

The Natural Capital Manifesto

From Nature to Capital

Overview

The Natural Capital Initiative pioneers a strategy that merges conservation, digital and AI technologies, and financial incentives to restore ecosystems. In 2024, AECOM was commissioned by Napital Group, a proponent of the initiative, to establish a natural capital pilot project on a 100-hectare site in Bintan Island, Indonesia. To encapsulate the positioning for the initiative, the project team leaders and Napital Group have decided to consolidate the concepts in the following manifesto.

This Natural Capital Manifesto explores innovative strategies for creating a new asset class centered around nature, focusing on how investments in conservation initiatives can be quantified and rewarded. We aim to establish frameworks that recognize and capitalize the value of natural ecosystems, thereby integrating natural capital with traditional financial systems and fostering economies that are aligned with nature. The manifesto will discuss methodologies for measuring conservation impact, showcase case studies, and outline pathways for integrating these insights into mainstream investment practices.

The Challenge

Our planet faces interconnected crises compounding into the nature and climate emergency.

The nature emergency is characterized by a rapid decline of biodiversity, degradation of ecosystems, and depletion of natural resources. These are driven by human activities such as deforestation, pollution, and greenhouse gas emissions. All these disruptions threaten the valuable ecosystem services provided by nature, which are key to recovery from the effects of rising temperatures.

As natural resources become scarcer, industries that directly rely on them, such as agriculture, fisheries, and forestry, face significant challenges. Crop failures, reduced fish stocks, and loss of timber can lead to higher prices and food insecurity. Additionally, the increased frequency and severity of extreme weather events, such as typhoons, floods, and droughts, results in substantial economic losses due to damage to infrastructure, property, and livelihoods. The cost of disaster recovery and adaptation measures also strains public finances.

The degradation of ecosystems and loss of biodiversity can potentially destabilize the global economy. The World Economic Forum, in its New Nature Economy report Nature Risk Rising, states that over half of the world's GDP, approximately \$44 trillion, is moderately or highly dependent on nature and its services. Moreover, if countries fail to invest more in protecting and restoring nature, leading to failures in pollination, fisheries and forestry services, the global economy faces annual losses of \$2.7 trillion by 2030, according to the World Bank.

Despite international agreements and targets, such as the Aichi Biodiversity Targets, many countries still struggle to meet their goals and arrest declines in biodiversity. This shortfall is largely due to insufficient resources and a lack of effective policy and economic drivers.

Decisive action is required to move forward and achieve tangible results. This involves prioritizing investments in green technologies, sustainable practices, and conservation efforts. By aligning economic incentives with environmental sustainability, we can drive meaningful change and protect our natural resources.



The Vision

To move forward from using carbon as a single environmental benchmark, and foster sustainable economies around nature, we need a strategic entry point that leverages the growing momentum in Environmental, Social, and Governance (ESG) ambitions among corporations.

We believe that the critical issue is recognising the value of nature and its natural capital. Traditionally, investments in conservation have been viewed as charitable endeavours, lacking explicit returns or gains for companies. However, to bridge the gap between the natural environment and the commercial world, we need a common ground. This is where data monitoring and the quantification of natural capital can play crucial roles, creating synergy by demonstrating the tangible benefits and returns of conservation efforts.

The Natural Capital Initiative has a twofold mission: to enhance ecosystem quality and to quantify natural capital gains. By focusing on these objectives, the Initiative will create healthier, more resilient ecosystems while

communicating the outcomes of conservation efforts in a way that resonates with the commercial world. This dual approach not only supports global rewilding efforts, but also demonstrates the value of investing in nature.

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The Method

Step 1: Create a high-performance ecosystem

Conserving the last remaining high-performing ecosystems is not enough to overturn the nature and climate emergency. Our focus is therefore to restore ecosystems. This involves applying scientific principles to improve ecosystem performance, ensuring that all restoration actions are grounded in robust research and evidence. Accountability is maintained through surveying, monitoring, and disclosure of data, providing transparent and measurable results that track the progress and impact of these improvements.

We build on the experience with the Natural Capital Laboratory (NCL) of AECOM, a testbed for restoration and natural capital innovation that has showcased how the restoration of high-performing ecosystems leads to natural capital gains.

The AECOM NCL is an innovative project launched in 2019 in collaboration with the Lifescape Project,

landowners Emilia and Roger Leese, and the University of Cumbria. Located in the Scottish Highlands near Loch Ness, the NCL is restoring 40 hectares of ancient Caledonian forest and reintroducing lost species. Within the first five years, the initiative served as a living laboratory to identify, quantify, and value the impacts of rewilding efforts.

The NCL employs advanced technologies such as artificial intelligence (AI), drone technology, earth observation data, and geographic information systems (GIS) to monitor and track environmental changes. These tools help create digital 3D models of the site, providing detailed insights into habitat conditions, species populations, and carbon sequestration. The data collected is stored in a digital natural capital accounting platform¹, which makes it accessible through a user-friendly dashboard. Furthermore, adaptive environmental management strategies can be adopted accordingly based on the data. The NCL demonstrates how natural capital restoration projects can be implemented.

¹Through AECOM's PlanEngage platform, NCL data is transformed into a visual, accessible, and engaging experience: <https://uk.planengage.com/aecom-ncl-digital-natcap/page/home>

Case Study: Natural Capital Laboratory | A Digital Natural Capital Account

Performance Driven | Accountability

How to create High Performance Ecosystems?

PROJECT OVERVIEW

- 📍 Birchfield, Loch Ness, Scottish Highlands
- 📏 Size: 42 hectares
- 📅 2019 - 2024
- 👤 Client: The Lifescape Project

PROJECT SCOPE

- 1 To restore habitats, reintroduce lost species, and encourage people to connect with the environment.
- 2 Set up as an experimental testbed to trial new techniques to quantify, measure, and communicate environmental and social change associated with rewilding.

SERVICES

- ✓ Ecology monitoring and reporting
- ✓ Natural and social capital accounting
- ✓ GIS
- ✓ Virtual reality
- ✓ Drone surveys
- ✓ Ecological visualisation
- ✓ Remote sensing
- ✓ Aquatic ecology



Building on the momentum, AECOM, commissioned by Napital Group, initiated a natural capital pilot project on Bintan Island, Indonesia. Drawing inspiration from the successful NCL, this initiative seeks to implement a method for restoring forest into a high-performance ecosystem while utilizing digital tools to track and report ecological progress using essential natural capital data. The project will explore developing natural capital into a tangible asset that enables commercial partnerships.

and data is provided for display. This approach ensures a comprehensive and measurable assessment of the project's impact on the environment.






Step 2: Natural Capital Quantification

To quantify the results of restoration and enhancement actions, natural capital accounting will be employed, using five selected performance data points as key performance indicators. Natural capital is defined by a basket of metrics relating to air, water, soil, carbon, and biodiversity. These were selected as being representative of core ecosystem services: soil, life, water, air and climate regulation. In addition, the metrics are robust and simple to describe, effectively bridging the gap between science and the commercial world.

Baseline data will be established to set future targets, and this will be compared with data gathered after the ecosystem enhancement activities to determine the natural capital gains of the project. Regular monitoring will ensure that targets are being met, progress is tracked,



A Comprehensive Set of Natural Capital Performance Data

Biodiversity Gain	Other Key Ecosystem Services			Carbon Sequestration
Biodiversity Unit	Air Quality	Water Quality	Soil Quality	tCO ₂ e
 <p>Biodiversity gain involves creating, enhancing and improving natural habitats and calculating the numerical change in biodiversity using 'biodiversity units'. The UK has already rolled out a statutory biodiversity metric to measure losses and gains. In Asia, AECOM has developed the Singapore Biodiversity Accounting Metric and is developing similar metrics elsewhere.</p> <p>By quantifying the value of habitats, the tool calculates the potential loss or gain in biodiversity that can help stakeholders improve the sustainability of natural asset management.</p>				 <p>Carbon dioxide (CO₂) is a greenhouse gas that is the main contributor to the climate crisis, being released in huge amounts through the burning of fossil fuels. Plants naturally absorb and store CO₂ during photosynthesis, a process known as sequestration.</p> <p>The conservation and restoration of ecosystems with high sequestration rates (such as forests and wetlands) is therefore a major tool in the fight against global heating.</p>

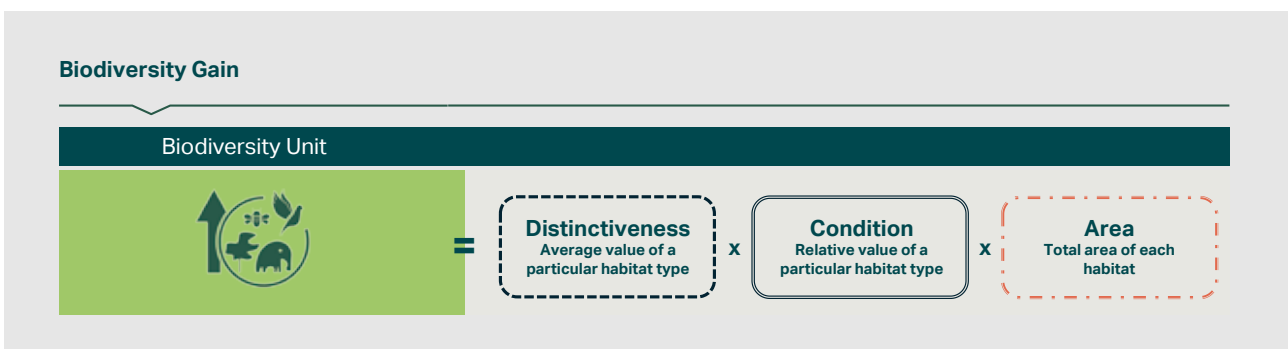
Biodiversity

Biodiversity is significantly harder to quantify compared to the other key performance indicators due to its complexity, diversity, and lack of equivalence. Biodiversity also exhibits significant natural variability, further complicating data collection and analysis. With this in mind, accounting approaches to quantify biodiversity typically provide values to habitats which infer their overall value to biodiversity, in the form of units.

Biodiversity accounting derives units by multiplying two coefficients: distinctiveness and condition. Distinctiveness refers to the average biodiversity value of a habitat type and is typically derived from analysing reference datasets against criteria related to conservation or restoration priorities, such as average species richness, rarity of habitat, number of species unique to a

habitat, and irreplaceability. On the other hand, condition, which follows the principles of ecosystem integrity or condition as defined by the UN (2021²), is the relative biodiversity value of a given habitat parcel. Condition values are derived by scoring site specific survey data against criteria relating to species composition, structural diversity and function. Such a metric can then be used to determine a quantifiable change in biodiversity through a single comparable unit.

In the Bintan Island pilot project, the Napital biodiversity accounting approach is inspired by similar metrics developed in other countries. It utilises site specific survey data related to ecological processes, flora and fauna composition, structural diversity, and soil biota communities.



²Adapted from United Nations et al. (2021) System of Environmental-Economic Accounting - Ecosystem Accounting (SEEA EA)

Water Quality

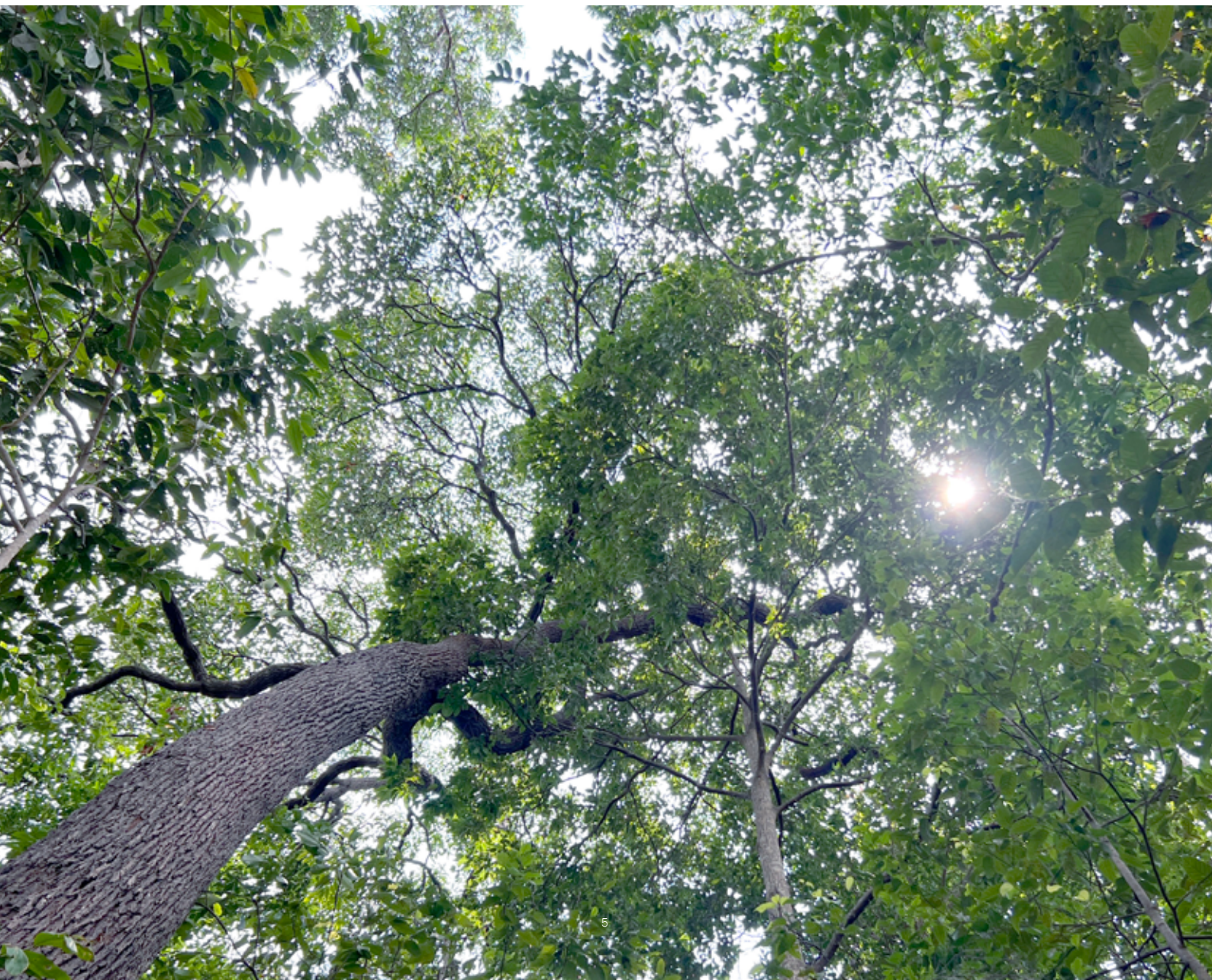
Healthy ecosystems play an essential role in regulating the water cycle, moderating climate through evapotranspiration, attenuating stormwater run-off during rain and reducing water pollution. These functions are less effective in degraded habitats. In particular, the loss of vegetative cover typically results in an increased volume of stormwater run-off that can cause flooding in downstream areas. Moreover, this run-off typically carries high concentrations of sediment from the soil, leading to soil erosion and increased pollution in receiving waterbodies.

Improvements to water quality can be assessed by estimating sedimentation rates before and after implementation of the enhancement measures. The analysis can use models to analyze climate data (average/peak precipitation), site topography, current management and vegetative coverage for estimation of sedimentation rates.

Soil Quality

Healthy soils are essential for resilient forest ecosystems and underpin the services they provide. The clearance of vegetation and/or conversion of forest to other land uses has multiple impacts on soils, including erosion, loss of litter influx after canopy removal and enhanced decomposition and nutrient mineralization rates.

Two measures that can be used to track the recovery of soils under the enhancement measures are Soil Organic Matter (SOM) and microbial communities. Whilst most tropical ecosystems have a lower SOM than their temperate counterparts, higher SOM content is generally an indicator of better-quality soils. More diverse and species rich microbial communities are also indicators of healthy soils, and will be assessed through environmental DNA (eDNA) analysis.





Air Quality

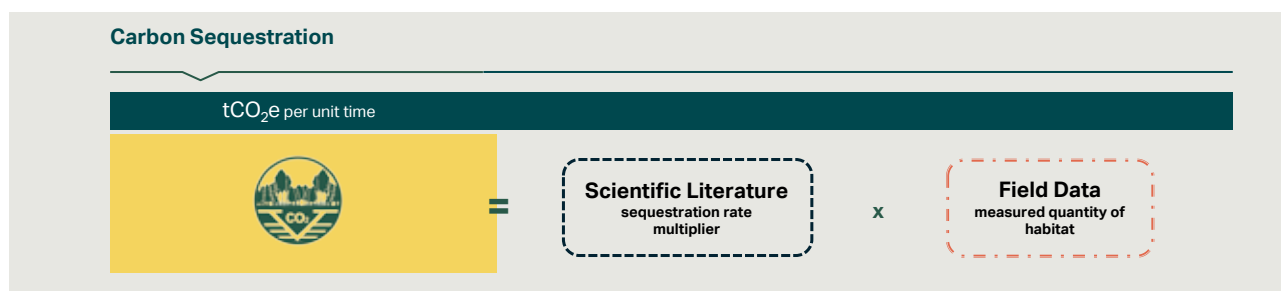
Air pollution is the greatest environmental threat to public health globally and accounts for an estimated 7 million premature deaths every year (UNDP, 2024). Air pollution and climate change are closely linked as all major pollutants have an impact on the climate and most share common sources with greenhouse gases. Improving our air quality will bring health, development, and environmental benefits.

Vegetation can reduce the concentrations of airborne pollutants, especially of particulate matter (PM), through several different processes. This makes green spaces, especially in urban areas, a valuable tool in addressing acute air pollution issues. The air pollutant removal potential of the baseline habitats and restored habitats will be estimated using available models that take factors such as biogeography, species, planting density and leaf area index into consideration.

Carbon Sequestration

The ability of ecosystems to absorb carbon from the atmosphere and store it is a key service that helps regulate the climate and fight the worst impacts of the climate crisis. This process is known as carbon sequestration, and refers to the total amount of carbon stored in ecosystems both in living (i.e., biomass) as well as non-living (i.e., soils) material. Carbon sequestration can be measured as the sum weight of carbon contained in a particular ecosystem, or the amount of carbon absorbed by that ecosystem per unit of time. It is commonly quantified as “metric ton of carbon sequestered” per unit of time.

Direct measurement of carbon sequestration (by sampling biomass and soils to determine the quantity of carbon they contain) is a time consuming and expensive process, so it is common to deploy other techniques to estimate carbon sequestration. Site investigations can be undertaken to characterise vegetation and habitats on the site (i.e., habitat types, dominant/common tree species, tree densities, tree age profile, soil depth). This information will be coupled with typical sequestration rates of different types of habitat/tree species in the biogeographical location of the project, and combined in a simple model to determine current carbon sequestration of the project site. The same model will then be used to estimate sequestration of the project site following restoration.



Display through Natural Capital Digital Twin

1

Digital tools and techniques are increasingly used to track and communicate a vast array of complex relationships and data at scale.



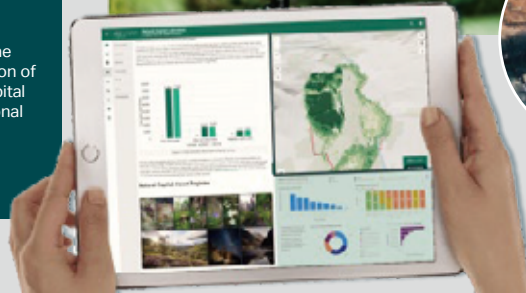
2

Scalable based on investor's requirements and enhanced user experience; as well as an open, transparent, reliable, and visualised display platform for the public.

3

Measure the increase in ecosystem services over time as natural capital matures, resulting in a set of "Nature Capital Performance Data" in exchange for financial incentives.

Facilitate the incorporation of Natural Capital into traditional Financial Systems



Step 3:

Digital Monitoring and Display

The monitoring process involves establishing a robust and comprehensive data monitoring system using camera traps, audio recordings, and eDNA. This approach ensures thorough and accurate data collection. The regular data collection and analysis will be displayed through a user-friendly interface, making the information accessible and understandable. The gathered data will be displayed in a natural capital digital twin so that stakeholders are able to track the progress of the site. The goal is to present environmental data in a manner that can engage non-scientists to generate support, receive feedback, and educate the public. The availability of this data also facilitates the adaptive management of the site to maximize performance.

Additionally, by incorporating design and blockchain technology, we aim to create an open and transparent culture, ensuring that all stakeholders can trust and verify the data and processes involved. This transparency fosters accountability and encourages broader participation in conservation efforts.

Bridging the gap with the business sector

In today's world, capitalizing on environmental efforts, such as investing in renewable energy, energy transformation, and supporting restoration projects, is a vital measure in

the ESG market. For organizations, alignment with global ESG standards is not just a requirement, but can also garner advantages. Moreover, as the Taskforce on Nature-related Financial Disclosures (TNFD) gains traction, more corporations will be evaluating, disclosing, and managing their nature impacts systematically.

Natural capital presents an opportunity to invest in nature, with metrics and measurements to evaluate its performance. The benefits span risk mitigation, adaptation

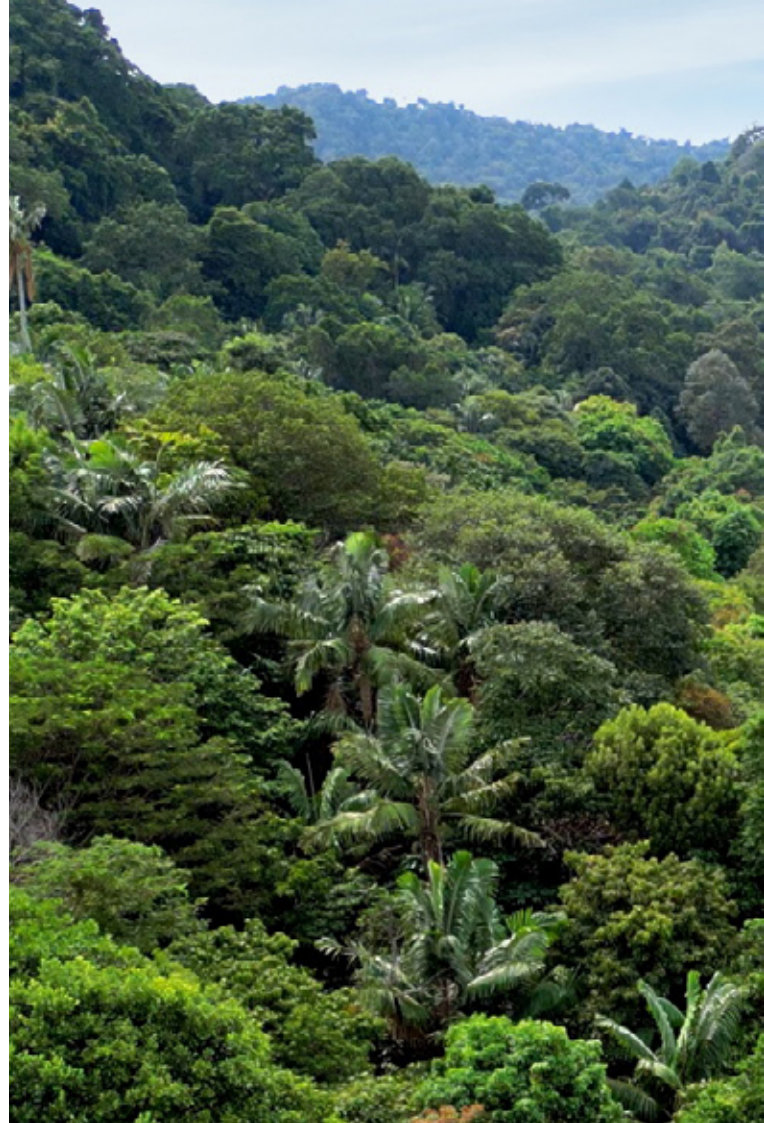


and transformation, financing opportunities, and enhancing brand value in line with consumers' expectations. There is also future investing potential through participation in the natural capital market, where natural capital holds its own value as a tradeable asset.

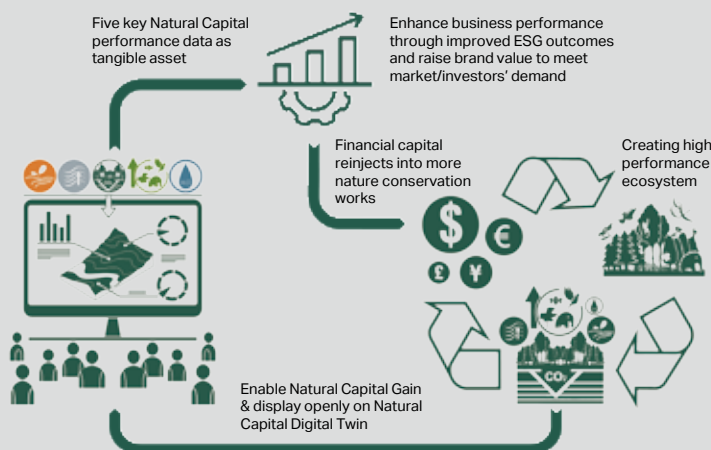
Investing in natural capital to fulfil business ambitions is a strategic choice due to its cost-effectiveness and broad relevance, including:

- **Enhancing ESG performance:** Potentially improving ESG metrics, which can provide businesses with more favourable financing concessions and loans to support their initiatives
- **Strengthening brand value:** Aligning with the values and expectations of investors and customers who are increasingly concerned about business impacts on nature
- **Business sustainability:** Better navigation of transition risks such as regulatory changes, market shifts, and environmental challenges; future-proofing the business as the world charts a challenging future

Businesses can create a continuous cycle that benefits both natural and financial capital. Proactive engagement in this conversation may yield a spectrum of benefits, demonstrating that doing good should be an integral part of business strategy and not an afterthought.



Enhance business performance & fulfill corporations' ESG ambitions



Riding on the results and data collected from High Performance Ecosystems (Natural Capital Projects) on the ground, such data shall be reinforced by a sound metric + measurement system (Natural Capital Accounting) to ensure accountability. These are key assets to improve business performance for obtaining financial concessions, enhance corporate branding and are potentially tradable as the sphere of ESG matures around the globe.

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David is an Ecological Specialist with over twenty years professional and academic experience in Asia. His expertise spans environmental (planning, conservation, impact assessment, audit and monitoring), ecological (design, surveys and research), translocation and faunal re-location projects, nature-based solutions (NbS) and natural capital assessment. Key high-profile projects include developing a biodiversity masterplan for Yunnan Province, designing the world's first

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Stephen is a UK-chartered landscape architect and urban designer with twenty years of professional experience, ranging from master planning to detailed landscape/architectural design on international projects. He received his master's degree in urban design from the Bartlett School of Architecture (UCL) in 2004 and has a degree in engineering with business finance (UCL).

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AECOM is the world's trusted infrastructure consulting firm, delivering professional services throughout the project lifecycle – from advisory, planning, design and engineering to program and construction management. On projects spanning transportation, buildings, water, new energy, and the environment, our public- and private-sector clients trust us to solve their most complex challenges. Our teams are driven by a common purpose to deliver a better world through our unrivaled technical and digital expertise, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities. AECOM is a Fortune 500 firm and its Professional Services business had revenue of \$14.4 billion in fiscal year 2023. See how we are delivering sustainable legacies for generations to come at aecom.com and [@AECOM](https://twitter.com/AECOM).

About Napital Group

Napital Group provides advanced sustainability and Environmental, Social, and Governance (ESG) solutions, to address the growing need for sustainable business practices and promote the concept of natural capital in Hong Kong and the Southeast Asia region, in alignment with the countries and regional context.

The primary objective of Napital Group is to develop and implement the Natural Capital Initiative and its projects, an innovative solution that integrates environmental sustainability, social responsibility, and financial value creation. The Natural Capital Initiative is designed to assist organizations in identifying, measuring, and managing potential natural capital assets and impacts, demonstrating strong capability in Public-Private Partnership coordination and management.