be established prior to impacts, although where this is not possible (such as for long-running, established projects that are adopting no net loss ambitions after project establishment), appropriate historical baselines should be set. Developing guidance on baselines, could be a useful sector-wide decision. In response to request for IAI members we have also provided further guidance on standardising metric selection in Section 4.3.

No net loss planning and monitoring for bauxite mining will always require site-level data and an appropriate approach to aggregate performance across sites to national or sector wide level. However, this can be supplemented with global or national datasets. As outlined in Sections 4 and 5, these datasets can: Identify and fill data gaps—particularly when establishing retrospective baselines where pre-impact data are unavailable. Enable benchmarking at national or sector levels, using consistent metrics to compare outcomes across sites. For instance, national associations could review rehabilitation and offset outcomes across operations, allowing companies to assess their performance against sector averages.

### 4.3 Additional guidance on selecting State of nature metrics

When specific species are included within the scope of no net loss commitments, a range of appropriate metrics may be suitable, including those that directly measure the species population abundance, or those that obtain a more indirect measure through evaluating the extent and condition of habitats that a species occupies (see Box 2). During regular calls with the project steering committee, and during several national workshops, it was identified that knowing which measure is most appropriate is a common challenge. In response, we provide additional guidance to support metric selection.

Habitat metrics are generally empirical and directly measurable, assessing both the physical extent of a habitat (i.e. how many hectares it covers), and the condition of that habitat (i.e. whether it is degraded due to fragmentation, logging or species richness). Habitat extent and condition are usually collected as separate data and then combined to produce an estimate of *Quality Hectares* (extent × condition) method, often expressed as *Quality Hectares (QH)*. Ideally both baseline conditions and subsequent changes are measured in terms of Quality Hectares. Losses and gains are determined by comparing predicted or observed changes in extent × condition against the baseline, for each habitat type within a project's zone of influence, or on their offset or conservation sites. Assessments should account for residual impacts following avoidance, minimisation, and restoration, using locally relevant ecological data and baseline surveys.

**Box 2:** *Choosing metrics – species specific or habitat as a proxy?*

**Habitat as a Proxy**

- ✓ Simple, repeatable and cost-efficient.
- ✓ Suitable when habitat condition reliably predicts species occurrence or recovery.

Good for (for example):

Species with clear habitat dependence. Understory amphibians, reptiles, forest mammals with well-understood habitat associations.

**Species-specific metrics**

- ✓ Direct measurement of populations
- ✓ When habitat does not capture key limiting factors (e.g., hunting, microhabitat specialists)

Good for (for example):

Rare primates or species limited by factors such as hunting, not habitat alone

Mobile or cryptic species where habitat quality does not reflect occupancy, or where significant uncertainty exists

It is also worth emphasising, that while tailoring condition metrics to site level biodiversity provides significant benefits in terms of confidence that losses and gains can be accurately and efficiently tracked, the interpretation of these metrics can still be harmonised across and between sites. For example, an organisation operating in Guinea, may be measuring the changes in condition of several forest types (i.e. gallery forest, submontane dwarf forests, and lowland evergreen forests) at multiple sites. Each of these forest types will have differing characteristics that define their condition, in terms of canopy cover, species composition, fragmentation etc. Some condition data may be easily captured with remote sensing (i.e. canopy cover) while other data will require site-work (i.e. species composition). Different sites will also likely have different no net loss targets. However, a well-defined condition metric will still be able to score the condition of each forest class on a composite scale from 0 – 1 and thus provide a common benchmark that can be used to understand how the Quality Hectares of different forest types is changing across sites and regions, to report on progress against no net loss at varying scales.

Species metrics measure direct impacts on species populations and can include absolute counts (e.g., individuals or nesting pairs), relative abundance estimates (e.g., density, camera trap, or acoustic detection rates), or proxy measures (e.g., habitat area, number of burrows, or tracks) when direct measurement is impractical. Habitat proxies may be suitable for species that are hard to detect, have variable populations, or where direct surveys are not feasible. However, proxies should not replace species-specific monitoring for highly localised, rare, or migratory species; those threatened by non-habitat pressures (such as hunting); or those of significant

stakeholder concern. In such cases, tailored population or management-focused indicators are essential to ensure accurate measurement of impacts and recovery.

## 5 Global datasets for input into biodiversity metrics

Achieving no net loss of biodiversity in the bauxite mining sector requires robust, reliable data to inform metric selection, baseline setting, and ongoing monitoring. Global datasets play a critical role in this process, particularly where site-level or national data are limited or inconsistent. The spreadsheet developed as part of Task 2 for this project identifies a suite of global datasets that can support the identification and application of biodiversity indicators and metrics across the Pressure–State–Response (PSR) framework.

Global datasets are most effective for contextualising no net loss commitments, identifying globally important biodiversity features, and providing baseline information on the Pressures and State of nature. However, they are generally less suitable for tracking Response metrics, which rely on site-specific monitoring, and detecting changes in Pressures or State of nature in response to these actions. For this reason, global datasets should be complemented by local ground-truthed data and stakeholder input to ensure assessments reflect conditions on ground.

Global data are valuable during the early stages of applying the Mitigation Hierarchy, specifically for avoidance and minimisation, to identify globally important ecosystems or the potential presence of priority species. However, these datasets should be used alongside regional or national biodiversity data. In countries with comprehensive national datasets, relying on global datasets risks overlooking areas of biodiversity importance (Nomura *et al.* 2025). Conversely, in countries with limited accessible national data, global data play a more critical role.

Because global and local datasets are compiled using different methods and expert inputs, both offer unique value. Where discrepancies arise between datasets, users should apply expert judgement, potentially with stakeholder consultation, considering factors such as data resolution, spatial relevance, and recency of updates. The Task 2 deliverables include examples of global datasets relevant to bauxite mining. These encompass widely used, authoritative, and data sources such as:

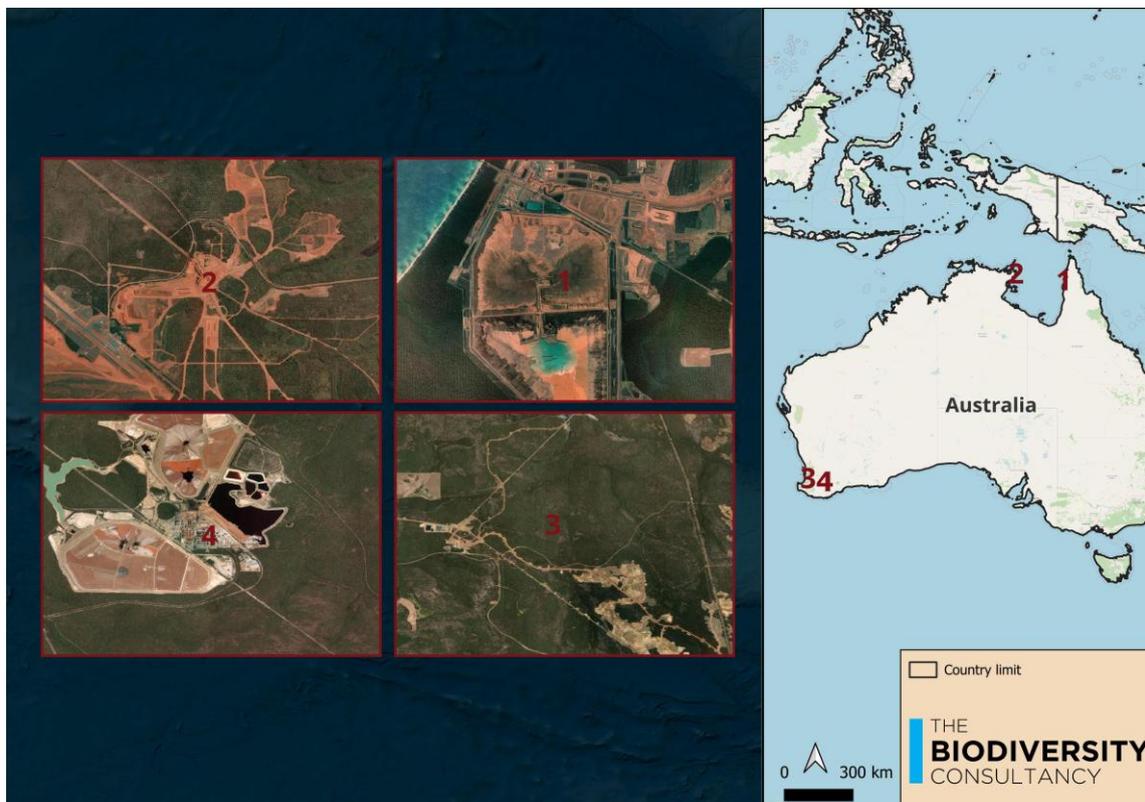
- The European Space Agency’s WorldCover layer for tracking land-use change,
- The Global Ecosystems Atlas for assessing ecosystem extent,
- The IUCN Red List and STAR Metric (via the Integrated Biodiversity Assessment Tool - IBAT) for evaluating species extinction risk, and
- The WWF Water Risk Filter, which provides layers on hydrological pressures.

These datasets are maintained by credible institutions, regularly updated, and offer global coverage, making them valuable, accessible resources for companies operating across diverse geographies and seeking consistency in biodiversity planning, benchmarking, and reporting. It is worth noting that whilst global land cover maps are an important input, they have been found to not sufficiently capture mining pressures to biodiversity and therefore, until resolution increases, they should be complemented with additional data and analysis, such as cumulative impact mapping (Sonter *et al.* 2025).

## 6 National profiles

This section provides national profiles for Australia, Brazil, Guinea, and India. For each country, we identify key bauxite mining regions and provide high-level summaries of the *State of Nature* within those areas. We then summarise site-level biodiversity monitoring practices, based on findings from Task 3 workshops, including the metrics and approaches currently in use, the data inputs that support them, and the main implementation challenges. National datasets identified through these workshops will be evaluated for their usefulness in supporting site-level no net loss tracking, their potential to address existing data and knowledge gaps, and their value for enabling sector-wide benchmarking. Each profile concludes with top recommendations for developing a standardised and systematic approach to metric selection and outlines practical considerations for consistent implementation across companies and jurisdictions.

### 6.1 Australia



*Figure 4: Spatial distribution of bauxite mines in Australia (Source: ICMM 2025). Data on mine locations is sourced from ICMM databases and does not include all bauxite operations.*

#### 6.1.1 State of Nature overview in Australia

Australia's bauxite mining industry is concentrated in three main regions - Cape York in northern Queensland, the Gove Peninsula in the Northern Territory, and the Darling Range in Western Australia - each supporting distinct ecosystems, biodiversity features, and conservation challenges.

In northern Queensland (the Weipa region on Cape York Peninsula), bauxite deposits occur within tropical savannah and open eucalypt woodlands interspersed by wetlands, vine thickets, and extensive mangrove-lined estuaries. This region supports a high level of endemism and species regulated under national legislation, including the Palm Cockatoo (*Probosciger aterrimus*), Red Goshawk (*Erythrorchis radiatus*) Northern Quoll (*Dasyurus hallucatus*), and Green Turtle (*Chelonia mydas*). According to the IUCN Red List of Threatened Species, key threats to biodiversity include altered fire regimes, invasive species, hydrological changes, and habitat fragmentation.

In the Gove Peninsula in the Northern Territory, bauxite is found within remnant monsoonal forests and open woodlands. The region provides habitat for the Northern Masked Owl (*Tyto novaehollandiae kimberli*), Gove Crow Butterfly (*Euploea alcathoe enastri*), and endemic flora adapted to lateritic plateaus. Pressures arise from habitat disturbance, weed invasion, erosion, and cumulative impacts.

In the Darling Range, southwestern Western Australia, bauxite found in lateritic upland geomorphological divisions of the Darling Plateau including regions overlapping Jarrah–Marri forests (*Eucalyptus marginata*–*Corymbia calophylla*), part of the Southwest Australia Global Biodiversity Hotspot (Koch & Hobbs 2007; (Bell & Heddle 1989; Bauxite mineralization in the Darling Range, Western Australia (No. 33) 1992). These forests support threatened and range-restricted species including Scarp Darwinia (*Darwinia apiculata*), Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black Cockatoo (*Zanda baudinii*), Numbat (*Myrmecobius fasciatus*), and Quokka (*Setonix brachyurus*). Threats include habitat loss and fragmentation, dieback disease (*Phytophthora cinnamomi*), altered hydrology, and climate change.

### 6.1.2 Current state of site-level monitoring in Australia

Site-level biodiversity monitoring by bauxite miners in Australia was found to be largely driven by regulation but often going above and beyond requirements determined at the state level<sup>1</sup>. Monitoring of habitat extent and condition was widespread, although data gaps remained, particularly where state requirements included demonstrating an absence of impacts. Condition metrics were applied using a combination of theoretical frameworks, remote sensing, and ground-truthing, with the CSIRO's [NatureIQ™](#) platform frequently referenced for habitat condition modelling. Note, whilst NatureIQ is a subscription-based tool, a number of the underlying datasets are freely available. Companies reported the use of secondary monitoring approaches including satellite imagery, LiDAR and innovative methods, such as drone-based monitoring to assess vegetation health over time, and site management plans aimed to deliver substantial improvements in flora and fauna monitoring. Results of surveys are required to be submitted to repositories, such as the [Index of Biodiversity Surveys for Assessments](#) (IBSA).

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<sup>1</sup> For example, Alcoa's Forest Research Centre <https://www.alcoa.com/australia/en/sustainability/forest-research-centre>

Key barriers to comprehensive biodiversity data included the large spatial extent of mining leases, data comparability across operations, and between States, confidence in remotely sensed data, and the complexity of integrating diverse data sources. For species monitoring, key species lists were typically informed by national and state databases (see Section 4.2). Although based on the guidelines, reported monitoring approaches varied. Flora was generally easier to track, whereas elusive fauna (e.g. the Western Quoll, *Dasyurus geoffroii* in Western Australia) required trapping or camera surveys. Other species were assessed through presence or abundance surveys, or via indicator metrics, for example, populations of black cockatoo populations were monitored through tree hollow counts as a proxy for abundance. In Western Australia (WA), guidelines state where actions likely to impact three species of Black Cockatoo require referral to the Minister for the Environment <sup>2</sup>. Barriers to abundance monitoring included ethical and compliance constraints, particularly for threatened species, and the logistical challenges of fieldwork over large areas. Some companies reported using habitat occupancy models to estimate abundance where direct monitoring was impractical.

Companies also monitored pressures, such as invasive species (e.g. dieback / *Phytophthora cinnamomi*<sup>3</sup>), land conversion, fire regimes (including prescribed burns managed by the Department of Biodiversity, Conservation and Attractions - DBCA), and water quality in downstream ecosystems, drawing on national and state datasets, such as the Weeds of National Significance database ([WonS](#)) and the [Water Quality Guidelines](#). Despite these efforts, participants identified a strong need for greater consistency in data collection and metric application across operations, regions, and countries. For example, South32 had developed site-specific data trackers, and other companies were progressing toward similar systems. Nevertheless, workshop participants noted that existing metrics and data were not always sufficient to track changes in priority biodiversity features, highlighting the need for further harmonisation and methodological refinement across the sector.

Regulatory developments are also likely to have implications for measuring and tracking biodiversity in Australia. Examples include the draft National Environmental Standards for Matters of National Environmental Significance (MNES) and for Environmental Offsets, which are currently under consultation. These draft Standards are open for public feedback and may evolve before final adoption, but they signal a shift toward stronger, data-driven offset requirements and clearer expectations for biodiversity measurement under national environmental law. If adopted this Standards will create clearer national requirements for biodiversity metrics and tracking of no net loss and net gain commitments.

### 6.1.3 Relevant national biodiversity datasets for tracking no net loss in Australia

During the Australia workshop, several national biodiversity datasets were mentioned by participants. These included the Matters of National Environmental Significance (MNES) data e.g., [Species of National Environmental Significance](#), Australia's Bioregions ([IBRA](#)). A number of

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<sup>2</sup> <https://www.dcceew.gov.au/sites/default/files/documents/referral-guideline-3-wa-threatened-black-cockatoo-species-2022.pdf>

<sup>3</sup> <https://www.dbca.wa.gov.au/management/threat-management/plant-diseases/phytophthora-dieback>

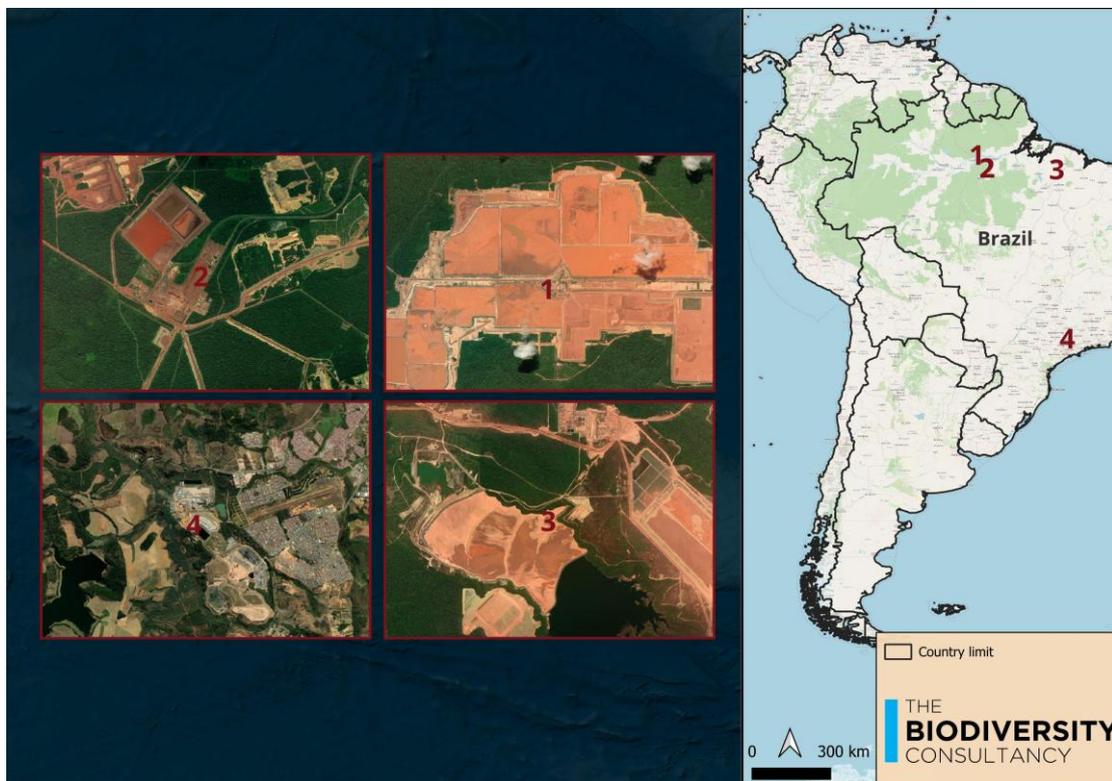
important datasets in Australia are provided at the State level, such as the Government of Western Australia [Threatened Species and Communities](#) database, the Index of Biodiversity Surveys for Assessments ([IBSA](#)), [Data WA](#), [Dandjoo](#), or the Queensland Government’s Regional Ecosystem Database and [WildNet](#) platform. Other relevant official sources of biodiversity data include the Australian Government [Biodiversity Data Repository](#).

#### 6.1.4 Recommendations

Workshop participants noted that relevant innovation to advance on tracking no net loss outcomes across the Australian bauxite mining context would include the following priorities:

1. Standardised criteria for identifying priority biodiversity features, and nationally appropriate metrics and monitoring approaches for these features, across companies and jurisdictions (i.e. state-by-state) to improve data comparability and enable sector-wide benchmarking.
2. Leverage and align national and state biodiversity datasets (e.g., MNES, IBRA, IBSA, Data WA, WildNet), including alignment on spatial and temporal resolution, to fill site-level data gaps and improve the breadth of use of existing data.
3. Enhanced integration of existing monitoring methods, which would include combining remote sensing, ground-truthing, and model-based approaches (e.g. NatureIQ™ and habitat occupancy models) to strengthen data accuracy and confidence in measuring habitat condition and species abundance across very broad spatial scales.

## 6.2 Brazil



*Figure 5: Spatial distribution of bauxite mines in Brazil (Source: [ICMM 2025](#)). Data on mine locations is sourced from ICMM databases and does not include all bauxite operations.*

### 6.2.1 State of Nature metrics overview in Brazil

In Brazil, the northern state of Pará accounts for over 80% of national bauxite production, with the remainder coming from Minas Gerais in the southeast (Government of Brazil 2022). Bauxite extraction involves strip mining and clearing of surface vegetation. This activity primarily threatens two globally important ecosystems: the tropical moist Amazon rainforest in Pará and the Atlantic Forest in Minas Gerais.

In Pará, mining occurs across extensive plateaus within the Uatumã–Trombetas Moist Forests, a subregion of the Amazon biome where bauxite mining requires clearing of dense rainforest on lateritic soils. These forests are biodiverse, with many species dependent on intact canopy cover for foraging, shelter, and nesting. Species of conservation concern occurring within bauxite mining landscapes include the Black Bearded Saki (*Chiropotes satanas*), listed as *Critically Endangered* and endemic to Maranhão and Pará, and the Red-faced Black Spider Monkey (*Ateles paniscus*), listed as *Vulnerable*. Both species rely on extensive tracts of mature forest and are sensitive to fragmentation, hunting, and noise disturbance associated with mining and haul road development (IUCN 2019; IUCN 2020a).

In Minas Gerais, bauxite deposits occur primarily in the Zona da Mata and Poços de Caldas plateaus, within the Atlantic Forest biome, which is a global biodiversity hotspot and one of the world's most threatened forest ecosystems. While the Poços de Caldas plateau includes remnants of Tropical Montane Semideciduous Seasonal Forest and high-altitude grasslands (Barros *et al.* 2012), most current mining operations in this region take place on agricultural lands rather than native forests, with footprints of up to 50 ha and mine lifespans between 2 – 8 years (Melo & Sánchez 2020). The remnant Atlantic Forest patches supports roughly 5% of all vertebrate species on Earth, including over 1,000 bird species, 450 amphibians, 300 reptiles, and approximately 20,000 vascular plants, of which 8,000 are endemic (WWF Brazil 2025). Threatened species such as the Woolly Spider Monkey (*Brachyteles hypoxanthus*) and the Maned Three-toed Sloth (*Bradypus torquatus*) occur within or adjacent to bauxite mining landscapes in Minas Gerais and are indirectly affected by habitat clearance, fragmentation, and disturbance.

### 6.2.2 Current state of site-level monitoring in Brazil

Site-level biodiversity monitoring in Brazil leverages a combination of field data, remote sensing, and a range of national datasets (see Section 6.2.3 below). Monitoring approaches were strongly shaped by regulatory requirements, with most companies required to demonstrate compliance with state or federal environmental licensing conditions.

Companies monitored habitat extent for a range of species, using both field surveys and remote-sensing data, supported by national and global datasets. Workshop participants noted limitations in global datasets such as Global Forest Watch, which may overestimate primary forest extent in Brazil's complex landscape mosaics. Barriers to effective condition monitoring included the large spatial scale of mining areas, overlapping land uses, and the difficulty of defining optimal and comparable metrics across sites.

For species monitoring, no single list of priority species was consistently applied across projects or companies; instead, monitoring of biodiversity features appeared to be conducted on a case-by-case basis, although records of flora and fauna was extensive. Regulatory requirements drove a strong focus on threatened and endemic fauna, particularly for *Critically Endangered* or *endemic species* where abundance needed to be tracked by regulatory requirements. Red List species were subject to compensation requirements if individuals were removed, and monitoring efforts typically focused on specific populations rather than broader species-level trends. Workshop participants highlighted that monitoring programs would benefit from greater standardisation of indicators and integration of data sources to improve comparability across operations and facilitate sector-level benchmarking of progress toward no net loss targets.

### 6.2.3 Relevant national biodiversity datasets for tracking no net loss in Brazil

During the Brazil workshop, a range of national datasets were identified. These included the Brazil [MapBiomas](#) landcover data (see also [TerraBrasilis](#)), the [Priority Areas for the Conservation, Sustainable Use and Benefit Sharing of Brazilian Biodiversity](#), [Official data platform of National System of Nature Conservation Units](#), the [Rural Environmental Registry - CAR](#), data from the [Brazilian Institute of Geography and Statistics](#), [National Indigenous Peoples Foundation \(FUNAI\)](#), National Institute of Colonization and Agrarian Reform (INCRA) data on Quilombola communities, Chico Mendes Institute for Biodiversity Conservation ([ICMBio](#) / [SISBIO](#) / [SALVE](#)), and national lists of threatened species from the Ministry of the Environment ([MMA](#)) and the State Secretariat for the Environment and Sustainability ([SEMAS](#)). Additionally relevant datasets may include [WikiAves](#) for birds, and the research outputs of the [Biodiversity Research Consortium \(BRC\) Brazil-Norway](#), who support research initiatives and biodiversity and forest restoration in Paragominas. All official national datasets should be available via the Brazilian Government [Portal](#) for national spatial data. Vale Institute of Technology Sustainable Development (ITV) is also active in developing solution for tracking biodiversity in Carajas and Paragominas. Such a rich variety of national biodiversity datasets suggests that whilst global datasets will have a role, especially for companies working internationally, national datasets may play the most important role in sourcing data to inform biodiversity prioritisation and planning to deliver no net loss at bauxite mines in Brazil.

### 6.2.4 Recommendations

Workshop discussions identified the following key priorities to strengthen biodiversity monitoring and improve consistency in tracking progress towards no net loss across Brazil's bauxite mining sector.

1. Adopt a standardised approach for identifying priority biodiversity features across operations, aligned with national regulatory frameworks and global best practice. This would enable consistent monitoring requirements and clarity in metric needs.
2. Develop a systematic framework for metric selection to ensure that indicators used for biodiversity condition, extent, and species abundance are appropriate, non-redundant, and directly linked to priority biodiversity features. This would help avoid duplication, improve efficiency, and align site-level data with sector-wide reporting needs.

3. Design and implement standardised no net loss trackers to enable transparent reporting of progress against biodiversity targets at both site and corporate levels. These trackers should integrate baseline, impact, and mitigation measures, and support alignment with national datasets (e.g. MapBiomias, ICMBio, and MMA lists).

## 6.3 Guinea

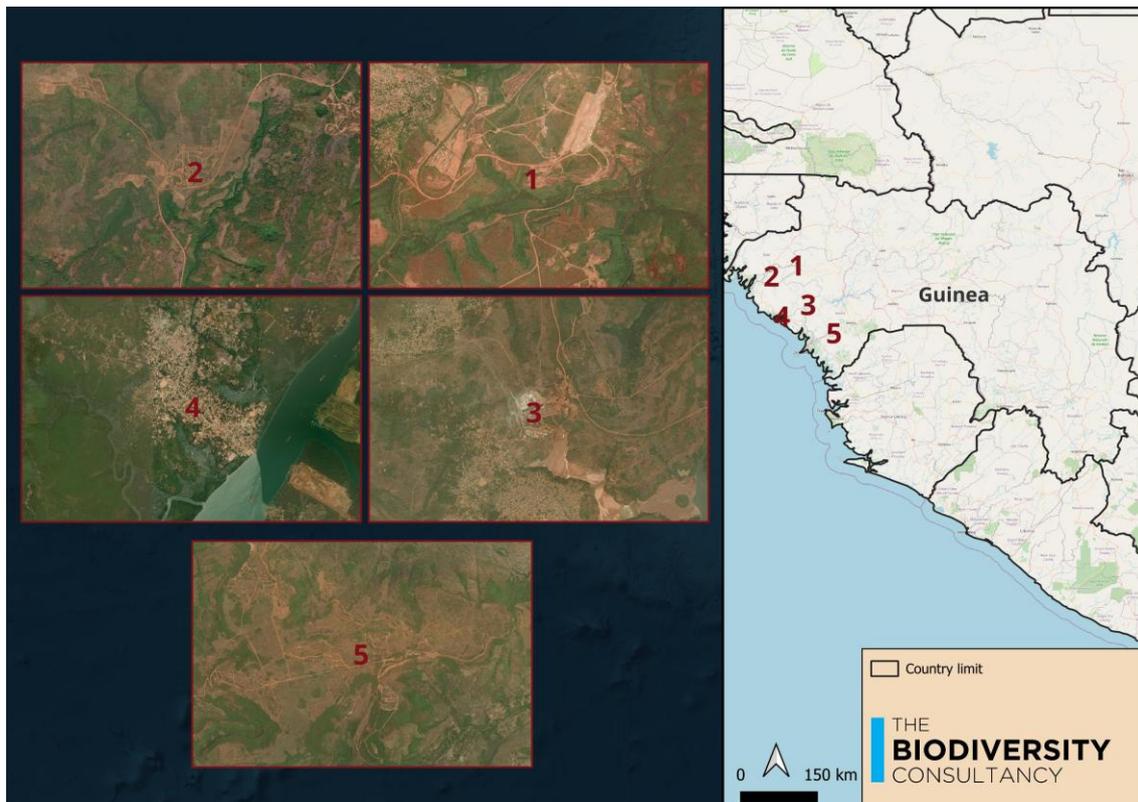


Figure 6: Spatial distribution of bauxite mines in Guinea (Source: [ICMM 2025](#)). Data on mine locations is sourced from ICMM databases and does not include all bauxite operations

### 6.3.1 State of Nature metrics overview in Guinea

In Guinea, bauxite mining is concentrated in the west of the country, particularly in the Boké, Sangarédi, Noké and Fria areas (EGIS 2016; Tost *et al.* 2020). Mining takes place across tropical and subtropical grasslands, savannas, and shrublands. The gallery forests of western Guinea are among the ecosystems most affected by bauxite mining (Seredkin & Jeffress 2025). These narrow riparian forests provide habitat for a range of endangered species (Sidiki 2019), including globally significant populations of the Western chimpanzee (*Pan troglodytes verus*) (Rabenamtoandro *et al.*, 2024) which are sensitive to habitat loss and disturbance. The gallery forests themselves consist of range restricted plants, some of which are unique to the gallery forest habitat type, such as *Napoleonaea alata* (Endangered, with an area of occupancy of only 36 km<sup>2</sup>) *Dialium pobeguini* (Vulnerable, area of occupancy 72 km<sup>2</sup>) and *Placodiscus riparius* (Vulnerable, area of occupancy > 500 km<sup>2</sup>) (IUCN 2018a, 2018b, 2019b; Couch *et al.* 2019). Mining-related roads and railways have further increased human access to remote forest areas,

intensifying fragmentation, wild meat hunting, and human–wildlife conflict (Humble & Kormos 2011).

The Bowé grasslands, another key ecosystem in Guinea’s bauxite region, are seasonally dry savannas characterised by shallow lateritic or ironstone soils and sparse vegetation. They support distinctive communities of drought-tolerant grasses, sedges, and endemic herbs adapted to nutrient-poor soils, often forming mosaics with woodland and gallery forest. Because bowé grasslands are highly erosion-prone and easily degraded by mining, overgrazing, and agriculture, they are recognised as ecosystems of conservation priority, supporting specialist flora and providing seasonal habitat for pollinators and open-habitat fauna.

Rivers and streams, when impacted by mining, have the potential to become acidic and contain elevated concentrations of sulphates, iron, and heavy metals (Keita & Traore 2020; Diallo *et al.* 2024), indicating degradation and potential risks to fish, amphibians, invertebrates, as well as to the people and animals dependent on these waterways.

### 6.3.2 Current state of site-level monitoring in Guinea

Site-level biodiversity monitoring in Guinea faces several challenges due to limited data availability, lack of consistent standards, and low regulatory capacity. Companies primarily use field data to monitor changes in the extent of priority habitats and ecosystems, with some reliance on globally and publicly available remote sensing data. However, the quality and granularity of available data for Guinea is generally poor, with global datasets (e.g., Global Forest Watch) offering limited utility. The government’s focus is on offsets rather than avoidance or minimisation, viewing offsets as a potential funding source for protected areas. There is little pressure on proper baselining or quantification, and no system in place for tracking outcomes.

Most organisations develop their own monitoring approaches due to the absence of national datasets and standardised frameworks. Monitoring of key species (such as chimpanzees) is conducted through field surveys and direct measurements, with habitat used as a proxy for many plant and animal species. However, there is a lack of scientific knowledge and baseline data for many species, especially cryptic species and plants. This makes it difficult to track abundance or establish agreed indicators. Compound impacts from multiple projects are not recognised or assessed, and there is no national framework for evaluating them. Migratory species are present, but their significance is not well understood or assessed due to data gaps.

Companies reported to monitor pressures including habitat loss and fire via remote sensing. Grazing pressure is typically assessed through presence/absence of plant species and their fruiting bodies. Hunting (particularly for chimpanzees) is assessed using metrics, such as presence of cartridges, hunter paths, snares, and species presence in wild meat markets. Project-induced migration is also a major pressure and changes in population and housing patterns (based on extensive community baseline data) are used to track changes in indirect or induced impacts.

There is a strong need for a well-developed process for tracking no net loss commitments and for a clear understanding of how to track changes in priority biodiversity features.

### 6.3.3 Relevant national biodiversity datasets for tracking no net loss in Guinea

During the Guinea workshop, few additionally relevant national biodiversity datasets were identified by participants aside from fairly coarse data associated with Chimpanzees. This highlights the importance of global data and especially site-level monitoring to inform a precautionary approach during application of the mitigation hierarchy. There is a need for clear guidance on the appropriate use of any national maps, as they may not cover critical habitats and risk being used for loss-gain calculations without proper verification. Workshop participants agreed that the current biodiversity metrics and data are not sufficient for tracking changes in priority biodiversity features.

### 6.3.4 Recommendations

Workshop participants identified three key priorities to strengthen biodiversity monitoring and reporting against no net loss targets within Guinea's bauxite sector:

1. Establish a standardised process for identifying key biodiversity features, including species, habitats, and ecosystems of concern. In Guinea, these should include chimpanzee populations, lowland rainforest, submontane forests, gallery forest, and bowé grasslands across all mining operations.
2. Develop a systematic framework for selecting appropriate, non-redundant metrics for tracking changes in biodiversity condition, extent, and species populations, tailored to the ecological context of Guinea's mining regions.
3. Explore and implement a consistent approach to report progress toward no net loss across operations and "Nature Types." For example, tracking cumulative outcomes for chimpanzee populations across all sites, or aggregating habitat condition and extent for ecosystem types such as lowland rainforest, submontane grasslands, or gallery forest.

## 6.4 India

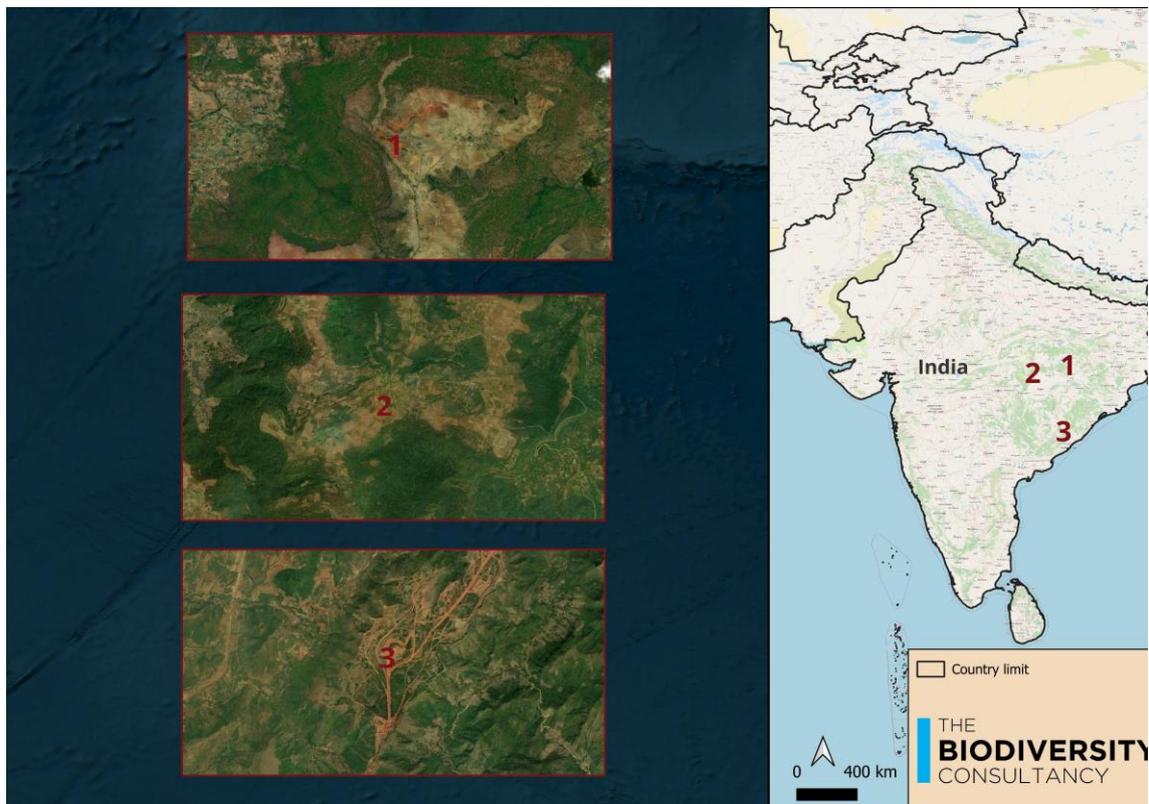


Figure 7: Spatial distribution of bauxite mines in India (Source: [ICMM 2025](#)). Data on mine locations is sourced from ICMM databases and does not include all bauxite operations.

### 6.4.1 State of Nature metrics overview in India

In India, bauxite mining occurs primarily across the lateritic plateaus of the Western Ghats, particularly in Maharashtra, and within the Niyamgiri hill range in Odisha. These regions form part of some of the country's most ecologically important and biologically diverse landscapes. Mining is concentrated on lateritic plateaus and hilltops, often classified as "wastelands", that in fact support unique ecosystems with high levels of endemism and ecological value (Watve, 2010; Lad & Samant, 2012).

The Western Ghats, a recognised global biodiversity hotspot, contain over 30% of India's plant, fish, herpetofauna, and mammal species (Lad & Samant 2012). Bauxite-bearing lateritic plateaus here host distinctive plant communities adapted to thin, nutrient-poor soils, including more than 360 species of seed-bearing plants, nearly half of which are endemic (Watve 2010). These rocky outcrops, described as "terrestrial habitat islands" and "islands on islands" (Porembski *et al.* 2000), provide microhabitats that support species assemblages not found elsewhere.

In Odisha, the Niyamgiri hill range represents another region of exceptional ecological and cultural value. The area supports a mosaic of tropical evergreen, moist and dry deciduous, and peninsular sal forests (*Shorea robusta*), along with dense bamboo thickets and scrub woodlands (WII 2006). These forests harbour diverse flora, including *S. robusta*, *Pterocarpus marsupium*, and

a wide range of orchids, ferns, and medicinal plants, as well as providing essential ecosystem services to local Indigenous communities. The Niyamgiri massif is also the source of major rivers and perennial streams, with the bauxite layer functioning as a natural aquifer that sustains aquatic and terrestrial ecosystems throughout the year.

Grassland and forest ecosystems in these mining landscapes support a range of threatened and flagship fauna, including the Endangered Asian Elephant (*Elephas maximus*), tiger (*Panthera tigris*), Vulnerable leopard (*Panthera pardus*), Sloth Bear (*Melursus ursinus*), and Four-horned Antelope (*Tetracerus quadricornis*), along with species such as the Giant Squirrel (*Ratufa indica*), Sambar, Pangolin, and Palm Civet. Many of these species rely on the integrity of forest and lateritic habitats for movement, breeding, and foraging, and are highly sensitive to habitat fragmentation and disturbance caused by mining and associated infrastructure.

Bauxite mining also affects aquatic ecosystems, as the plateaus and hill ranges coincide with high-altitude catchments that feed numerous springs and streams, supporting freshwater species and downstream agriculture. Loss of vegetation cover and alteration of hydrological regimes threaten both biodiversity and water availability, underscoring the ecological interdependence between terrestrial and aquatic systems in these mining landscapes.

#### 6.4.2 Current state of site-level monitoring in India

Site-level biodiversity monitoring in India was reported by workshop participants to be shaped by regulatory requirements and evolving corporate standards informed by partnerships with organisations like the IUCN. Companies monitor ecosystem extent using field data, remote sensing, and habitat indexes based on both global datasets and local field surveys. A risk-based approach was often used to identify areas where habitat is already at risk, followed by identification of species within those sites that may also be at risk.

Barriers to using condition metrics include limited awareness, technical capacity, costs of monitoring, data limitations, and policy and governance constraints. Companies used a wide range of indicators to track on-site and off-site actions including information on the number of native species, number of invasive alien species removed, area of habitats created, enhancement of habitats for birds, butterflies, mammals, amphibians, and reptiles, and number of trees planted. Ground-truthing (e.g., 10m resolution field surveys) is used to refine habitat-based monitoring, with survival rates of planted species being a key metric.

Monitoring of changes in individual species is conducted. This often uses habitat as a proxy for species presence and abundance. There was a focus on IUCN Red List species and indigenous species across different climatic zones, but specific individual species are rarely tracked. Relevant pressures reported from the environments that companies work in included dynamic pressures, such as air and noise pollution, use of natural resources (timber, non-timber forest products), and impacts from dams. Pollution is measured through regional Environmental Impact Assessments (EIAs) and state/national datasets. Watershed projects and offset plantations are implemented to enhance biodiversity and support local economies.

Robust tracking of biodiversity features and condition is a major challenge, alongside the identification of priority biodiversity features. Baseline studies to inform the tracking of no net loss is based on regulatory requirements but often limited to the 'area restored' rather than more detailed measures of quality of the abundance of species therein. There was interest in updating corporate standards and leading frameworks, and refining approaches to the identification of priority biodiversity features.

#### 6.4.3 Relevant national biodiversity datasets for tracking no net loss in India

During the India workshop, national datasets identified included Forest Reserves from the Ministry of Environment, Forest and Climate Change (MoEFCC), [Wetlands of India Portal](#), [Eco-Sensitive Zones](#), [Tiger Reserves](#), Agro-ecological regions by the National Bureau of Soil Survey & Land Use Planning (NBSS & LUP), and those data associated with satellite imagery, such as Sentinel 2 and Above Ground and Below Ground Biomass from NASA. As protected areas are not reported globally, national data on protected areas from the MoEFCC are important. Additionally relevant and authoritative national data may include the Indian Biodiversity Information System ([IBIS](#)).

#### 6.4.4 Recommendations

Workshop participants identified the following priorities to strengthen biodiversity monitoring and reporting within India's bauxite mining sector:

1. Establish clear, standardised criteria for identifying priority ecosystems and species within lateritic plateaus, forested landscapes, and associated aquatic systems, ensuring alignment with national conservation frameworks.
2. Develop a structured process for selecting biodiversity metrics from the core set identified in this report, with those required based on priority biodiversity features and their targets.

## 7 Conclusions: lessons learnt and recommendations

Bauxite mining occurs in different ecological and governance contexts across the four countries included in this report. In Australia, companies operate in highly regulated landscapes, with comparatively mature monitoring but challenges related to data comparability, large spatial scales, and difficult-to-monitor biodiversity features. In Brazil, operations face risks caused by deforestation in Amazonian and Atlantic Forest biomes, where biodiversity is exceptionally rich and social safeguards for Indigenous and riverine communities are critical. While monitoring is more advanced than elsewhere, it is still hindered by inconsistencies in data records and limitations of global datasets to fill gaps. Guinea's western bauxite belt creates pressures on gallery and lowland evergreen forests, Bowé grasslands, and aquatic systems, but monitoring is constrained by regulatory capacity, scarce national datasets, and limited baselining—making cumulative impacts challenging to assess. In India, operations face challenges of endemism with corridor-dependent forests and high-altitude catchments and, while corporate monitoring is

evolving, practice is often indicator-heavy (e.g., counts of plantings) with gaps in condition and population tracking and uneven use of risk-based, feature-specific metrics.

Despite these differences, there are lessons to be learned across nations. For example, Australia's experience in standardising habitat condition methods (using remote sensing + ground-truthing + modelling) and building site trackers can guide Brazil and India in moving from diverse indicators to feature-linked, comparable metrics. Brazil's rich national data infrastructure (including MapBiomas, CAR, ICMBio/MMA lists) shows how aligning corporate monitoring with authoritative national datasets can improve coverage and inform baselining – an approach Guinea could adapt by prioritising site-level surveys and precautionary gaps-filling where national data are sparse. Guinea's focus on pressure monitoring (fire, hunting, project-induced migration) may, for example, provide a template for other countries to better connect pressures to biodiversity, and response options, to state of nature outcomes.

Across all regions, companies still struggle to (i) consistently identify priority biodiversity features, (ii) choose non-redundant (i.e. metrics providing unique and accurate data on biodiversity), decision-relevant metrics that link habitat and species responses, (iii) track progress toward no net loss (NNL) in a comparable way across sites, and (iv) report results credibly across different jurisdictions and Nature Types. As such, companies are not currently able to easily determine whether they are meeting relevant corporate, regional or global biodiversity goals. To address these common gaps and enable enhanced biodiversity management at the site-level, as well as corporate aggregation and reporting of results, we recommend:

- Clear principles for defining priority biodiversity features, tested and refined through the application across diverse regions.
- Further support to implementing the guidance provided here in Section 4.3 in deciding when habitat quality (extent and condition) can be used as a proxy for a species, and when an individual approach should be adopted.
- A decision support and tracking tool for inputting and tracking metrics and measures and enabling sites, corporates and sectors to report against no net loss targets. This does not necessary require standard metrics but does require a shared consistent structure.
- Guidance on reporting across operations and regions that recognises biodiversity complexity, while also offering practical cross-site reporting protocols.

Going forward, the International Aluminium Institute (IAI) can help drive implementation of these recommendations by coordinating shared frameworks and tools that enable consistent no net loss tracking across companies.

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