



proteus

Status and trends in data sources and digital technologies to support action on nature and climate

Boi Tshwene-Mauchaza, Programme Officer, UNEP-WCMC

Vere Ross-Gillespie, Sector Head – Extractives, NatureMetrics

27TH JUNE 2023

WELCOME

Objectives of the Proteus Data Forum sessions

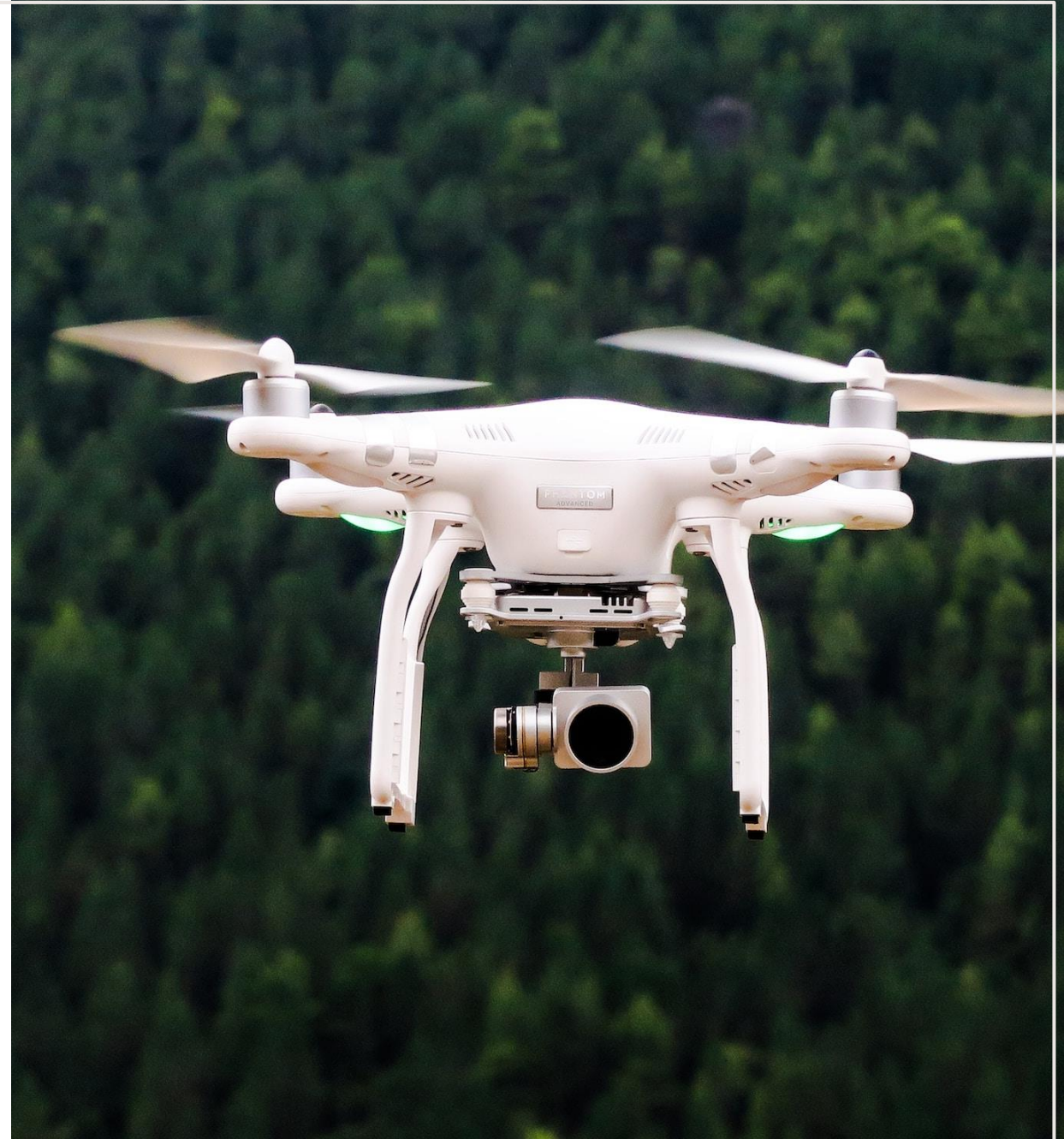
- A venue for direct communication between data users and technical experts
- Increase familiarity with Proteus resources
- Peer-to-peer learning between Proteus Partner companies
- Identifying common challenges & finding solutions

Logistics

- *Frequency* quarterly
- *Rules* Chatham House discussion, but presentations recorded

OVERVIEW

- Setting the scene: Status and trends in technologies
- Use case: Demonstration of new technologies and potential uses for business by Nature Metrics
- Q&A, Discussion:
 - How is your company using these technologies?
 - What are the key barriers to increasing tech uptake?
 - How can these barriers be overcome?



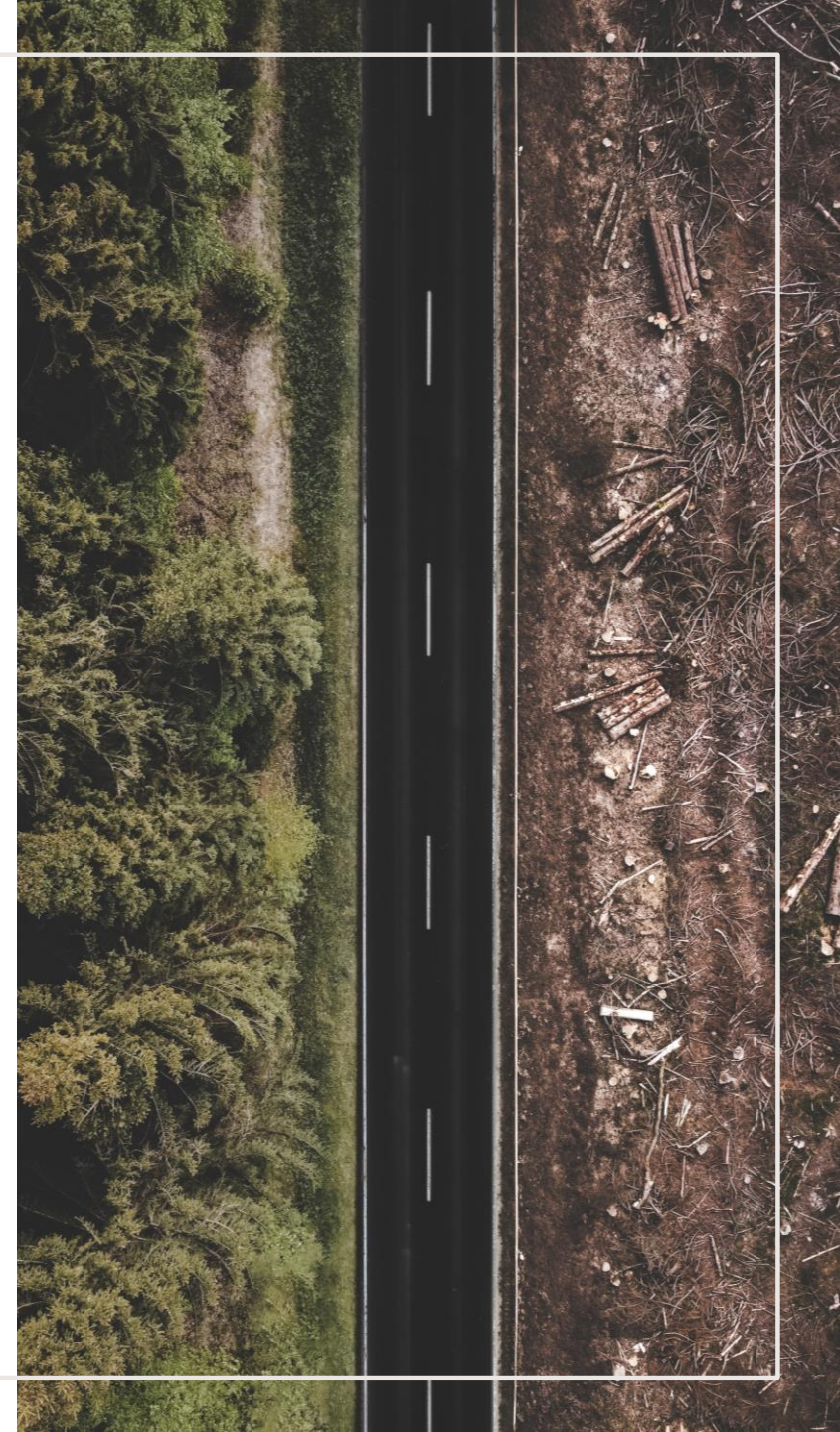


Setting the scene

Boi Tshwene-Mauchaza, Programme Officer, UNEP-WCMC

KUNMING-MONTREAL BIODIVERSITY PACKAGE

- Kunming-Montreal biodiversity package includes:
 - Global Biodiversity Framework
 - Monitoring framework for the Kunming-Montreal global biodiversity framework
 - Mechanisms for planning, monitoring, reporting & review
 - Resource mobilisation
- 2030 mission: To take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and planet
- All of the Global Biodiversity Framework goals and targets are relevant to business



THE 'DATA VALUE CHAIN' FROM DATA COLLECTION TO SHARING



1. Gathering data with remote sensing



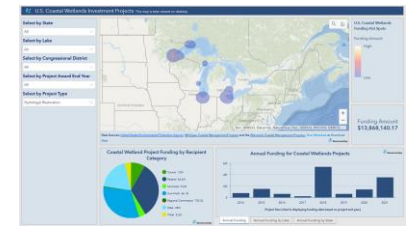
2. Gathering data on-the-ground



3. Processing and analysing data



4. Data visualisation and sharing



Pictures are examples of specific steps.

Step

1 Remote sensing

Key developments

- a **Satellite remote sensing:** increasing spatial, temporal, and spectral resolution of satellites support refinement of existing impacts, and opportunities for measuring new impacts.



Step

2

Gathering data on-the-ground



Key developments

a

Terrestrial (sensor) data: networks of sensors can contribute to more automated and standardised monitoring of species and habitats, although traditional observer-based methods will still be needed.

b

eDNA/genomics: the use of eDNA makes biodiversity surveys and nature mapping cheaper, easier, and more comprehensive although not all species can be mapped using eDNA.*

c

Citizen science: the impact of citizen science could massively increase due to the use of mobile applications and increased public interest, although data inconsistencies and bias will always remain.

*Environmental DNA (eDNA) is not a 'silver bullet'. eDNA can only be used to identify species after genotyping technologies have already identified the 'barcodes' of these species.



Step

Key developments



- a **Data processing:** less time and effort is needed for data filtering, processing and storing (i.e. due to increased processing power, cloud storage); and aggregation and integration of nature and climate datasets is becoming easier
- b **Integration of nature/ climate data with supply chain data:** integrating asset and supply chain data (collected using both remote sensing and observational data) is technically feasible and could have great impacts on reporting and accounting
- c **Data analysis:** applications and importance of Artificial Intelligence for processing and analysing nature & climate data are increasing, as the amount of 'raw data' is expected to increase.



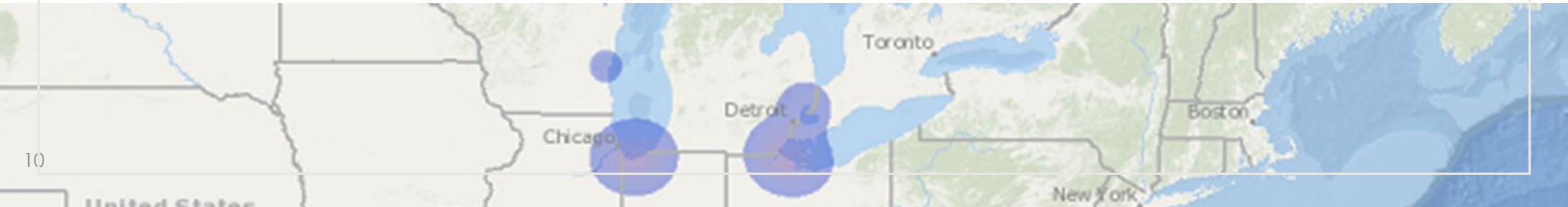
Step

4 Data visualisation



Key developments

Data visualisation and sharing: private parties are accelerating a shift from directly selling unprocessed data, to selling analysed information, which can be used by everyone (less expertise is needed) and anywhere (accessible via a laptop with internet).



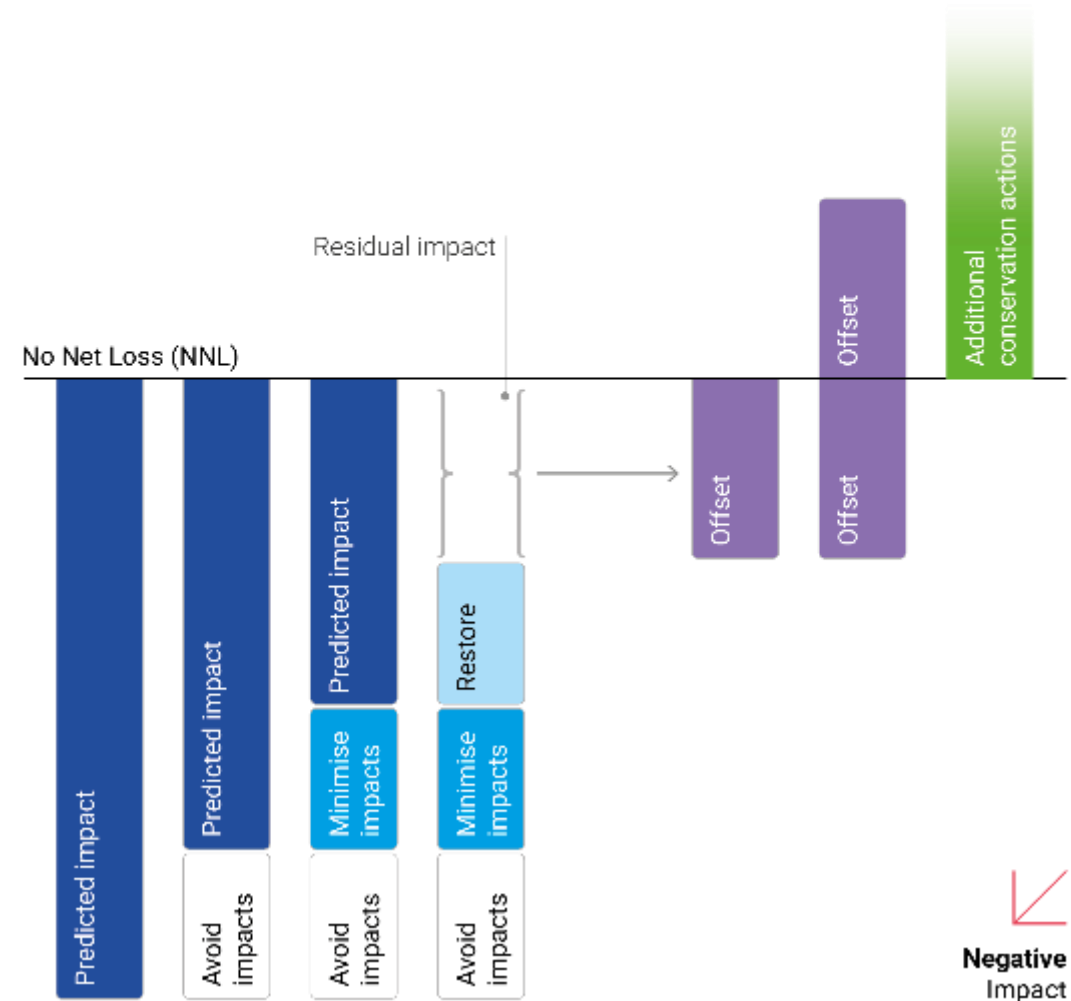
LINKS WITH THE MITIGATION HIERARCHY...



Net Gain (NG)

Sequential steps to minimise negative impacts on biodiversity:

1. Avoidance
2. Minimisation
3. Restoration
4. Offsetting



Negative Impact



Case study

Vere Ross-Gillespie, Sector Head – Extractives, NatureMetrics



DNA-based biodiversity monitoring with NatureMetrics

**PROTEUS DATA FORUM - STATUS AND
TRENDS IN DATA SOURCES AND DIGITAL
TECHNOLOGIES TO SUPPORT ACTION
ON NATURE AND CLIMATE**

Dr Vere Ross-Gillespie: Head of Extractives & Onshore Industries

@NatureMetrics



CONTEXT

@NatureMetrics



INCREASING COMMITMENT TO BIODIVERSITY

ative fish eDNA project launched at offshore wind farm

ashed: 10th March 2022



New IUCN-Anglo American collaboration aims to deliver collective net positive impacts for biodiversity and tackle climate mitigation through nature-based solutions

Thu, 11 Feb 2021
 Gland, Switzerland – A new three-year collaboration agreement between IUCN and the mining company Anglo American will explore how nature-based solutions can help deliver positive biodiversity outcomes and support carbon neutral goals, while delivering additional benefits for wider stakeholders.

Leading renewable energy consultancy and service provider, **Natural Power**, along with project partners, **EDF** and nature specialist, **NatureMetrics**, has kicked off a ground-breaking research project to validate offshore fish eDNA methods – the first of its kind to trial the use of eDNA to improve survey methods for offshore wind farm environments.

"There is significant evidence for eDNA providing robust data on fish diversity in nearshore, and to our knowledge, there has been no work investigating eDNA methods for offshore wind farms. We believe this research has huge potential benefits and will lead to more robust data, potentially replacing more destructive methods."

IUCN
Net Positive Impact on biodiversity
 The business case

Aim 16: enhancing biodiversity

Our aim 16 is making a positive impact through our actions to restore, maintain and enhance biodiversity where we work.

We will do this by putting our biodiversity position into bp projects in scope, we expect that from 2022 all new actions to restore, maintain and enhance biodiversity will achieve net positive impact (NPI), with a target to deliver 90% of actions within five years of project approval. We also aim to enhance biodiversity at our major operating sites and support biodiversity restoration and sustainable use of natural resource projects in the countries where we have current or growing investments.

We will also continue to work with others, including our joint ventures, to influence and promote collective action on biodiversity.

Major operating sites in or close to international protected areas*

Inside the boundary	4 sites
Adjacent (within 1km)	4 sites
Near (1-5km)	9 sites
Close (5-20km)	11 sites

* A major operation may exist within or close to more than one type of protected area.



Unearthing investor action on biodiversity

INVESTING IN NATURE: FINANCING CONSERVATION AND NATURE-BASED SOLUTIONS

A PRACTICAL GUIDE FOR EUROPE
 Including how to access support from the European Investment Bank's dedicated Natural Capital Financing Facility

Measuring business impacts on nature

A framework to a better observation biodiversity in global supply chains

The Little Book of Investing in Nature

A simple guide to financing life on Earth

FINANCING NATURE: Closing the Global Biodiversity Financing Gap

Full Report

Finance for Biodiversity Pledge

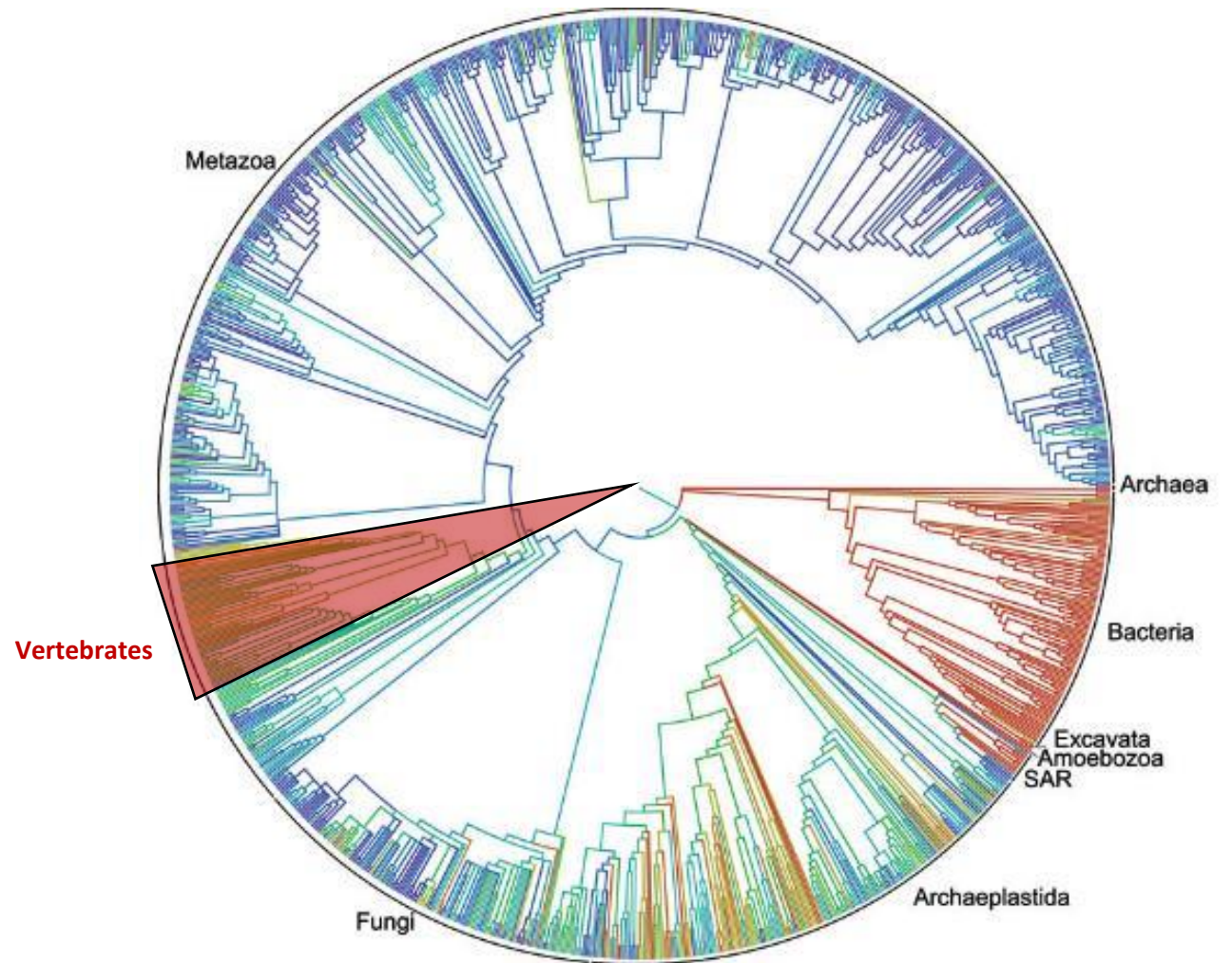
36 signatories 3.1m EURO	33 signatories 4.8 m EURO	33 signatories 9.1m EURO	75 signatories 12.1m EURO
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Business and finance are waking up to the need to **account for nature**

BUT BIODIVERSITY HAS A MEASUREMENT PROBLEM

Biodiversity is complex and we typically only scratch the surface with current monitoring

Meaningful metrics must simplify complexity.....not by-pass it altogether



BEING HELD BACK BY THE COMPLEXITIES OF NATURE

Challenges with conventional Biodiversity Monitoring



Data is expensive and time consuming to obtain. Conventional methods rely on **identification by sight** which can be time consuming and costly.



Biodiversity monitoring usually requires **large expert teams** in the field which is expensive, has **HSE concerns** and can be **weather dependent**.

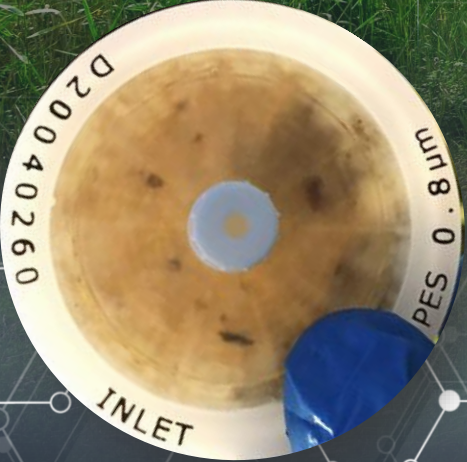


Cryptic or elusive taxa can be hard to detect.

Biodiversity data and **monitoring datasets are often incomplete**

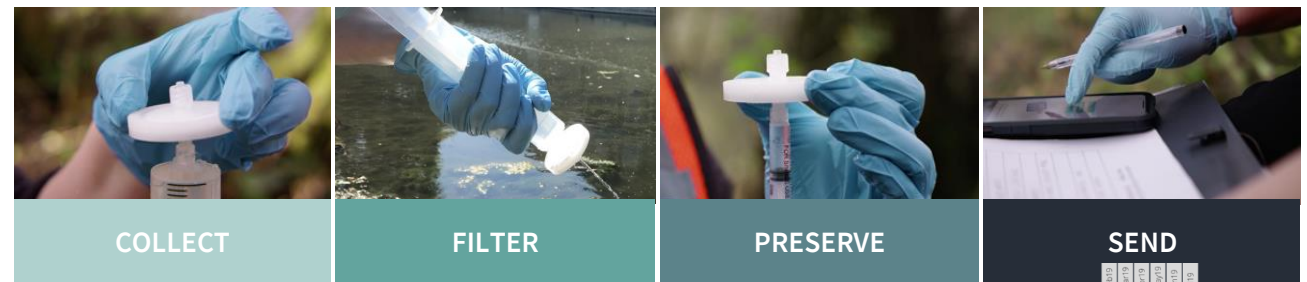
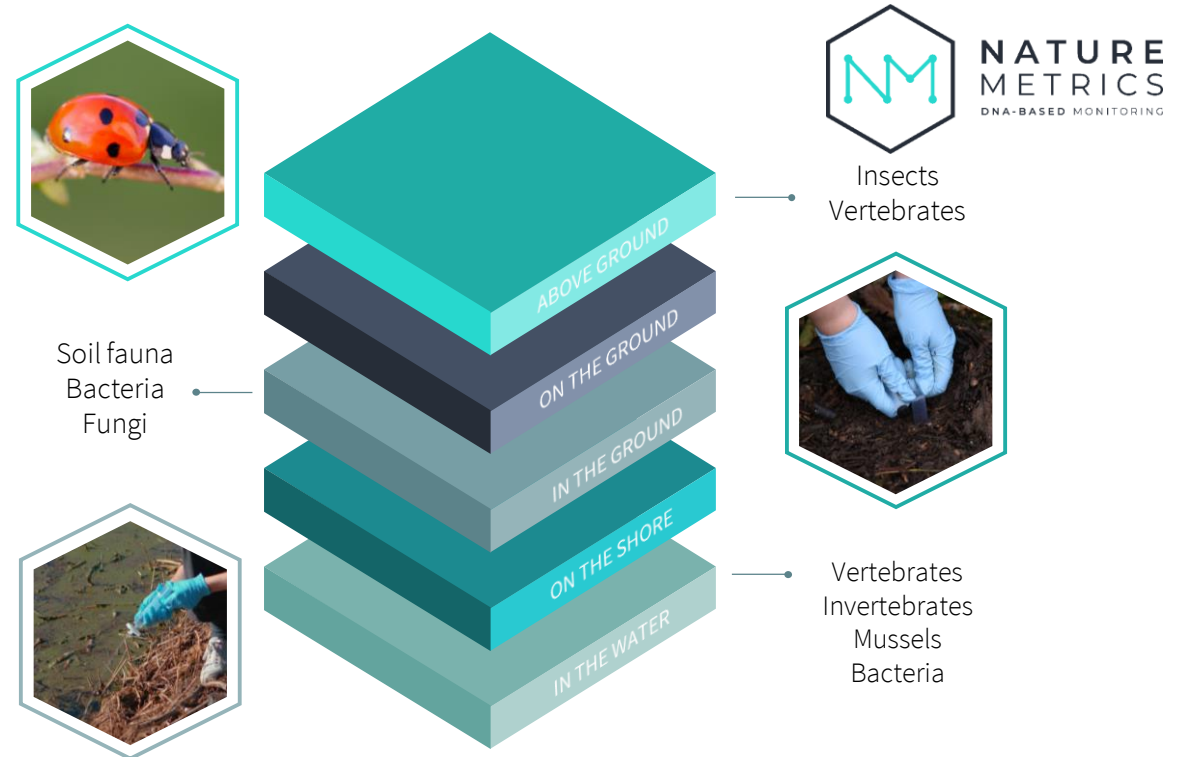
A solution is Environmental DNA (eDNA)

These are the traces of DNA that organisms leave behind in the environment



ENVIRONMENTAL DNA (eDNA)

- Animals shed cells containing DNA as they move (skin, mucous, faeces, urine) through environments
- Cells with DNA enters water courses
- This is environmental DNA (eDNA)
- eDNA in the water remains detectable for hours to few days
- The eDNA can be captured & used to survey species.



SO WHY eDNA?

- Accurate, repeatable, efficient sampling
- Generate BIG data from a range of taxa
- Build baselines/reference libraries esp. in remote & inaccessible areas
- Build barcoding datasets, augment & share data across global platforms for transparency
- Reduced HSE risks and early risk identification
- Detect cryptic/elusive/species of conservation concern
- Support commitment to NPI & delivering positive biodiversity outcomes
- Assess management interventions (e.g. habitat restoration), through the mitigation hierarchy



WHO WE ARE & WHERE WE OPERATE



AECOM



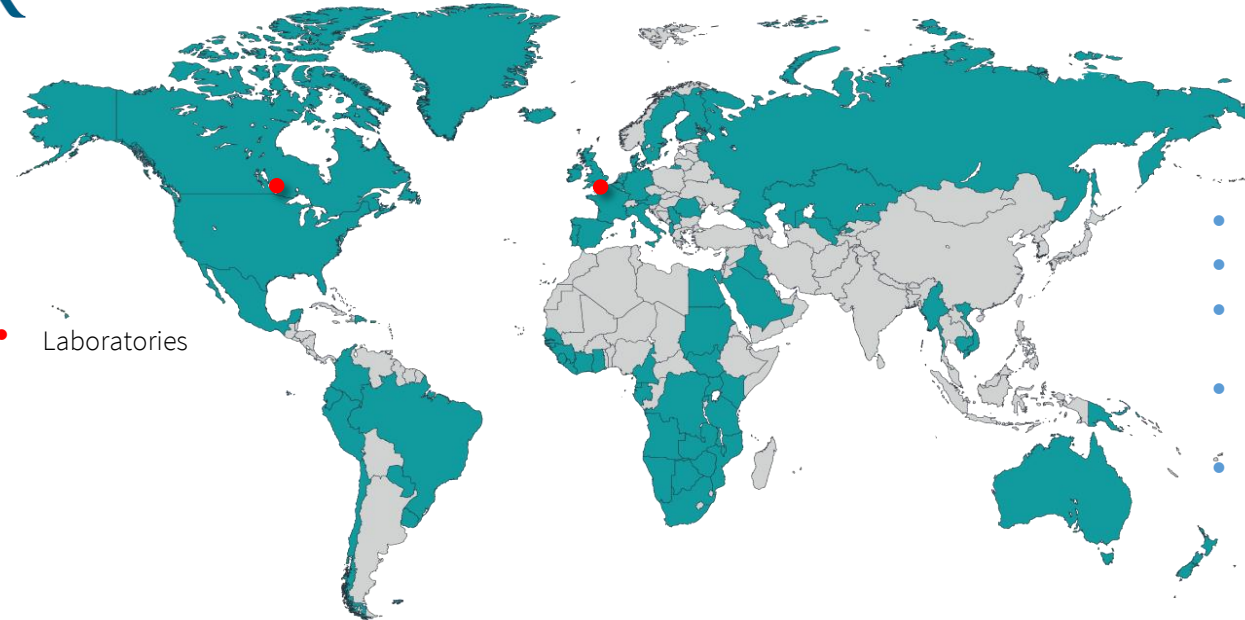
Jacobs



BARRICK



THE
BIODIVERSITY
CONSULTANCY



• Laboratories

- Conservation
- Research
- Impact assessment
- Statutory monitoring
- Planning



Marine Infrastructure Extractives Conservation Water / Utilities Research Agriculture Renewable Energy

~130 employees

1000+ client/projects

100+ countries

WHY IS eDNA TRANSFORMATIONAL?



Sensitivity

Mitigate
Risk

Efficiency



Scalability



Unique
Habitats

R&D

Contribute
to
Outreach



NPI MONITORING & GLOBAL PORTFOLIOS

@NatureMetrics



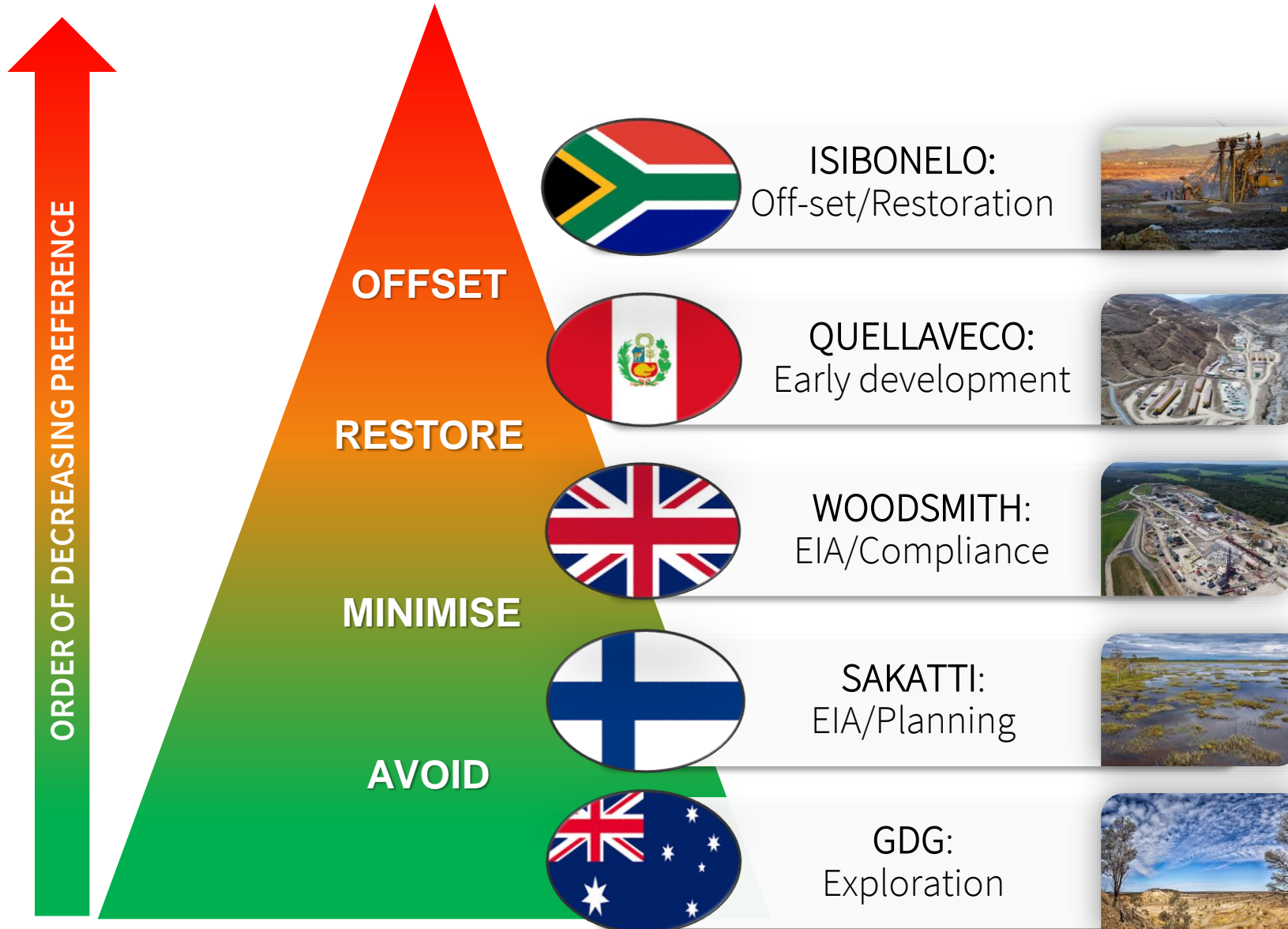
eDNA INFORMS THE MITIGATION HIERARCHY



AngloAmerican



NATURE METRICS
DNA-BASED MONITORING



COMPLETED

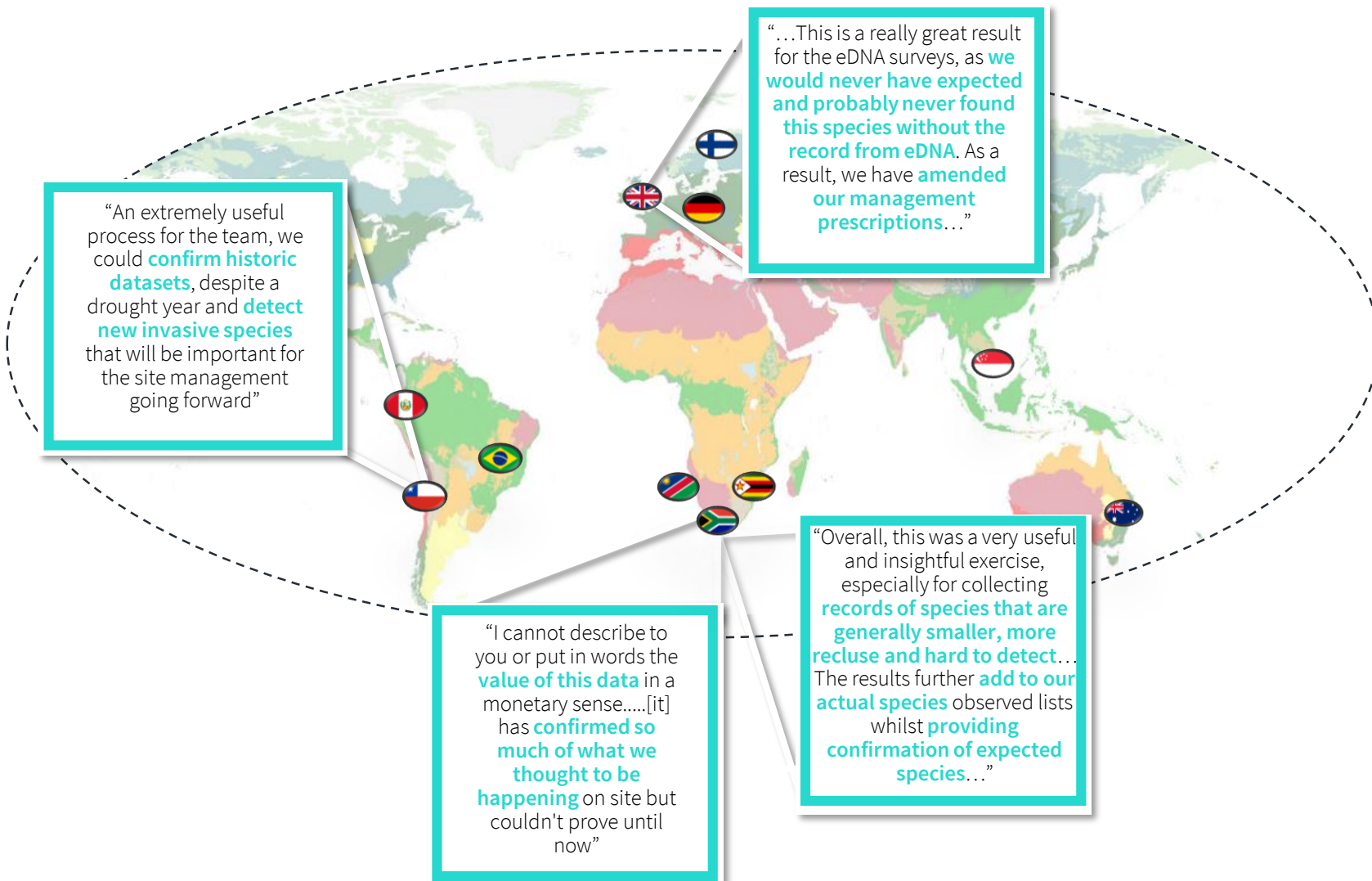


- Early surveying to **develop baseline** for the project
- **Monitoring** to track changes in the nature and the extent of the impacts on biodiversity
- Prior to intervention **planning for restoration and offset**, measure biodiversity and then track changes to monitor progress in species and habitat recovery.

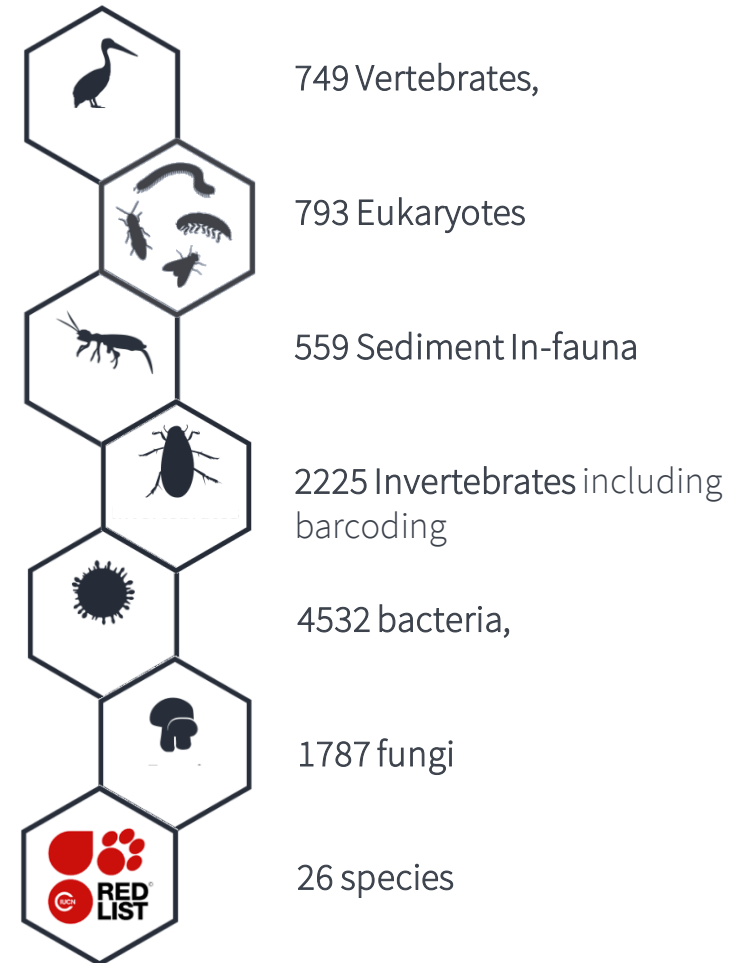
eDNA MONITORING ACROSS A PORTFOLIO



Over 1600 samples collected in 1st season sampling – Global BU’s Anglo American
15 sites globally, terrestrial & marine including site-based training & citizen science



Species Detected



SAMPLING EFFICIENCY

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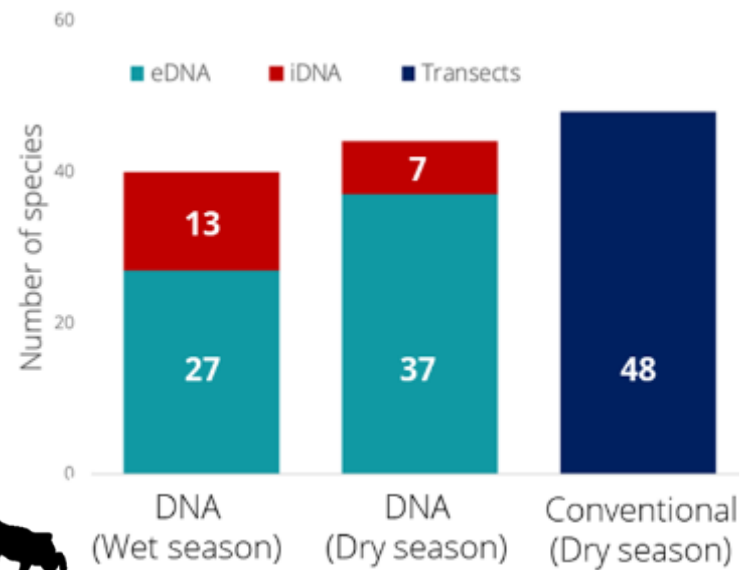
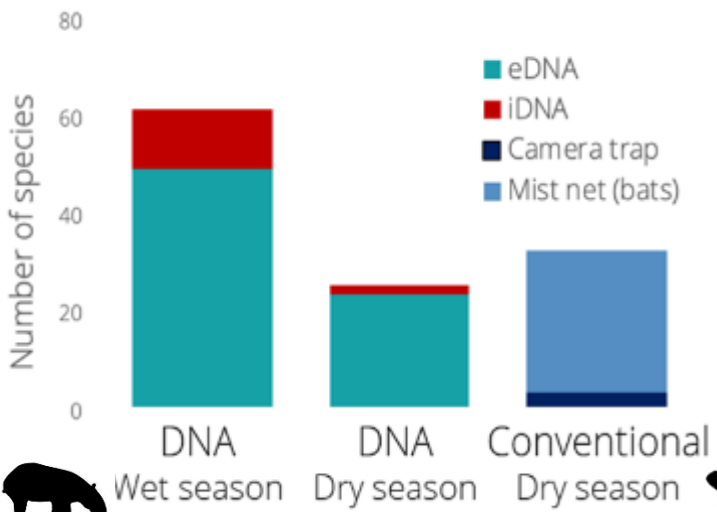
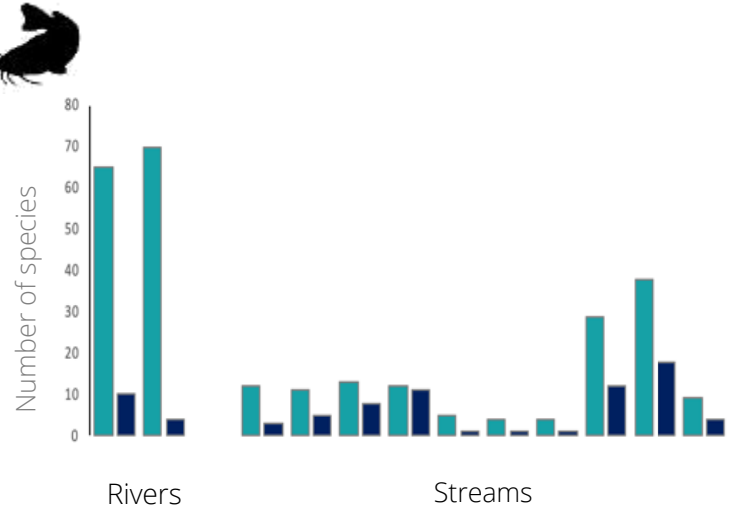
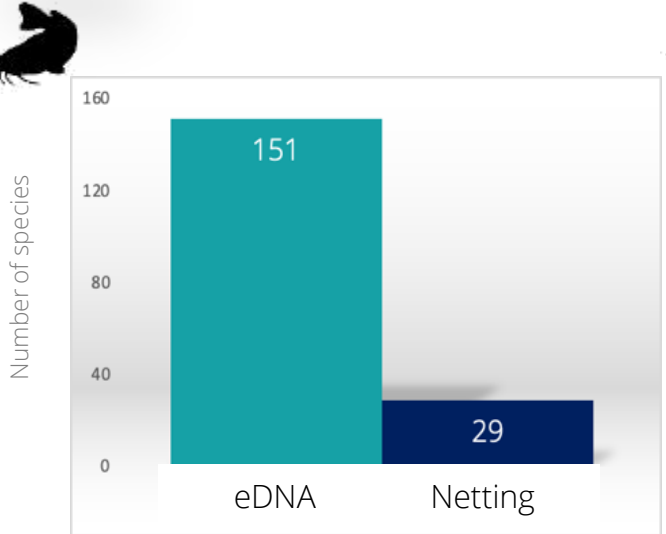




COMPARISON OF METHODS

COMPLETED

METHOD COMPARISON DURING EIA - PERU



At 2 river sites and 10 stream sites, the client compared aquatic eDNA with the netting process

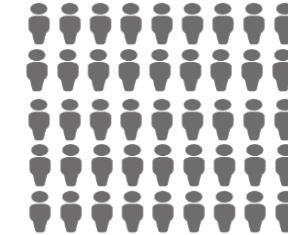
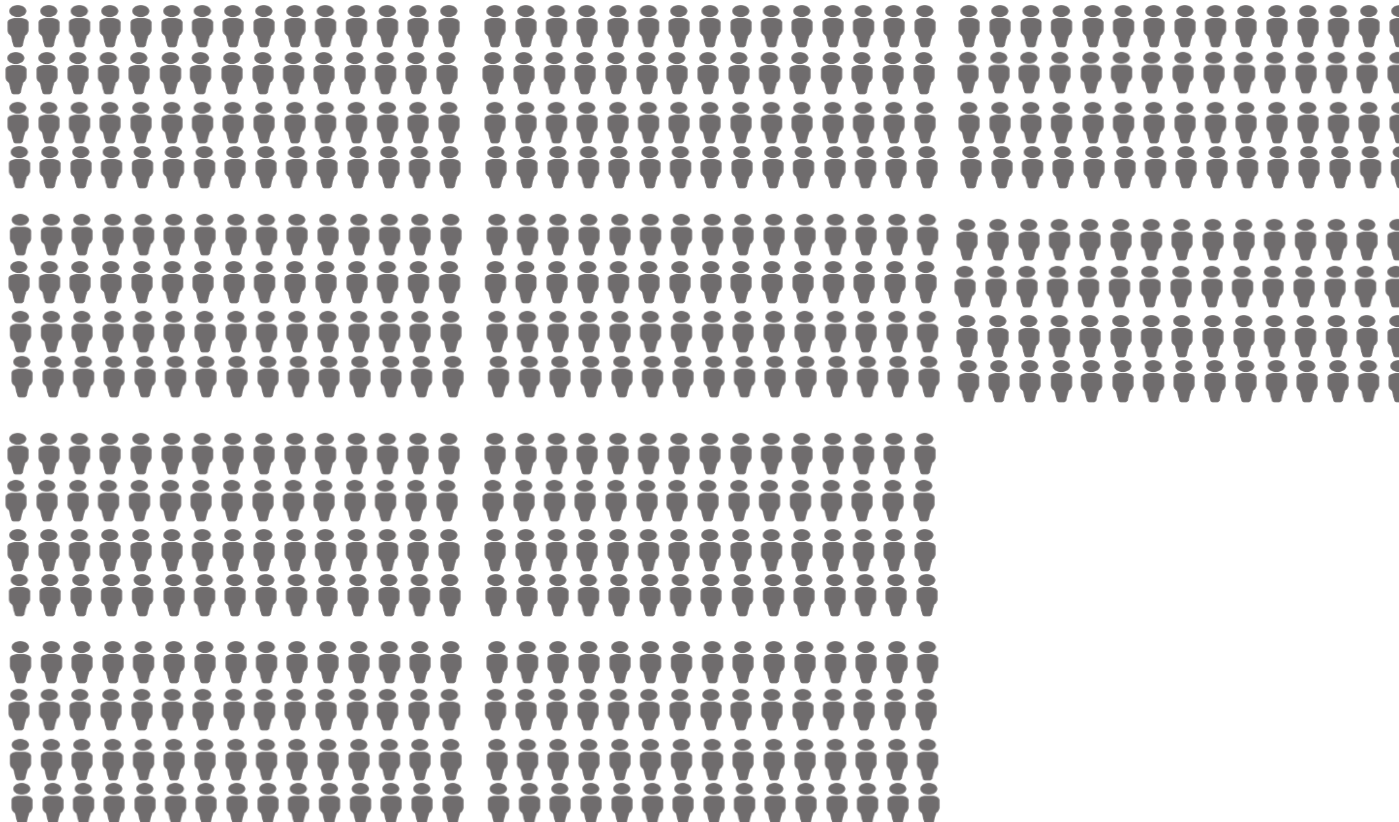


EXAMPLE COSTS – PERSON DAYS



Conventional Methods 600 person days

 eDNA 50 person days





TAXANOMIC YIELD PER UNIT SAMPLING EFFORT



Conventional methods



eDNA

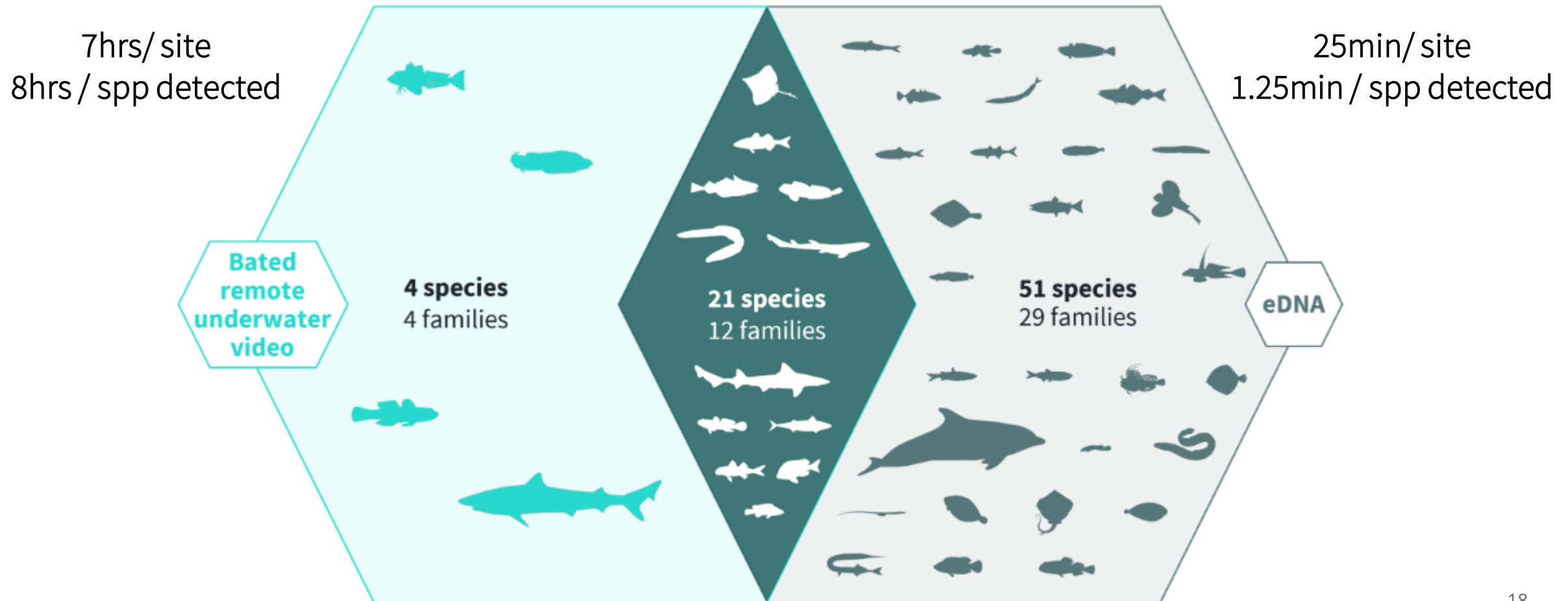
Data from a completed project revealed a **DNA based survey** yielded almost a factor of **27x more species** than conventional surveys per unit sampling effort

Taxonomic Group	Total number of taxa detected using conventional survey methods	Total number of taxa detected using DNA based survey methods
Fish	34	106
Major mammals	4	19
Minor mammals	29	7
Reptiles	26	2
Amphibians	48	44
Birds	169	25
Insects	118	753
Total taxa	428	956
Total sampling effort (person days)	600	50
Taxa per unit sampling effort (person days)	0.71	19.12



TAXANOMIC YIELD PER UNIT SAMPLING EFFORT

eDNA outperforms traditional visual surveys in underwater marine forests – Sussex



INTEGRATION WITH REMOTE SENSING

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NET POSITIVE IMPACT OVER LARGE AREAS



UNDERWAY



SAMPLING
Survey design
and eDNA
sampling



MAPPING
Biodiversity
landscape
mapping



RANKING
Identification of
biodiversity
values across the
landscapes



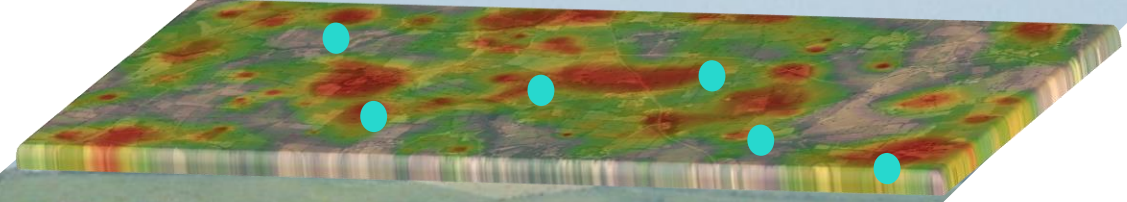
RESTORING
Site restoration
and offset
planning



MONITORING
Measurement of
NPI success



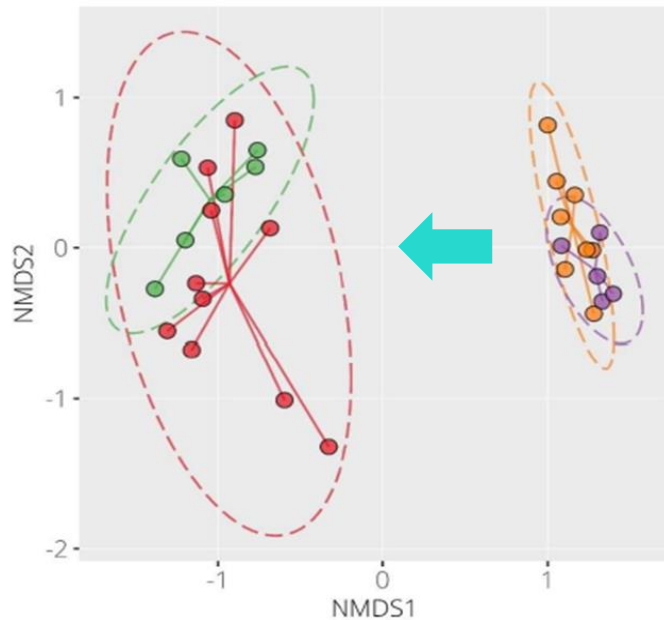
- Insects as a proxy
- Ground-truthed data
- Used to create a layer for planning
- Calibrated to remote sensed data
- Sea-scape iNPI?



WE CAN QUANTIFIABLY TRACK RESTORATION PROGRESS

UNDERWAY

- Tracking community composition shifts until relatively similar
- Target vs. counter target
- Qualitative with NMDS plots



- Area
- Woodland 1
 - Woodland 2
 - Intervention area 1
 - Intervention area 2



- Quantitative Machine learning model - Trained on target communities
- Samples fed in each year from different areas – model indicates closeness to community target score

ALIGNMENT WITH TNFD

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To implement the LEAP approach in practice, organisations need access to **high-quality, trusted, decision-useful data** on **nature-related risks and opportunities**.

Companies first need to **Locate** sites that have a high risk to business activities and then **Evaluate** and **Assess** impacts on biodiversity linked to those risks. High risk sites then require on-the-ground-data to **Prepare** to respond, as well as to track and disclose biodiversity impacts.

1. Locate

interface with nature

- Global screening tools identify sites with high risk to business and / or nature
- **Local calibration using site-based tools such as eDNA**

2. Evaluate

Dependencies & impacts

- Understand business dependencies on nature (ecosystem services)
- Identify **how** business processes are **driving nature impacts**

3. Assess

Risks & opportunities

- What are the **risks** and opportunities **to the business**
- What are we already doing / **should be doing**

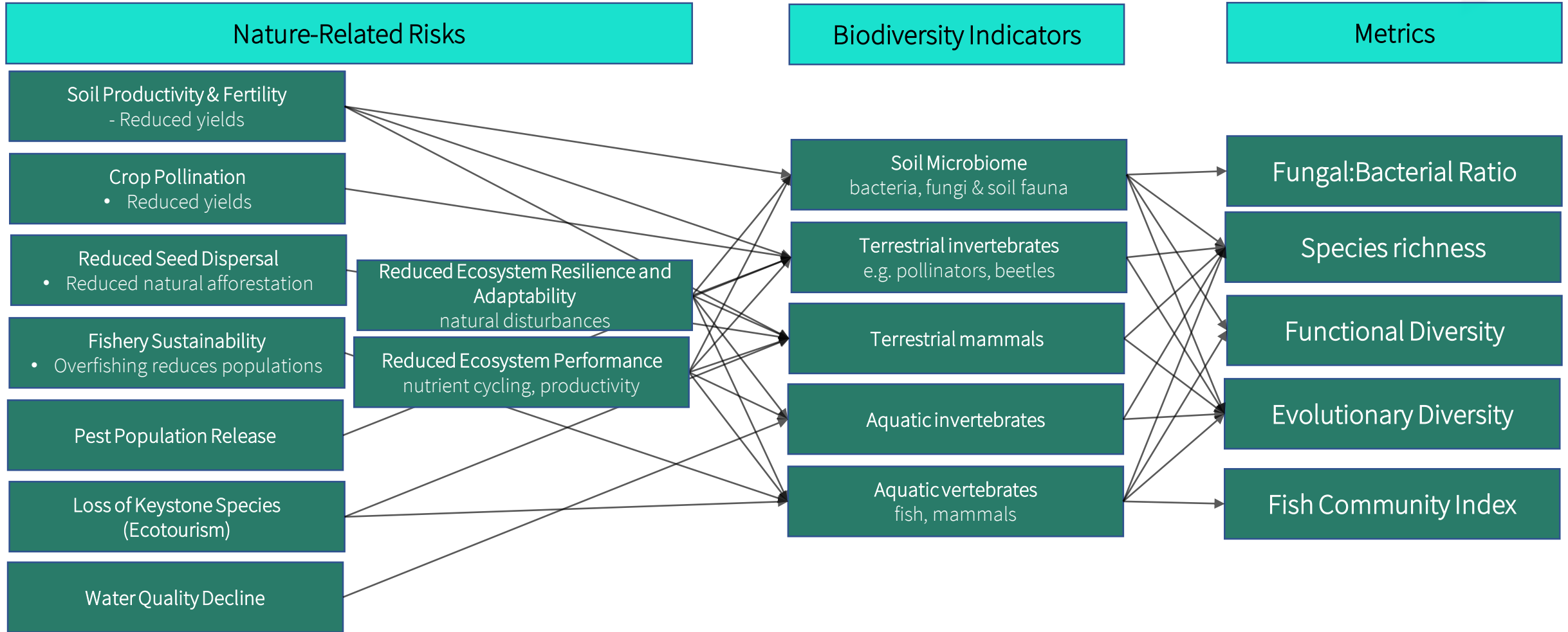
4. Prepare

To respond and report

- Strategy and resource allocation
- **Setting targets to define and measure progress**
- Reporting



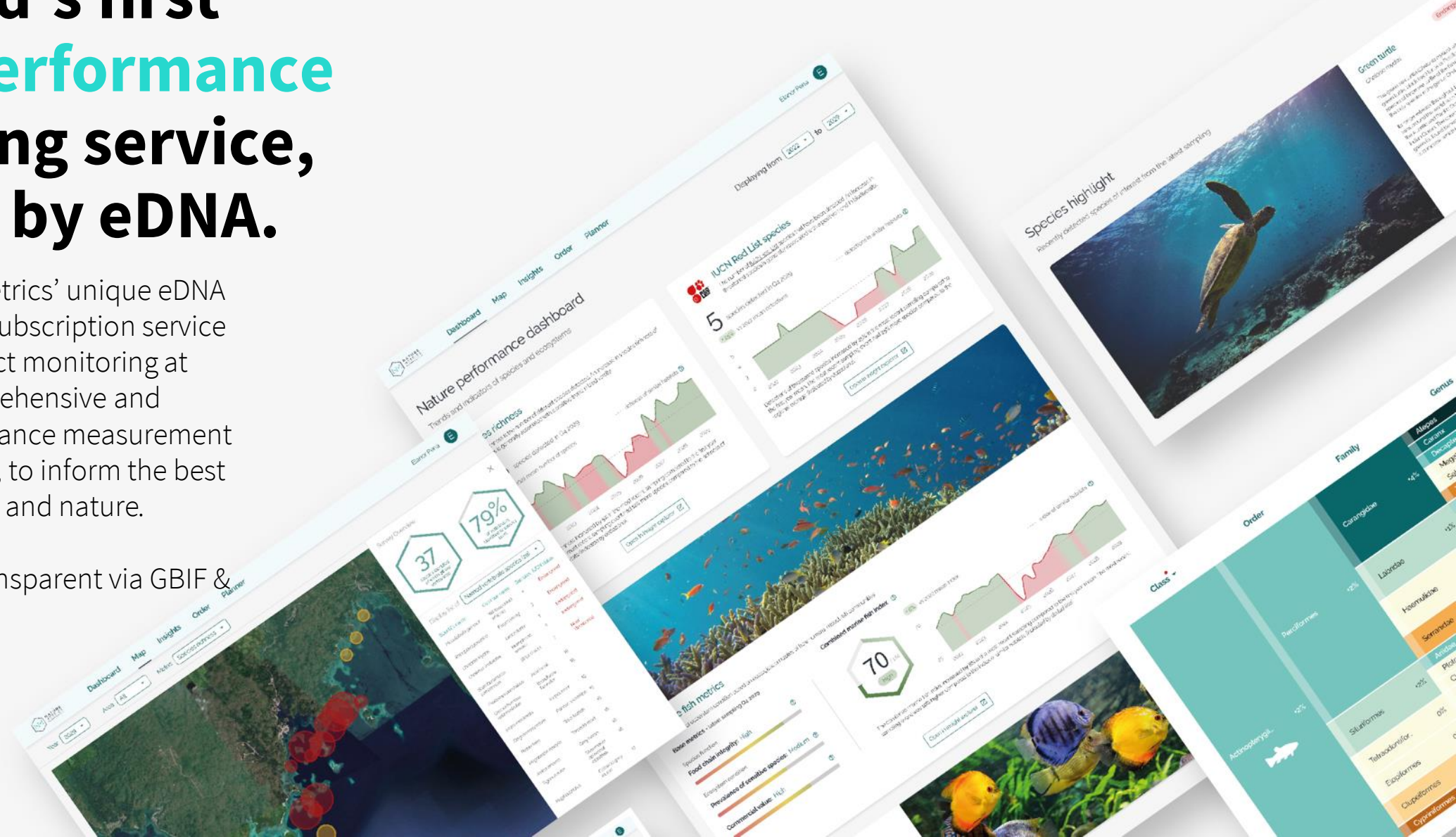
Declines in the State of Nature (Metrics) leads to increased risks for businesses, and we can help companies track their impacts on biodiversity that directly influence those risks



The world's first nature performance monitoring service, powered by eDNA.

Powered by NatureMetrics' unique eDNA technology, the new subscription service provides nature impact monitoring at scale, enabling comprehensive and standardised performance measurement on biodiversity health, to inform the best decisions for business and nature.

Data can be made transparent via GBIF & eBioAtlas





NATURE
METRICS
DNA-BASED MONITORING

eBioAtlas

A new global biodiversity data layer

A transparent service for
reporting and disclosure



INNOVATION & DEVELOPMENT

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DRONES & R&D

Safe monitoring from inaccessible locations

Overview & Objective

- eDNA & Water Chemistry
- Rapid, safe, automated deployment
- Imagery & Lidar

DNA Based methods

- Different depths
- Samples analysed for several taxonomic groups
- Remaining DNA stored for future assessments

R&D for Key Taxonomic Groups

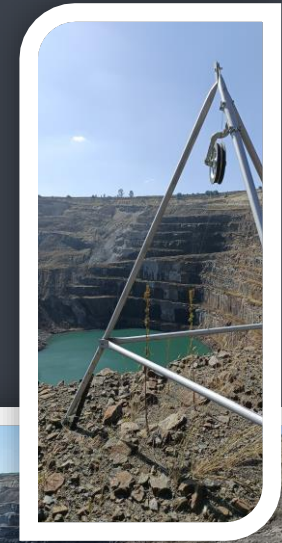
- Sharks & Elasmobranchs – Many critically endangered
- Great Apes and Chimpanzees – Critical habitat triggers
- Diatoms – measure of integrated water quality

DE BEERS GROUP



NATURE
METRICS
DNA-BASED MONITORING

COMPLETED



AUTONOMOUS SAMPLING R&D

Air DNA Sampling

Overview & Objective

- eDNA & Air Chemistry
- Passive & Automated deployment

DNA Based methods

- Static stations
- Samples analysed for several taxonomic groups

Passive Aquatic eDNA Sampling

DARTMOUTH OCEAN TECHNOLOGIES (DOT) SAMPLER



NM New Partnership with DOT

<https://dartmouthocean.com/nature-metrics-and-dartmouth-ocean-technologies-partner-provide-autonomous-marine-edna-sampling>

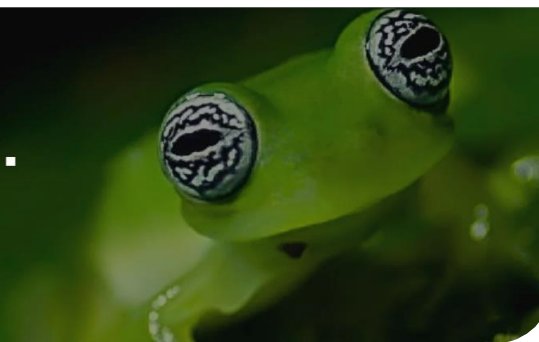
RAINFOREST X PRIZE
- SEMIFINALS



COMPLETED

DISCOVER.
UNDERSTAND.
PRESERVE.

PHASE Semifinals



TEAM Re-Forest-ER



INDUSTRY GUIDANCE

COMPLETE



Using Environmental DNA to manage biodiversity risks

Briefing note

- An eDNA approach complements traditional survey methods and is particularly useful for aquatic species.
- eDNA has multiple potential applications, from understanding ecological communities at a landscape scale to confirming the presence of rare and elusive species at a project site or demonstrating the effectiveness of mitigation measures.
- Collecting eDNA samples requires no expert skills and while limitations exist, eDNA approaches can reduce the cost of data collection and provide answers to clearly defined questions and objectives.



DNA-BASED BIOMONITORING RECOMMENDATIONS, OPPORTUNITIES AND PERSPECTIVES FOR THE MARINE ENVIRONMENT

WHITE PAPER
NatureMetrics, December 2020



A practical guide to DNA-based methods for biodiversity assessment

PENSOFT

Kat Bruce, Rosetta C. Blackman, Sarah J. Bourlat, Micaela Hellström, Judith Bakker, Iliana Bista, Kristine Bohmann, Agnès Bouchez, Ren Brys, Katie Clark, Vasco Elbrecht, Stefano Fazi, Vera G. Fonseca, Bernd Hänfling, Florian Leese, Elvira Mächler, Andrew R. Mahon, Kristian Meisner, Kristel Pankeep, Jan Pawłowski, Paul Luis Schmidt Yáñez, Matthew Seymour, Bettina Thalingst, Alice Valentini, Paul Woodcock, Michael Traugott, Valentin Vasselon, Kristy Deiner



Critical Minerals Association

Enabling the UK's Green Industrial Revolution

A Blueprint for Responsible Sourcing of Critical Minerals

Environmental, Social and Governance (ESG)

THE CRITICAL MINERALS ASSOCIATION ESG WORKING GROUP



Contribution to

Applicable to onshore & offshore environments, all phases of a project lifecycle and stages of the mitigation hierarchy



Early-stage exploration & baselining insights - Pilot site

A once-off snapshot of a site's biodiversity for screening – mainly aquatic

Early-stage risk mitigation, to inform planning & future monitoring

Can be conducted by exploration teams

Up to 200ha*

~£15,000 – 30,000



Seasonal monitoring for comprehensive baseline & trend monitoring

A robust baseline for a site over a year, multiple seasons and different habitats & locations

Integration of data with biomonitoring & water quality info for trend monitoring

Site inventories & contribution to local / regional knowledge

Up to 1000ha*.

~£30,000 - 50,000



Comprehensive multi-year monitoring & management across logistics chain

Advanced insight evidencing over time and project phases & inform management actions

Ecosystem level targeting, including soil & water biodiversity & pit-port

Make data-driven decisions using dashboard

Up to 5,000ha*

~£50,000 - 150,000



Nature intelligence & disclosure over land/sea-scape towards Net Positive Impact

Landscape level multi-year monitoring for improved planning

Ecosystem level targeting, including soil & water biodiversity to evidence NPI

Dashboard & modelling outputs with remote sensing

Up to 25,000ha*

~£150,000 – 200,000

*Hectares may vary depending on site context & sampling is easily scalable



THANK YOU

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**NATURE
METRICS**
DNA-BASED MONITORING



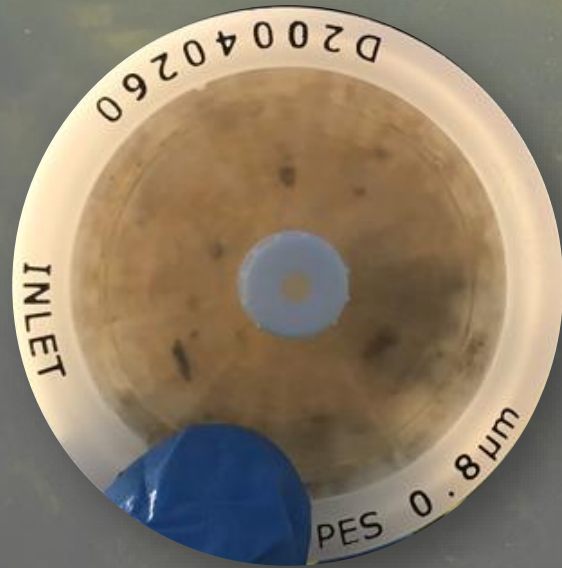
**NATURE
METRICS**
DNA-BASED MONITORING

Extra slides if needed

ALL species contain DNA and leave traces of their genetic code in the environment (**eDNA**)

eDNA can be captured by **filtering water** from rivers, lakes & oceans. It is then analysed in a laboratory to identify the species present in the area.

We can also extract DNA from soils, sediments, and even in the future we will pull it directly from air



WE ARE ENTERING A NEW ERA



1800s



Nature was
a **curiosity**

1900s



Nature was
a **resource**

Today



Nature is
at **risk**

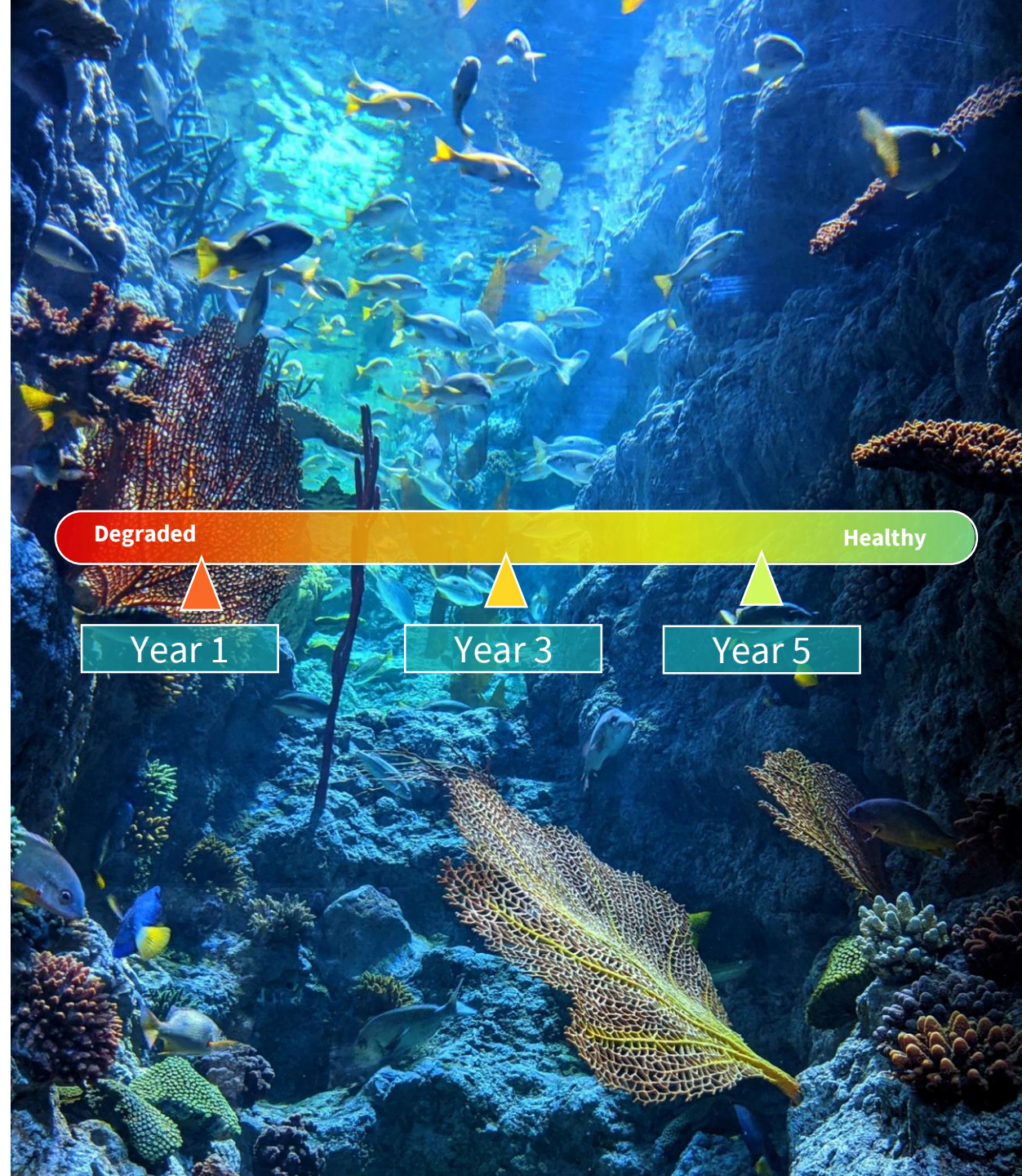
Tomorrow



Nature
must
recover

INDUSTRY NEEDS TRANSPARENCY

- For the private sector to **value** and invest in something, they need an **objective, verifiable measure** of its **quality**
- Incentives are NB (First Mover/Credits)
- Conservation and restoration require *outcome* metrics
- Biodiversity is a **big data** problem
- How to convert **complexity** into something **simple, universal and meaningful**?



WHAT IS NEEDED?

Industry perspective

Global perspective

Academic perspective

- Trustworthy digital data
- Efficiency at scale
- Cost savings
- Risk mitigation & Safety
- Data for compliance & transparency
- Data for management decisions

- **Collaboration**
- **Urgent Action**
- **Stewardship**

- More monitoring & more data
- Accuracy
- New tools & innovation
- Funding
- No Greenwashing





GROUP DISCOVERY & GEOSCIENCE

Australia & Germany

Anglo American

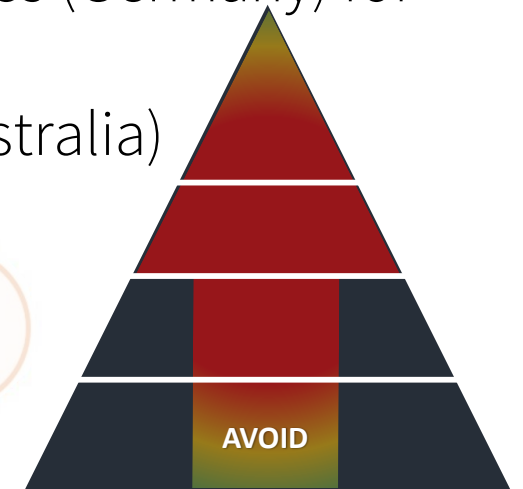
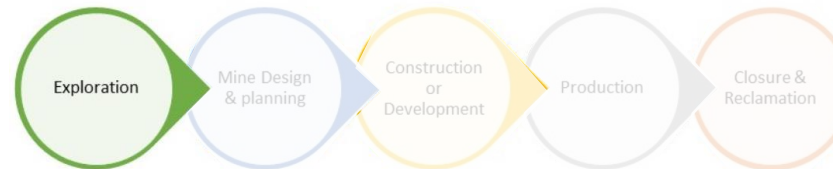


UNDERWAY



Outcomes

- **Exploration geologists trained** in eDNA collection
- **Valuable Baseline data** collected in earliest project stage for long term monitoring
- Risk mitigation – key species detected
- Capacity building
- Large datasets for invertebrates (Germany) for water quality monitoring & vertebrates/invertebrates (Australia)

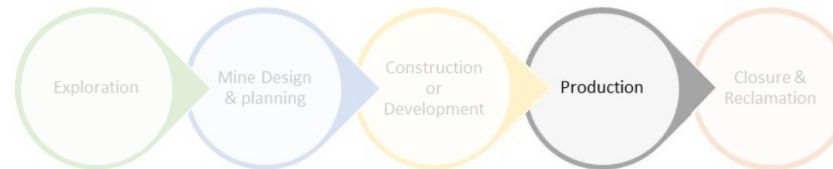
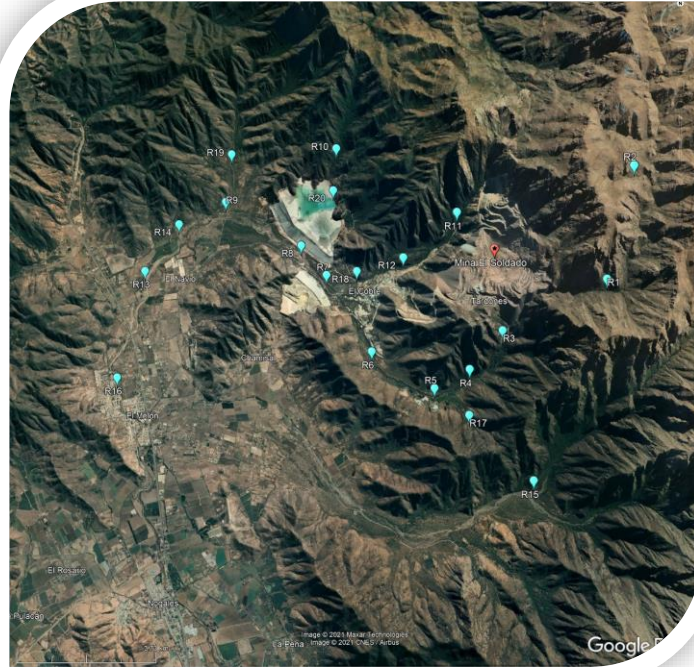




EL SOLDADO COPPER MINE

Nogales, Chile

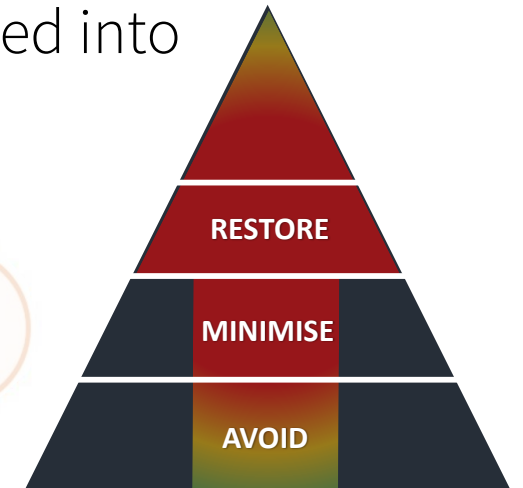
Anglo American



Key Outcomes

COMPLETED

- Strong agreement between historical data & eDNA
- New **invasive species records**
- Species presence confirmed at new sites
- **New species records & R&D**
- Barcoding confirmed species
- eDNA integrated into monitoring



This is a **transformation** in scale

No other method can deliver data across the tree of life from a simple, low-cost, participatory field effort



Accessibility

Anyone in the world can collect a sample



Comprehensiveness

Everything in one sample
- from microbes to megafauna



**NATURE
METRICS**
DNA-BASED MONITORING