



**NATURE
METRICS**
DNA-BASED MONITORING

Make nature your competitive advantage

Using nature intelligence to transform how the extractives industry approaches, measures and reports on biodiversity

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Balancing the scales of nature and energy

The world is experiencing the fastest energy transition in history as we collectively race to curb climate change and achieve net-zero.

The mining and heavy industrials sectors have a vital role in this journey. Sustainable technology is mineral intensive. On average, an electric car requires six times more minerals than a petrol or diesel car, and an onshore wind plant requires nine times more mineral resources than a gas-fired plant. In fact, research by the International Energy Agency suggests that we will need to quadruple our mineral inputs by 2040 to meet the goals of the Paris Agreement.

As a result, meeting our global energy needs will require an exponential increase in access to new mineral resources and a vast increase in the scale of mining operations that produce other important resources, such as copper.

A 2020 World Bank Group report found that the production of minerals, such as graphite, lithium and cobalt, could increase by nearly 500% by 2050 to meet the growing demand for clean energy technologies. Lithium, nickel, copper, cobalt, manganese and graphite are needed to power new battery technology. Rare earth metals are essential for wind turbines and EV motors. And our electrical energy grids require huge amounts of copper and aluminium to be extracted from ores beneath the Earth's surface.

Accessing these raw materials will therefore mean identifying, opening and operating new and existing mine sites more intensely than ever before. As such, the demand for minerals is making greenfield sites, even those that were previously logistically unviable, increasingly bankable.

But in powering a net-zero future, we cannot afford to 'rob Peter to pay Paul': that is, mitigating climate change should not come at the cost of global biodiversity – especially as we are only beginning to understand the links between these two existential threats to our planet.

Nature cannot pay for Net-Zero

Rich and diverse ecosystems are vital for a healthy planet, from flourishing forests to vibrant marine ecosystems. Biodiversity supports all life on Earth. It protects us from climate extremes, regulates the water cycle, and keeps us fed. The World Economic Forum estimates that more than 50% of global GDP (USD 44 trillion) "is moderately or highly dependent on nature and its services."

The environmental and social costs that are associated with mining, such as water contamination and habitation destruction, are well documented.

Research has found that 20% of global mines owned by MSCI ACWI Investable Market Index (IMI) constituents are located in biodiversity hotspots, with a further 13% occupying highly intact ecosystems.

Mining resources have also presented conflicts with Indigenous communities around the world – with free, prior and informed consent (or FPIC) required for any activities undertaken on their land.

As such, mining and other extractive operations face a high level of scrutiny from local communities, campaigners and the wider public.

In response, many mining operators have made substantial progress in addressing their impacts through improved commitments, performance and reporting on environmental, social and governance (ESG) issues.

But many challenges remain. For example, there is often a disconnect between corporate-level commitments and performance on the ground, while project-level impact assessments (ESIAs) need to be aligned with larger-scale, strategic approaches to nature.

While the mining and industrial sector has helped drive biodiversity innovation, more work is needed to ensure it meets the needs and requirements of a forward-facing, sustainable economy.

Biodiversity regulation and governance are already here

The pressure to protect biodiversity will become even more acute as voluntary biodiversity frameworks become increasingly mandated by governments and regulators over the coming years.

Just as COP27 introduced an increased focus on net-zero accountability for organisations, biodiversity transparency and commitment will soon become a legal reality. G7 leaders have agreed on commitments to halt and reverse biodiversity loss by 2030, and COP's Global Biodiversity Framework (GBF) has already established agreed criteria for rapid legislative progress.

Furthermore, 72 countries have committed to reversing biodiversity loss by 2030 as part of the Leaders' Pledge for Nature at the United Nations Summit on Biodiversity, while all 191 UN nations have agreed to 2030's Sustainable Development Goals.



In the financial space, the Taskforce for Nature-related Financial Disclosures (TFND) framework – which is supported by some of the major players in the banking and extractives industries – will put an increasing emphasis on accurate biodiversity performance monitoring and disclosure reporting.

Industry will therefore need to demonstrate a nature positive impact on long-term assets that are often held for decades. Companies will need to balance a rush for resources with a nature positive approach where biodiversity can thrive and grow – while also protecting habitats on which local communities and indigenous peoples’ livelihoods and cultures depend.

As such, Corporate Social Responsibility and Corporate Social investment cannot be seen as just tick-box exercises – businesses need to prove they are contributing to the sustainable economy by not only protecting ecosystems but improving them.

Nature intelligence – a scalable approach to understanding nature

Marrying a clean energy-powered net-zero future with a nature positive approach presents a significant challenge. But it is one that can be overcome with the right frameworks and technology.

Unlike carbon emissions, which have established clear metrics that can be targeted and tracked, it is far harder to quantify or consolidate nature into simple numbers. Historically, this has made it difficult to set baseline targets and accurately measure the impact of biodiversity interventions.

To bring about meaningful change, we need to bring accountability to our accounting. Businesses will need to rethink their existing monitoring requirements – shifting from a species-specific approach to measuring whole landscapes and protecting species at local, national and international levels. Companies will need to have robust biodiversity baselines in place and use the mitigation hierarchy to avoid, minimise, restore and offset their impact.

Thankfully, some of the new tools and techniques, such as nature performance monitoring and environmental DNA (eDNA) technology, are enabling companies to measure nature safely and cost-efficiently on a scale never seen before.

This paper will discuss how this new nature intelligence technology is transforming organisations’ approach to understanding, reporting and protecting nature: setting companies up to meet new nature reporting requirements, engage their stakeholders, improve their impact on nature, and contribute to our global biodiversity understanding.



“Organisations are being asked to account for biodiversity in a way they haven’t before. We’ve already seen over 180 countries sign the Global Biodiversity Framework, which requires large businesses to report on their impacts on nature.”

“At the same time, financial investors and lenders are also making their own nature-based commitments, leading to greater scrutiny of the companies in their portfolios and a greater demand for transparency.”

“Meanwhile, with end users more socially and ethically aware than ever before, companies are under increasing pressure to share their progress with customers, NASZ investors and regulators to demonstrate they are leaving a net positive impact on the planet.”

“As a result, simple compliance is no longer enough. While the onshore extractives sector has been at the forefront of measuring biodiversity impact, organisations will need to adopt new approaches and technology if they are to continue to lead the way.”

“Companies will be expected to measure, quantify, and demonstrate that they are going above and beyond in protecting and restoring nature.”

“As such, it’s vital that businesses can articulate the state of biodiversity across all stages of a project. With tools like Nature Performance Monitoring and eDNA technology, we can now routinely deliver detailed insights at a landscape scale – enabling biodiversity to be accounted for in decision-making and leading to better outcomes for nature.”



Dr Kat Bruce
Founder, NatureMetrics

eDNA technology – transforming how we measure nature

Forward-facing organisations are embracing new techniques such as eDNA surveys – an efficient, cost-effective and powerful tool for biodiversity monitoring.

All life – from bacteria to blue whales – leaves tiny traces of DNA in its environment. eDNA technology allows us to collect samples of these fragments to reveal a complete picture of the biodiversity of that ecosystem.

Traditional surveying techniques rely on experts to identify species on site. This is expensive and time-consuming and often requires large teams. However, through simple-to-use eDNA sampling kits, non-specialists on-site can easily and safely collect samples of whole habitats for remote analysis.

eDNA surveys allow organisations to identify high-risk invasive or protected species and survey multiple species – establishing “t-zero” baselines from which change can be detected. Linking activities to impacts to better understand risks, monitor progress and put effective actions into place.

“Species detection and identification have remained largely unchanged since the 1700s, relying on field observations, capture and morphological identification. However, these approaches are invasive and time-consuming, the skilled teams needed are expensive, and datasets produced are often biased towards larger and more visible species. This has led to the oversight of smaller, rare, or elusive taxa, particularly those found in challenging ecosystems like aquatic environments. eDNA technology is a new tool for a new era of nature reporting, enabling quick and comprehensive detection of entire animal communities from a single sample collected in under 15 minutes. Monitoring at this resolution and scale allows for ecosystem-level assessment and biodiversity management that improves outcomes for nature while facilitating a new age of species discovery.”



Dr Joe Huddart
Business Development
Manager, NatureMetrics

Working with Communities

Because eDNA surveys can be conducted by non-specialists, anybody can actively help monitor and manage biodiversity – from the executive level to a site’s HSE team, in addition to third-party auditors, regulators and the surrounding local communities.

As a result, stakeholders across the business are empowered to take a proactive role in measuring and improving biodiversity.

Such an approach has been demonstrated to create real, tangible engagement on the ground. In addition to contributing to corporate social investment and responsibility, it allows for more meaningful partnerships with communities. Far more than a simple tick box exercise, it allows both companies and their stakeholders to contribute to local knowledge by collecting highly valuable data at greater volume to help mitigate nature risk.



Source: SINESE

From Guidelines to Governance – the changing legislative landscape

Businesses and governments recognise that we cannot contain global warming to 1.5°C without factoring in nature loss.

As such, regulators are developing strict targets and ambitious goals around biodiversity. What was voluntary practice will soon become permanently enshrined in law.

The foundation for much of this governance will be guided by the Global Biodiversity Framework (GBF), ratified at the COP15 biodiversity conference in Montreal, Canada, in December 2022. The GBF will set the global agenda for biodiversity in the same way Paris Agreement did for carbon emissions and net-zero.

The GBF's ambition is to fully integrate with policy, regulation and planning across all levels of government and all sectors. With the support of 188 governments, the GBF is already setting the agenda for urgent action that will define biodiversity standards for decades to come.

The GBF's headline aims are to restore 30% of degraded natural habitats by 2030 – known as the '30 by 30' deal – and reduce the extinction rate tenfold by 2050. Those dates dovetail with COP26 emission goals and many organisations' net-zero ambitions: they are co-dependent targets that must be considered together.

What the Global Biodiversity Framework means for your business

New targets: including five key targets aimed at tackling the direct drivers of biodiversity loss: changes in land and sea use, climate change, pollution, exploitation of natural resources and invasive species.

Reporting requirements: companies must demonstrate compliance against global biodiversity targets.

Increased transparency: businesses will need to regularly monitor, assess and disclose their risks, dependencies and impacts on biodiversity. Larger companies will be expected to provide data across their supply chain and provide information to consumers to promote sustainable consumption.

Finance sector commitments: to transform the economy to nature positive through incentives, increasing scrutiny of company nature-related risk and performance and directing finance to nature positive investments.

What are the benefits?

Companies that are making progress towards these goals will be best placed to develop nature positive strategies, secure ongoing capital funding, and future-proof their operations and supply chains.

As the financial sector will be required to invest in assets and companies that will have a positive impact on nature, companies that can demonstrate nature progress will see more favourable lending rates, along with access to new financing and financial instruments. Businesses that comply with the standards will also benefit from improved ESG and investment scores.

In addition, greater access to robust biodiversity data allows for better decisions on the ground while truly working towards reducing global biodiversity loss.

Legislative change is already here

The GBF is already being used as a template for legislation around the world, including:

- The proposed [EU Nature Restoration Law](#) will transform many GBF targets into EU law, while the [Corporate Sustainability Reporting Directive](#) already requires large companies to record and report their environmental impact
- The UK Government is rolling out Biodiversity Net Gain regulation, which mandates that all developments must avoid or offset any habitat loss
- Australia, New Zealand and South Africa have delivered frameworks dictating and incentivising nature positive outcomes through measures such as biodiversity offsets, certificates and markets.

Financing Nature Positive Solutions – a more rigorous approach to accounting

But it's not just Governments that are paying close attention to GBF. The framework also has the backing of the investment community in the shape of 150 financial organisations managing a combined \$24 trillion.

Many financial institutions have already begun to integrate biodiversity-related assessment into their processes. The World Bank's Environmental and Social Framework (ESF) includes a standard (ESS6) that requires borrowers to protect and conserve biodiversity and habitats and apply the mitigation hierarchy.

The GBF also includes a target (19) to boost private sector investment through nature-positive funds and schemes. Independently, commercial banks are increasingly exploring green and sustainability-linked loans, with more biodiversity-related KPIs being tied to bonds, loans, revolving credit facilities and derivatives.

Initiatives like the International Finance Corporation (IFC) Performance Standard 6 (PS6) are setting the benchmarks for international best practice in biodiversity management – including critical habitat assessment and long-term monitoring and evaluation.

Elsewhere, multilateral development banks (MDBs), like the European Investment Bank (EIB), are increasingly factoring biodiversity considerations into their policies and operations while scaling up nature positive investments.

Similarly, the Taskforce on Nature-related Financial Disclosures (TNFD) framework has been designed to bring more accountability and rigour to how companies assess, disclose, and manage nature-related financial impacts and dependencies (see [Are you ready for TNFD Framework?](#)).

Such frameworks are already having a demonstrable impact. For example, the Endangered Wildlife Trust in South Africa regularly evaluates the biodiversity performance of the top listed companies on the Johannesburg Stock Exchange using the [Biological Diversity Protocol \(BD Protocol\)](#).

Such reporting has direct implications for green investment and ESG ratings. As financial institutions implement more stringent biodiversity policies and requirements, companies must be able to prove they are managing and mitigating biodiversity-related risks to ensure a steady flow of capital.



Are you ready for TNFD Framework?

The TNFD framework recommends that organisations should evaluate their nature risk using a LEAP approach (Locate, Evaluate, Assess and Prepare):

- **Locate** any assets and operations that affect vulnerable ecosystems.
- **Evaluate** what business processes and activities depend on or impact these priority locations – and on what scale.
- **Assess** any material nature risks and current mitigation management practices, along with potential improvements.
- **Prepare** by setting and measuring reporting targets that align with TNFD disclosure recommendations. This will require companies to capture accurate biodiversity baselines and monitor ongoing progress.

NatureMetrics can help companies prepare TNFD's reporting recommendations around nature-related risks disclosures through training, workshops and strategy development.

"NatureMetrics has worked with private sector companies, including onshore industrials, to help shape and pilot the TNFD's beta framework. We've also contributed to the framework's guidance for the mining sector and worked with the UK Business & Biodiversity Forum to help smaller companies prepare.

"We are helping to both support and deliver TNFD's LEAP approach by giving companies the tools and guidance they need to deliver nature positive outcomes, including the monitoring, metrics and key indicators necessary to ensure a high integrity, science-based approach."



Pippa Howard
Chief Nature Strategist,
NatureMetrics

The Emergence of Biodiversity Credits

Biodiversity credits – or biocredits or biodiversity certificates – are a nascent financial tool currently being tested globally, including in Sweden, Honduras, New Zealand, Indonesia, Brazil, Colombia and Australia⁴. In May 2023, Swedbank became the first European bank to buy biodiversity credits.

Like the market for carbon credits, which Deloitte currently values at \$300 million but could reach \$50 billion in the near future⁵, biocredits are only set to grow in value while enabling and incentivising nature progress – particularly as more sophisticated monitoring techniques make it easier to measure their impact.

Across the supply chain

In the same way that organisations are increasingly measured not just on their own carbon emissions but those of their suppliers, biodiversity regulations will also go beyond direct impacts. The GBF's Target 15 proposes that larger companies will need to regularly measure and disclose their environmental impacts across their operations and supply chain.

Following the Kyoto Protocol and the publication of the UN's Sustainable Development Goals, many leading businesses have already independently implemented their own nature-positive requirements for their suppliers.

Such developments mean that companies will need to understand the biodiversity footprint of their raw materials, finished goods and suppliers.

Organisations must act now

With biodiversity regulation progressing at pace, it is more important than ever to ensure robust, future-proof biodiversity practices and accurate baselines are in place to measure progress. Internal metrics aren't enough: businesses will have to publicly disclose accurate figures based on ongoing monitoring data.

While this would have proved challenging even a few years ago, new tools and technologies are making the process of collecting biodiversity data at scale simpler.

Nature intelligence – from data to actionable insights

Until recently, species presence data was reliant on detection and monitoring via observation and capture-based methods.

Traditional methods such as spotting species with binoculars or electrofishing are slow, time-consuming and just not fit for purpose for large corporate organisations that need to monitor at scale and obtain robust data that can be used for new regulatory reporting requirements.

New technologies coming into play are changing the game. Earth observation, drones, bioacoustics and eDNA technology are driving effectiveness, scalability and affordability at the scale required for corporates with large portfolios and extended supply chains.

But better and faster data isn't enough on its own. Insights and indicators that show how biodiversity health changes over time, served in an accessible way, are fundamental if businesses want to meet new global demands for reporting on nature positive biodiversity.



“We’re working to develop a more sophisticated relationship between business and nature. Companies need access to better biodiversity information to understand their impact and show they are contributing to the resilience of nature.”

“Thankfully, nature performance monitoring and eDNA technology enable us to translate the complexity of biodiversity into crucial metrics that describe the ecological health, function, components and traits of the different forms of life within an ecosystem. This makes it so much easier for organisations to understand nature and identify and quantify the values and characteristics of species and habitats over time.”

“Through understanding these values and any pressures impacting biodiversity, companies are better able to prepare, plan and respond through management actions and interventions.”



Pippa Howard
Chief Nature Strategist,
NatureMetrics

Bringing Scale and Context to Biodiversity Data

Using nature performance monitoring data to empower decisions.

Thankfully, in recent years we have seen a breakthrough in how we treat and effectively employ biodiversity data thanks to nature performance monitoring, powered by eDNA technology.

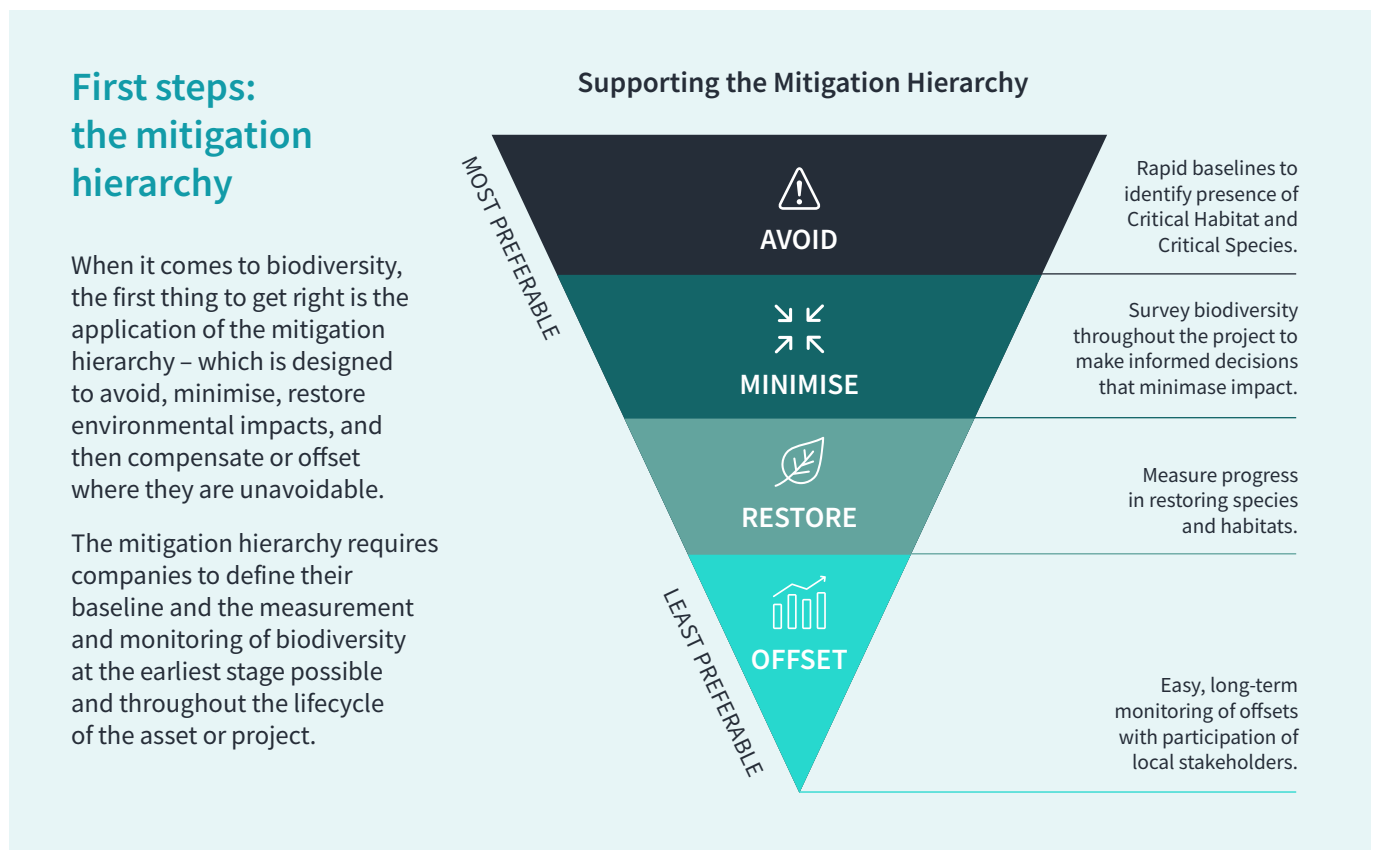
Nature performance monitoring enables businesses to make critical decisions around biodiversity, from risk analysis and investment assessments to management and mitigation strategy – future-proofing and transforming operations at both a site and portfolio level.

In the last few years, eDNA surveys have rapidly emerged as an effective and powerful tool for biodiversity monitoring. eDNA can be used to detect a wide variety of organisms, including fish, mammals, invertebrates, fungi and bacteria. As eDNA can be detected in very low concentrations, it is a sensitive tool for monitoring changes in biodiversity.

Through ongoing, non-invasive eDNA surveys, organisations can capture huge volumes of rich biodiversity data on a scale that has not previously been possible (see [eDNA technology – transforming how we measure nature](#)).

Meanwhile, nature performance monitoring uses easy-to-understand metrics to track and report on site-based nature progress in a simple, standardised way, enabling organisations to put good data at the centre of their decision-making.

This approach has benefits across the lifetime of a site, from establishing robust baselines and identifying and mitigating risks earlier in the exploration process to helping to accurately measure post-closure restoration.



First steps: the mitigation hierarchy

When it comes to biodiversity, the first thing to get right is the application of the mitigation hierarchy – which is designed to avoid, minimise, restore environmental impacts, and then compensate or offset where they are unavoidable.

The mitigation hierarchy requires companies to define their baseline and the measurement and monitoring of biodiversity at the earliest stage possible and throughout the lifecycle of the asset or project.

“Conventional monitoring only captures a fraction of the life in our ecosystems. But how can companies be expected to make great decisions if they don’t have the full picture?”

“eDNA technology provides on-the-ground information that’s high resolution and accurate. And because non-specialists can take samples, it is far easier to identify and mitigate risks early in the process – even before a traditional Environmental Impact Assessment. We’re working with exploration geologists at the earliest stages of a project so the very first people on the ground can capture valuable biodiversity data before expense is put forward for developing an asset – a problem that often plagues legacy sites.

“Crucially, integrating eDNA into our ongoing nature performance metrics allows us to look beyond just a particular site and its catchment area and understand what’s happening in the wider landscape. By collaborating with other companies and organisations, we can work on a scale that wasn’t possible before and drive nature positive impacts.”



Dr Vere Ross-Gillespie
Head of Onshore industries &
extractives, NatureMetrics

Building understanding, collaboration and insight through rich, scalable data

Conventional methods of collecting nature data, such as transects, quadrats and traps, can only capture small, isolated sample sizes – often only providing surface-level information on single species.

Meanwhile, a lack of comparable reference points has made cataloguing and comparing biodiversity metrics at scale almost impossible. A lack of standardised data leads to varying collection methods, metrics and protocols across the industry.

As a result, existing biodiversity data isn't shared between companies operating in the same sector – and can often be siloed within different regional groups of the same organisation. This makes it difficult to make informed and actionable decisions, learn from best practices or share meaningful, auditable information and results with third parties such as investors and researchers.

However, our planet, landscapes and ecosystems do not respect social, political or economic boundaries – nor should our biodiversity data practices.

Trying to compare data as 'apples and oranges' is inefficient and ineffective. In order to facilitate better outcomes for both businesses and nature, biodiversity data needs to be objective, standardised, sharable and transparent.

Mineral occurrences are rarely isolated, while vast geological structures often house multiple companies and stakeholders. As many operations are co-located, valuable biodiversity information captured from buffer and catchment areas can be efficiently shared to build a detailed picture of the cumulative impact on ecosystems and wider landscapes – without duplicating effort or cost.

Collecting a greater amount of comparable, standardised data makes it possible to detect trends and patterns and identify effective outcomes for nature – enabling organisations to make more informed, actionable decisions – while contributing to our global biodiversity knowledge base.

Developing global biodiversity understanding

Importantly, biodiversity data can be shared with other organisations, including researchers and NGOs. There are estimated to be more than two million described species living on Earth. Less than 10% have been assessed for the IUCN's Red List of threatened species, making it difficult to create an accurate framework for global biodiversity.

eDNA can fill in data gaps through eDNA barcoding, where the sampled DNA sequences are translated into unique barcodes for each species. In doing so, we can build genetic reference libraries – contributing an enormous wealth of information to local and global research efforts and building a better picture of how biodiversity responds to impacts.

eDNA can also complement earth observation metrics that capture remote-sensing and other geospatial data – which can be translated by nature performance monitoring into meaningful metrics and insights about habitats and ecosystems.

Such an approach ties into the Global Biodiversity Framework's goal to "share the monetary and non-monetary benefits of the utilisation of genetic resources, digital sequence information on genetic resources."





Sharing Biodiversity Knowledge

NatureMetrics enables organisations to share their data with the Global Biodiversity Information Facility (GBIF) – the world’s most comprehensive, openly available biodiversity data-sharing infrastructure.

NatureMetrics and IUCN have partnered to deliver eBioAtlas: an eDNA-powered global atlas of life in the world’s river basins and wetlands which aims to offer 30,000 new open-source global data points.

The first of the eBioAtlas river basin projects took place in the Malagarasi-Moyovosi wetlands, the largest drainage system into Lake Tanganyika and a site of international significance under the Ramsar Convention on Wetlands. Funding from Robert Downey Jr’s FootPrint Coalition

mobilised a sampling team led by TAFIRI, including the Nyakitonto Youth for Development Tanzania, to meet the following conservation priorities:

- Determine what species are present in this unique and under-studied system
- Determine the distributions of endemic species
- Develop an integrated catchment management plan



NatureMetrics' Nature Performance Service

NatureMetrics' Nature Performance Service provides continuous nature impact monitoring at scale – enabling ongoing measurement of ecosystems. The service allows businesses to monitor and manage nature risk across their whole portfolio on an easy-to-use digital platform – which translates complex datasets into clear, simple trends and insights.

Metrics that matter

NatureMetrics' subscription-based service allows organisations to make informed, data-driven decisions, enabling them to:

- Map the species in their landscape
- Understand species related risks and opportunities
- View how species composition is changing over time
- Detect endangered and invasive species
- Track community-specific metrics

Measuring nature progress at scale:

eDNA surveys make it possible to examine whole landscapes using that volume of data that might be impossible to collect using conventional methods – which tend to look at single species rather than whole ecosystems and habitats. eDNA samples can also be taken safely in riskier areas using drones.

A full picture:

eDNA survey data can be plotted out over time and mapped to a large area (via a raster layer) to identify hotspots across all stages of the mitigation hierarchy – from planning to closure. The eDNA results can be modelled and calibrated with remotely-sensed data collected at sites to provide a highly detailed and comprehensive biodiversity overview that can be used to inform planning and decision making.

Easy to use and share:

More data shouldn't mean more complexity. Through NatureMetrics' digital platform, organisations can view and manage nature risks in an accessible format at both an operational and site level – helping businesses model, plan and predict.

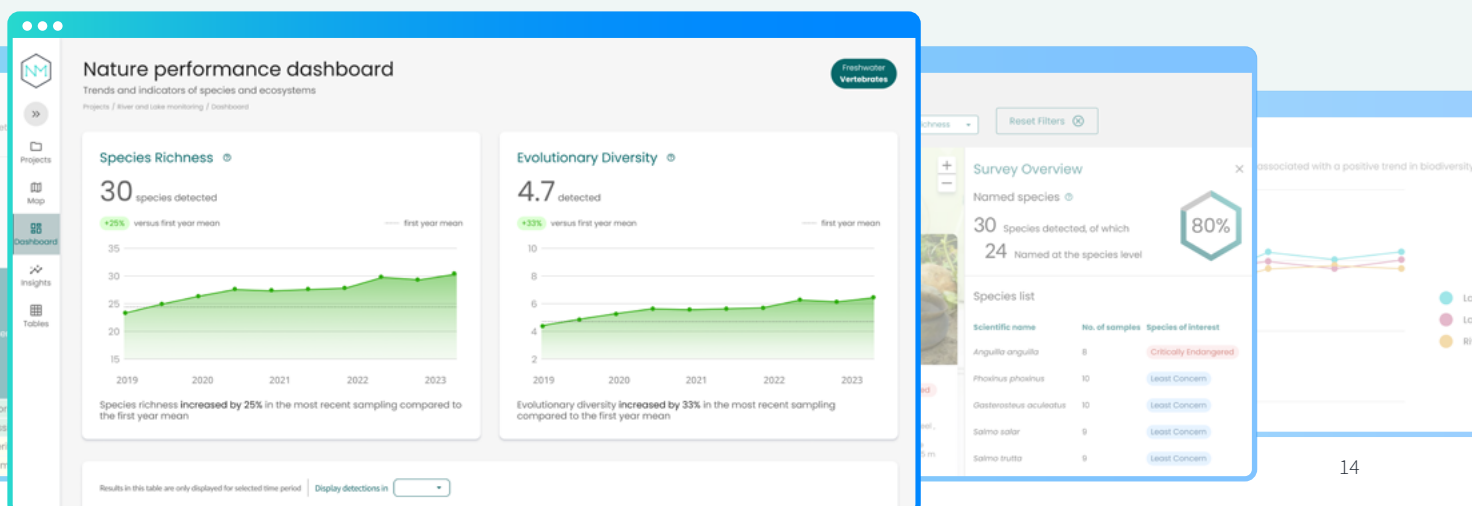
The platform's data is transparent, scalable and standardised – vastly reducing operator bias and human error while providing interoperability across users. Metrics can be aggregated across multiple sites, projects and corporate entities. As a result, businesses can monitor, track and compare performance from the earliest stage of a mining operation across their entire end-to-end supply chain – from pit to port.

The data is also commercially robust and auditable, so it can be easily shared with third parties – such as regulators and financial institutions – to demonstrate positive nature impacts and progress over time.

Charting progress:

Through INPI (Intelligent Net Positive Impact) data service, NatureMetrics can marry eDNA survey results with geospatial data to allow organisations to examine landscapes and understand the efficiency of restoration on the ground over time.

eDNA testing is highly repeatable, making it simple to compare areas at different points in time no matter who has collected the samples. A restoration tracker shows how ecosystems change over time compared to a reference or target site. Machine learning tools and models can be used to track progress against agreed targets – allowing companies to approach offsetting and restoration strategically.





A global application of eDNA: Helping Anglo American to transform biodiversity monitoring

“[eDNA monitoring has] got huge applicability. If we think about early on in the discovery and exploration phase, where our knowledge is limited about the potential biodiversity risk in the area that we might be looking to explore, it’s a critical component to that.”

“When a mine is in full operation, it will become a key part of the ongoing monitoring and evaluation in terms of our biodiversity performance.”

“When we start to get to the point where an operation is coming to closure, it will allow us to make sure the work has been done and we can meet our objective of restoring an environment to better than its pre-mining state.”

Warwick Mostert
Biodiversity Principal at Anglo American

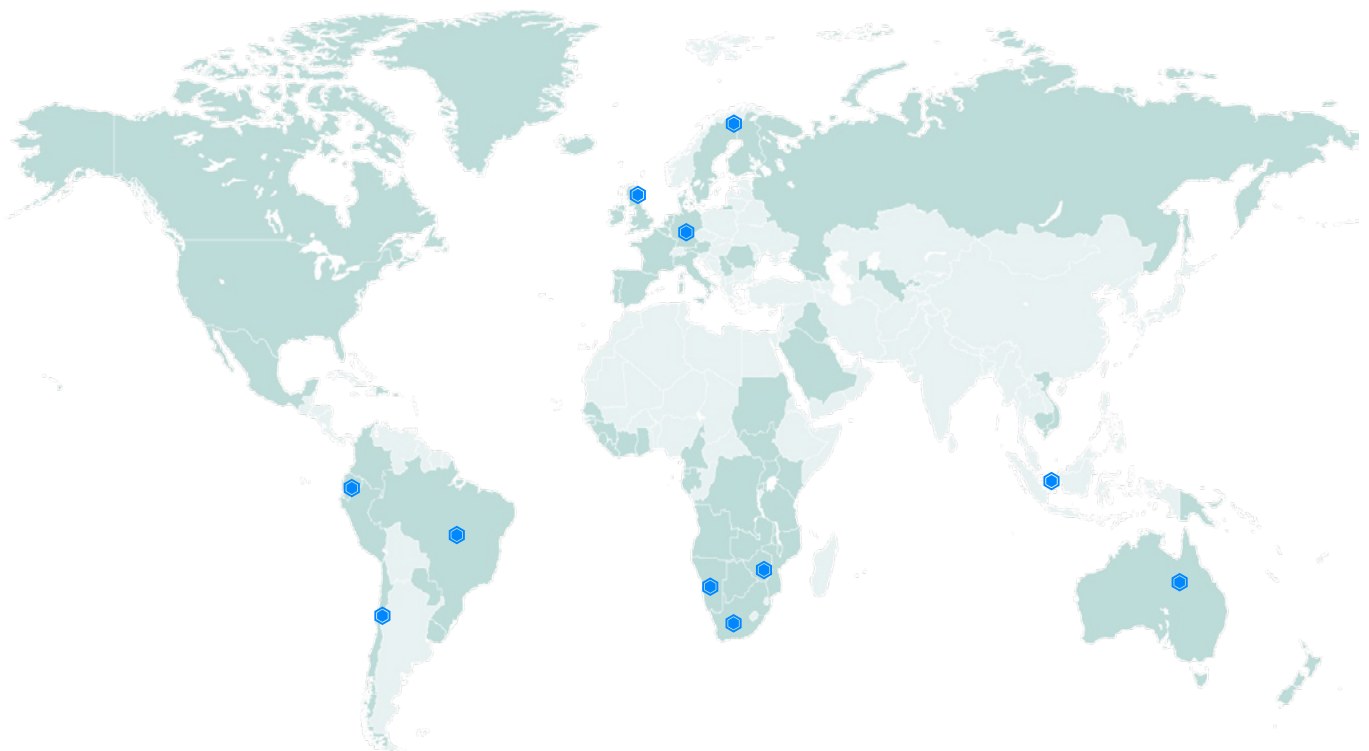
Using eDNA from:

16 projects across business units

11 countries

12 terrestrial and 3 marine ecoregions

2020 to present



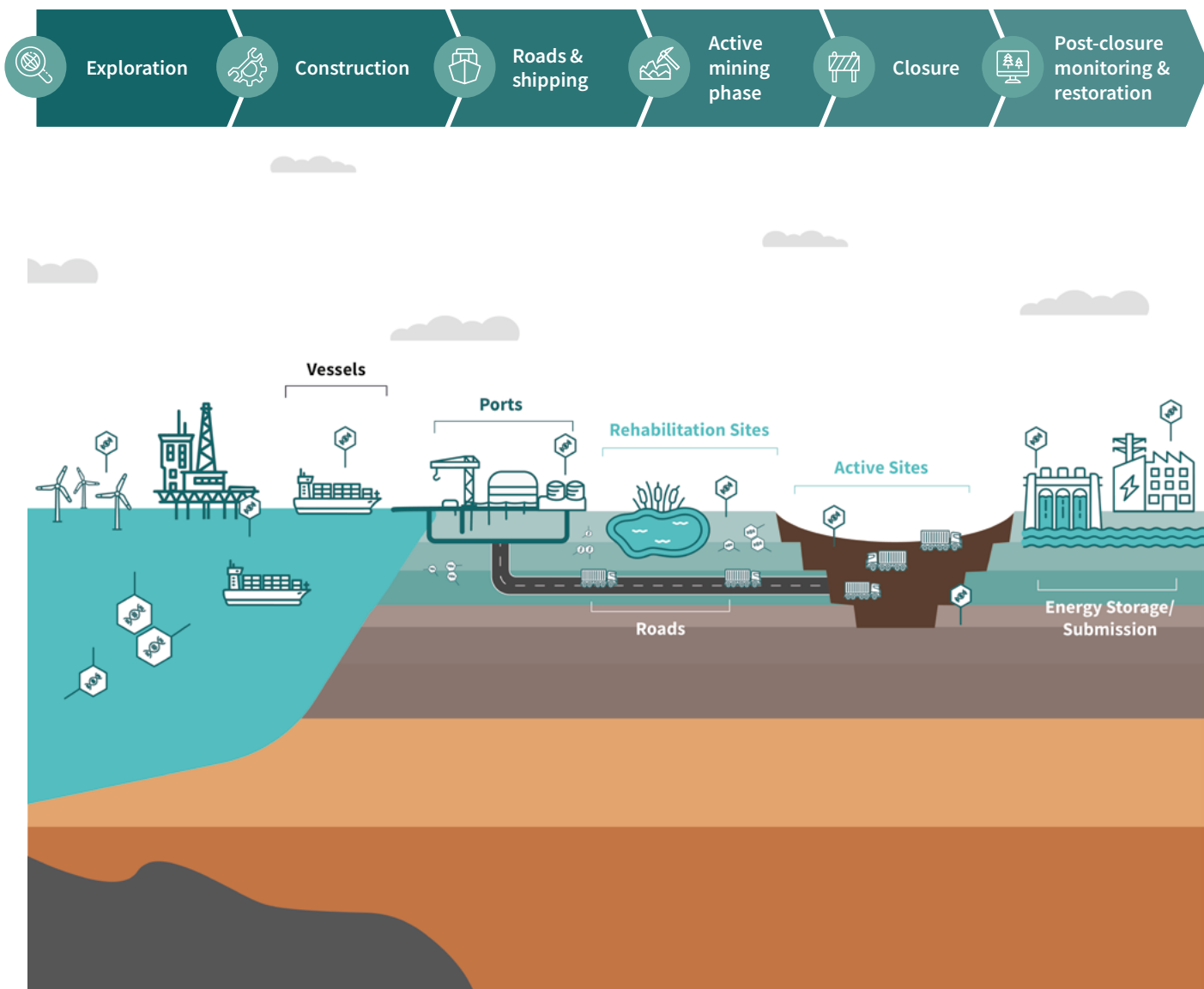
From pit to port

Supporting the mitigation hierarchy across supply and logistics chains.

Businesses are increasingly looking at their operations through the lens of a Science Based Targets Network (SBTN) mitigation hierarchy. Nature performance monitoring and eDNA technology are designed to augment and improve existing processes, so they can easily be integrated into an organisation's mitigation hierarchy to enrich their existing data and practices- without introducing additional complexity.

For extractives companies, nature performance monitoring offers insight and intelligence across the entire lifecycle of assets: from the first steps of exploration to ongoing restoration monitoring. As a result, organisations can identify risks much earlier and put the appropriate steps in place to mitigate them from the outset.

Meanwhile, eDNA technology is designed to be easy to use and repeatable – providing ongoing nature performance data that companies can use to make informed and impactful decisions across the entire supply chain.



DNA from complex biological samples can detect additional taxa

Zooplankton

Using a D-Net, zooplankton samples can be collected and identified using DNA sequencing.

Diatoms

With the correct field sampling techniques employed single celled algae / diatoms can be detected as excellent integrated measures of water quality.

Aquatic macro-invertebrates

From kick or surber sampling DNA extracted from bulk invertebrate samples can yield hundreds of taxa.

Terrestrial and flying insects

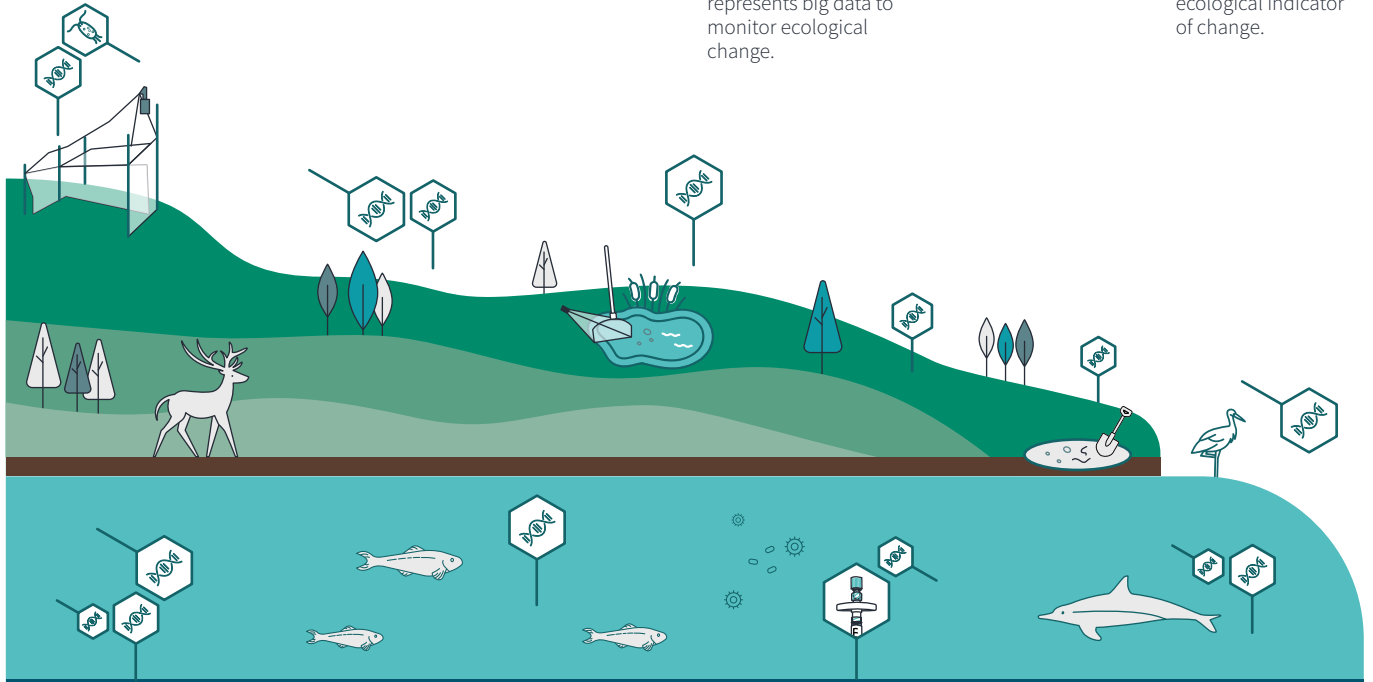
In numerous client studies, we've detected up to seven times more insect diversity than conventional methods. This represents big data to monitor ecological change.

Soil Microbiome

For the first time DNA can uncover the thousands of species present in the soil in Bacteria, Fungi and Metazoan groups.

Aquatic sediments

From marine to riverine environments DNA in sediment samples can uncover the hard to detect meiofauna which can offer a sensitive ecological indicator of change.



Aquatic eDNA can detect numerous taxa

Mammals and Amphibians

eDNA can detect species that visit the water as well as mammals and amphibians from the surrounding terrestrial environment. This can be at least as sensitive as traditional methods such as camera trapping.

Fish

eDNA has been shown to be consistently more sensitive than conventional fish survey methods.

Bacteria

Using a filter with a smaller pore size we can also pick up the aquatic bacteria which can give both specific pathogenic detections as well as big data on community composition changes in response to impact or restoration.

Birds, Bats and Reptiles

Due to their behaviour and characteristics, some species shed less of their DNA in water. This makes harder to detect. However, they can often still be found with the latest eDNA technology and survey design.



Measuring impact across the lifecycle of a mining asset

NatureMetrics has delivered a huge range of projects around the world across the lifecycle of mining assets and in a variety of ecosystems – from desert to tundra.



“Incorporating eDNA mapping into our diamond exploration toolkit allows us to further understand Earth’s present biology and natural systems and plan better ways to find and recover them.”

Luis Chambel
SÍNESE Consultoria
Angola



“We knew that eDNA can deliver big data and this just goes to show what can be done with such a quick, safe and simple sampling approach.”

Warwick Mostert
Principal Biodiversity,
Anglo American
Woodsmith, UK



“Using eDNA to measure biodiversity across nearly 700 Ha of managed land as a critical tool for informing biodiversity programmes that manage biodiversity risks and identify opportunities such as nature-based solutions.”

Namibia



Working towards their Biodiversity Action Plan: The CBG monitoring program, including reptiles, amphibians and aquatic environments (Marine and Terrestrial) uses eDNA to work towards achieving their targets

Guinea



“Incorporating eDNA data collection into our long-term monitoring programs is proving invaluable to quickly reveal changes in the environment, enabling the implementation of adaptive management measures.”

Offshore wind



O&G

Senegal and Mauritania



Hydropower

Papua New Guinea and Vietnam



Global application of eDNA

- 16** projects across business units
- 11** countries
- 12** terrestrial and 3 marine ecoregions
- 2020** to present

Various locations



“eDNA produced an extraordinary amount of data and confirmed the presence of 108 species. Ongoing eDNA sampling will inform how projects should be undertaken in the future and influence the implementation of the most appropriate and sustainable land uses, post-closure.”

Isibonelo, South Africa



“e-DNA is offering the opportunity to improve the quality and efficiency of biodiversity monitoring at QMM, in turn reducing safety risk associated with traditional biophysical sampling methods.”

Faly Randriatafika
Principal Advisor Biodiversity and Climate change

Madagascar



“While traditional ecology surveys have mainly been used in the past, they often capture insufficient data. In contrast, eDNA metabarcoding has facilitated a much better understanding, especially in the case of large deep rivers, allowing for a more comprehensive grasp of the impacts on ecological communities. As a result, appropriate mitigation measures can be implemented.”

Papua New Guinea and Vietnam

Using eDNA for regulatory reporting

A contribution by International Council on Mining & Metals (ICMM)

“To enable a world in which nature is more abundant, diverse and resilient than what we have today, we need to make different decisions from those we made yesterday. Good quality data that allows us to understand both the state of nature and what is driving its loss will be foundational for this. As will be open access to data, trust in that data and equitable, inclusive governance around how it is used to make decisions for tomorrow.

“Mining companies can play a huge role in contributing biodiversity and environmental monitoring data in areas where such data has typically been scarce. In 2021, Anglo American became the first mining company to make a commitment to share its eDNA data in the eBioAtlas – a global atlas of the state of life in rivers and wetlands around the world.

“Vale has also developed an extensive library of genetic references for more than 13,000 plants and animals within the Carajás region of Brazil. In 2023 the Vale Institute of Technology took their genetic sequencing work even further, developing a partnership with the Chico Mendes Institute to enhance management and conservation actions for endangered species in the Brazilian Amazon.

“Technologies like eDNA can also be used to unlock new pathways in democratising the collection of and access

to data, for example by enabling local communities to collect and contribute to sampling and monitoring through citizen science test kits. In South Africa, Anglo American has been running pilots to roll out participatory monitoring using eDNA techniques with local communities.

“More radical participation, transparency, openness and access to data is required to shift us towards a nature positive future. This should be at the core of both developing and implementing any corporate nature positive strategy. Good quality, real-time data can also be a powerful tool to unlock the conversations we need to have as businesses, communities and societies on how we conserve, restore and regenerate the ecosystems we rely on.

“eDNA sampling is non-invasive, easy to execute and highly sensitive, yielding rapid results for species presence / absence and ecosystem function. When you combine this cutting-edge technology with traditional knowledge, field studies, satellite data, and a growing commitment from the corporate sector to enhance nature-related data, a whole new world of opportunities opens up. Now is the time for organisations and governments to get behind these opportunities and help create a nature positive future.”



About ICMM

ICMM stands for mining with principles. It brings together a third of the global metals and mining industry, along with key partners, to drive leadership, action and innovation for sustainable development, ultimately delivering a positive contribution to society. Through collaboration, ICMM member companies set the standard for responsibly produced minerals and metals in a safe, just and sustainable world.



How eDNA technology allows SÍNESE to better understand nature impact

SÍNESE have used eDNA surveys on several projects – including mapping a cross-section of biodiversity in Lunda Norte (NE Angola) – and across multiple different mining and exploration stages.

These include alluvial and kimberlite projects, as well as work in greenfield and brownfield sites. eDNA allowed the organisation to collect data that covers several river basins that are hundreds of kilometres apart.

SÍNESE Consultoria have integrated eDNA with other technologies and data layers – including photos and videos, image composites of drone surveys, DTM models and geological maps – to drive innovation and improve nature conservation impacts.

Using eDNA to plan and assess

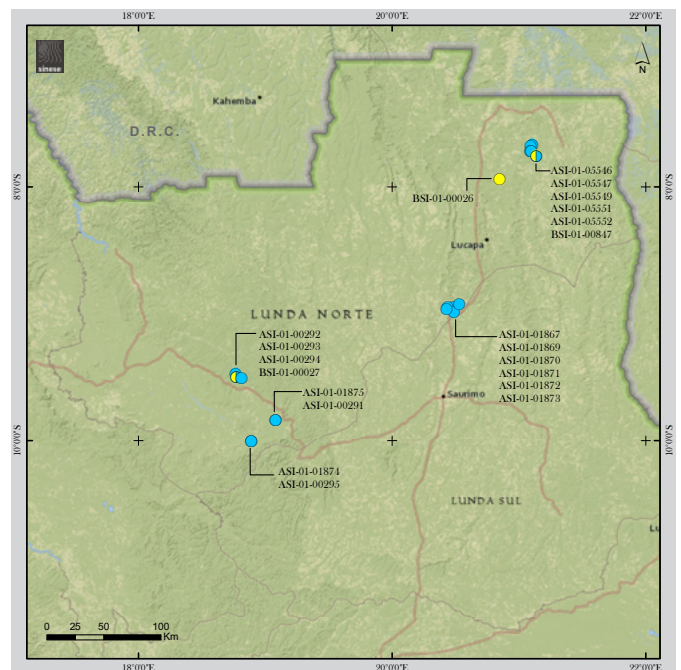
“Starting at the greenfield stage, eDNA has been a key tool in understanding the natural and social systems – allowing us, our clients and partners to plan a sustainable use of mineral and other economic resources such as renewable energy sources, freshwater, fish, arable soil, local production.”

“eDNA allows us to delineate and characterise biodiversity hotspots and the complex mesh of biological relationships, assess a region’s natural capital, and engineer better protection and recovery methodologies for impacted areas and ecosystems.”

Bringing knowledge up from the earth

“Diamonds are billions-of-year-old time capsules buried deep within the earth. By studying diamonds – as well as the rocks and minerals that accompany them – we can obtain precious knowledge about Earth’s old telluric, atmospheric and ocean environments.

“Incorporating eDNA mapping into our diamond exploration toolkit allows us to further understand Earth’s present biology and natural systems and plan better ways to find and recover them.”





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Achieving business objectives with eDNA

ERM considers eDNA sampling in marine diversity survey projects, particularly in Environmental Impact Assessments, to be of great importance.

“The coupling of this innovative technique with traditional sampling methods has provided us with an invaluable tool to document the full biological richness of marine ecosystems, enabling us to help our clients achieve their business objectives while also enhancing the scientific knowledge of marine ecosystems with an aim of improved management and protection.”

“By simply collecting and analyzing water samples for eDNA, we have discovered a wealth of biological information that would otherwise be logistically difficult, costly, and time consuming to obtain. These data have provided us with deeper insights into species interactions and dynamics within the water column and the overall health of the marine ecosystem, as well as the documentation of endangered species’ presence in areas where they were previously undocumented.”

Early detection of environmental impacts:

“Incorporating eDNA data collection into our long-term monitoring programs is proving invaluable to quickly reveal changes in the environment, enabling early detection of environmental impacts and the implementation of adaptive management measures.”

Invasive species detection:

“The sensitivity and high resolution of this technique enables us to detect the presence of invasive species at an early stage, facilitating the adoption of control and eradication measures before they cause significant harm to local biodiversity.”





Making progress towards nature targets

Compagnie des Bauxites de Guinée (CBG) is a Guinean company in the mining sector. Since 1963, it has been valorizing bauxite deposit of Sangarédi, in the Boké region, in Guinea.

In line with IFC's Performance Standard 6 (PS6), CBG committed to achieving the "No Net Loss" (NNL) target for natural habitats and a net gain (NG) target for the qualified biodiversity of critical habitats by 2040. This approach requires a hierarchical application of mitigation measures, including compensation for impacts, if necessary. The Biodiversity Action Plan (BAP), reviewed, approved and disclosed in 2021, sets out the strategy for achieving these targets. As part of this strategy, the biodiversity monitoring program has been developed and deployed to be fully compatible with PS6.

eDNA & CBG

Since 2020, the CBG monitoring program, including reptiles, amphibians and aquatic environments (Marine and Terrestrial) uses the eDNA technique in collaboration with NatureMetrics.

CBG has adopted the participatory and integrated monitoring method at three levels:

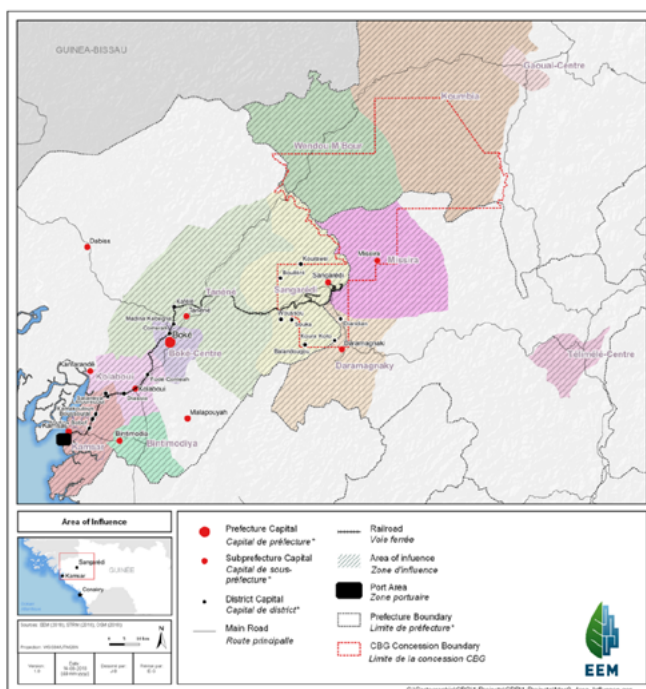
- Local Community participation at the level of the landscape
- On-site inventories by national scientists such as CEMED and SAMEC
- And monitoring by technology and international specialists including eDNA

"The benefits of having used eDNA are, and not limited to, the ability for us to:

- capture the presence of PS 6 target species with high certainty
- continue to perform quick monitoring during non-expected events such as during the COVID pandemic
- develop extensive landscape and cumulative impact management with neighboring mining companies"

Johny Rabenantoandro

Head of Biodiversity, Compagnie des Bauxites de Guinée (CBG)



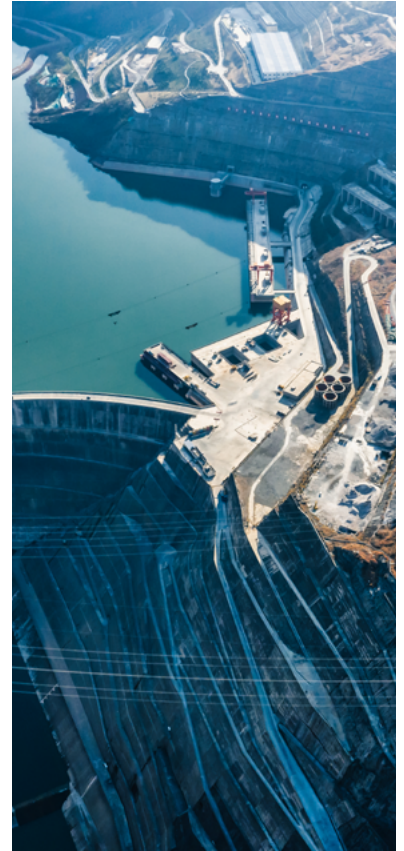
Map: TBC (2021), Biodiversity Action Plan for the operations of Compagnie des Bauxites de Guinée (CBG), Guinea, Version 2 – March 2021, The Biodiversity Consultancy Ltd. Cambridge, UK.



Stronger data for measuring hydropower impacts

Deploying eDNA metabarcoding techniques across South East Asia and the Pacific Region has provided SMEC with fascinating insights into complex aquatic ecosystems across the region.

The development of large-scale infrastructure projects, such as hydropower schemes, requires a deeper understanding of their potential impacts. While traditional ecology surveys have mainly been used in the past, they often capture insufficient data. In contrast, eDNA metabarcoding has facilitated a much better understanding, especially in the case of large deep rivers, allowing for a more comprehensive grasp of the impacts on ecological communities. As a result, appropriate mitigation measures can be implemented.



RioTinto



Improving quality and efficiency

“With NatureMetrics, Rio Tinto have utilised e-DNA techniques at the QMM site to study changes in the biodiversity of soil and water pre and post rehabilitation and impact, respectively.

Studies are still underway, however e-DNA is offering the opportunity to improve the quality and efficiency of biodiversity monitoring at QMM, in turn reducing safety risk associated with traditional biophysical sampling methods.”

Faly Randriatafika

Principal Advisor Biodiversity and Climate change



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eDNA at Isibonelo

Thungela partnered with NatureMetrics to trial the use of environmental DNA (eDNA) metabarcoding at Isibonelo to detect the presence of species in four local river systems and at two of the mine's four wetland offset projects.

eDNA provides a rapid, cost-effective way of determining the distribution and abundance of species by filtering out DNA from water, sediment or air samples. Sources include faeces, mucous, reproductive cells, skin and hair.

Just seven samples, taken in just one sampling exercise focusing on upstream catchments and the mine's wetland offset project, produced an extraordinary amount of data and confirmed the presence of 108 species. These include large-mouthed frogs, mosquitofish, bent-winged bats, ostrich, as well as *Cyprinus carpio* and African clawless otters. These are species listed as 'vulnerable' and 'near-threatened' on the International Union for Conservation of Nature's Red List.

Mine ecologists were also able to confirm that the speed at which water passes through a system has a direct bearing on biodiversity and that slower-flowing waters are more suitable for re-establishing sensitive ecosystems.

Ongoing eDNA sampling will be used to gauge the return of biodiversity as its wetland interventions mature. It will also inform how such projects should be undertaken in the future and influence the implementation of the most appropriate and sustainable land uses, post-closure.



Original source: Thungela ESG report 2022 "Impact with purpose"

Conclusion

We're entering a new era where biodiversity will require tangible commitment, not just good intentions.

As we've seen with net-zero governance, businesses need to up their game when it comes to understanding and reporting on nature. And as biodiversity regulations and legislation become more rigorous, the pace of change will become increasingly urgent.

While the mining and extractive industries have traditionally been ahead of the curve in monitoring and measuring biodiversity, the need to demonstrate active nature positive management and impact through auditable, transparent and up-to-date data will require a radical shift in approach.

Until recently, accessing this kind of intelligence would have been all but impossible, not to mention prohibitively expensive. Conventional techniques can't provide the right lens to even frame the problem, never-mind plot a path to a sustainable, nature positive solution.

However, new tools such as nature performance monitoring, eDNA surveys and earth observation are allowing organisations to examine landscapes at a scale and level of detail that enables them to better mitigate nature risk, contribute to a sustainable economy, and make a long-term impact on their landscapes.

Many businesses are making significant progress already by integrating nature intelligence into their operational practices and organisational goals. Others will need to act quickly to build out the insights and metrics they need to future-proof their operations.

The transition to a sustainable energy future must be managed in tandem with safeguarding or improving biodiversity. We must prepare, collaborate and build our understanding to achieve better outcomes for nature and businesses. By combining investment in new technology with the right approach, data and metrics, companies have a real opportunity to benefit from taking a nature positive approach.



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About NatureMetrics

NatureMetrics is a world leader in delivering nature data and intelligence. We use cutting-edge technology to generate biodiversity data at scale using environmental DNA.

We make biodiversity measurable and support business to transition to a nature positive economy by providing the data with which to drive good decisions for business and nature. Our mission is to transform the scale, comprehensiveness and accessibility of biodiversity data around the world, creating a comprehensive database of life on Earth which will help us identify how best to protect it.

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