Verdant Strategies

EXECUTIVE SUMMARY

The Big Picture: We propose that Borealis establishes the world's first sovereign-backed Natural Asset Company platform, unlocking biodiversity as a new investable asset class.

Situation

The challenge is clear. Finland's forests, which once absorbed carbon, became a net carbon source in 2021. Logging pressure and biodiversity loss threaten to erode asset values, undermine forestry's contribution to exports, and put Finland at risk of falling out of step with EU regulations. If BWF does not adapt, it risks stranded assets, reputational damage, and a weakened social license both at home and abroad.

Our 3 Pillar Objective

- Sustainable Forestry & Stranded-Asset Management
- Biodiversity Restoration & Global Leadership
- Resilient Prosperity & Capital Protection

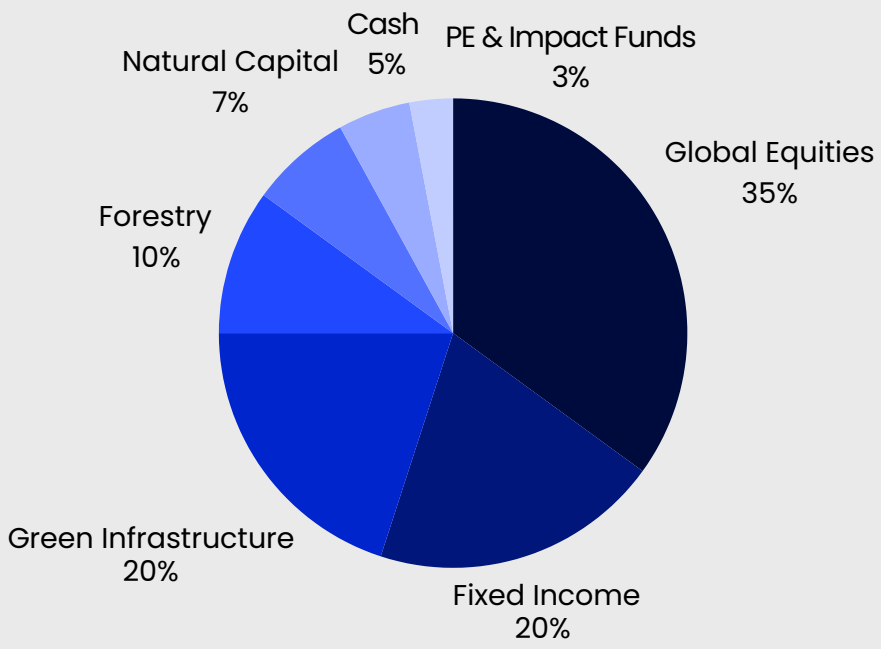
A Possible Solution

Our solution is the Borealis Blueprint: a dual-scoring investment framework that measures success in both financial returns and biodiversity outcomes by embedding nature as productive capital. The strategy shifts BWF's portfolio toward assets that generate value from ecosystem resilience, while maintaining competitive returns.

Innovation Highlight: NAC

Natural Asset Companies (NACs), highlighted in the WEF's 2025 *Finance Solutions for Nature* report as a top scalable mechanism for nature-positive outcomes, form the strategic backbone of our proposal. BWF will sponsor the creation of the Borealis NAC, the world's first sovereign-backed NAC, anchored by a €500 million seed investment. Built on Finland's existing METSO and Helmi programs, Borealis NAC unites forest owners, government and industry in a shared equity structure that monetizes carbon, biodiversity and sustainable timber while preserving national ownership. It creates market-based value from ecosystem health, rewarding landowners and investors alike while ensuring Finland's forests remain productive, resilient and aligned with EU biodiversity and Net-Zero goals. In doing so, Finland would take a leading role in redefining nature as a national asset.

Portfolio distribution



Geographic Mix: 27% Finland, 34% NA, 21% EU, 10% EM, 8% APAC

Target Return: 8.2% **Sharpe Ratio:** 0.87

Expected Volatility: 7.1 %

Tradeoff & Strategies

This allocation resolves the fund's critical trade-offs. As conservation and restoration efforts get underway, logging yields will be reduced by roughly 16%, but revenues will be sustained by shifting to premium biodiversity-certified exports. Forestry exposure will remain a core pillar, while NACs and biodiversity credits will hedge long-term stranded-asset risk. Approximately one-quarter of the portfolio remains domestic, enabling BWF to lead biodiversity restoration and forestry transition programs while avoiding excessive home-market exposure.

Conclusion

The path forward is equally clear. BWF should approve the Borealis Blueprint as its guiding framework, launch a pilot NAC within 12 months and rebalance its portfolio toward the proposed allocation over the next two years. Success will be measured not only in financial returns, but in securing the ecological capital that has underpinned Finland's economy for generations.

Verdant Strategies

1. Introduction

The Borealis Wealth Fund (BWF), managing €10 billion in assets and €1 billion in annual forestry-linked inflows, was created to ensure Finland's natural resource wealth supports future generations. As of 2025, the Fund's mandate has expanded to address two intertwined imperatives: delivering long-term financial returns while restoring biodiversity and ecosystem stability. This dual mission reflects both economic necessity and moral responsibility. Finland's forests, once a global benchmark for sustainability, have become a net carbon source, threatening the very foundation of the forestry economy that provides nearly one-fifth of national exports. We propose that Borealis establishes the world's first sovereign-backed Natural Asset Company platform, unlocking biodiversity as a new investable asset class.

2. Case Analysis: Biodiversity & Financial Risks

Over the past decade, Finland's forestry sector has faced mounting pressure from biodiversity decline, its carbon emissions, and international regulatory shifts. Forestry represents 18% of exports and contributes over 3% of GDP (Statistics Finland, 2024). However, intensive harvesting has transformed the land-use sector from a carbon sink into a carbon emitter. In 2021, Finland's forests emitted approximately 2 $MtCO_2e$ more than they absorbed (Finnish Environment Institute [SYKE], 2023). This shift threatens both the country's 2035 net-zero target and the valuation of forestry-linked financial assets.

Externally, the EU Nature Restoration Law and the Biodiversity Strategy 2030 mandate measurable ecosystem recovery. Capital that fails to meet these standards risks exclusion from sustainable finance classifications. Internally, BWF's 25% domestic asset concentration exposes the portfolio to correlated ecological and regulatory shocks.

According to the UN Environment Programme Finance Initiative (UNEP FI, 2022), the global biodiversity financing gap amounts to USD 700 billion per year, representing the shortfall between current spending (≈ USD 140 billion) and the ≈ USD 840 billion required annually to halt and reverse biodiversity loss by 2030. The OECD (2021) further reports that less than 0.1 % of global GDP is currently directed toward biodiversity conservation, leaving a large investable space for private and sovereign capital.

Finland possesses the governance quality, natural capital expertise, and institutional credibility to become a pioneer in sovereign biodiversity finance, integrating ecosystem restoration into mainstream capital markets. By reorienting the Borealis Wealth Fund toward biodiversity-linked instruments, Finland would demonstrate how developed economies can monetize ecosystem services while meeting both EU Biodiversity Strategy 2030 and 2035 net-zero objectives.

The Borealis Wealth Fund operates at the nexus of competing priorities that must be strategically reconciled:

Net Zero vs. Biodiversity:

- Fast-growing monoculture plantations sequester carbon quickly but reduce habitat diversity. Native mixed-species restoration supports long-term ecosystem resilience but yields slower carbon gains.

Logging Yields vs. Long-Term Forest Resilience:

- High harvest rates generate short-term profits but accelerate soil depletion, pest vulnerability, and carbon emissions. Reduced logging intensity sacrifices immediate cashflows but enhances future timber quality and forest health.

Domestic Concentration vs. Global Diversification:

- Heavy exposure to Finland's domestic forestry assets amplifies ecological and policy risk. A diversified portfolio, combining domestic restoration with global biodiversity markets, balances financial stability and ecological leadership.

Ecological Projects with Weak Cashflows vs. Market-Based Tools:

- Traditional conservation generates intangible public goods but limited revenue. Integrating market instruments such as biodiversity-linked bonds, carbon credits, and Natural Asset Companies (NACs) would allow ecological restoration to yield viable financial returns.

Verdant Strategies

3. Portfolio Architecture

Like a forest, the Borealis Wealth Fund must have deep financial roots in order to sustain new growth. The proposed core allocations, across Equities, Fixed Income, and Infrastructure, form the trunk that grounds the BWF in stability and disciplined diversification. From this foundation emerge the growth rings of innovation: natural-capital and biodiversity sleeves that will mature in step with the BWF's strategic pillars (Appendix 8.3).

Global Public Equities (35%)

Following Norway's GPF-G approach, we focus on global equities excluding Finland to reduce exposure to Finnish macro shocks and mitigate systematic forestry risk. Our geographic allocation mirrors NBIM's disciplined framework, with 60% in North America, 20% in EU ex-Finland, 20% in APAC, and 10% in emerging markets. We will first transition existing holdings to align with this geographic split and then rescreen allocations using the BFFI framework, adjusting from the 40% legacy allocation to our proposed target of 35% global equities. Looking ahead, we plan to adopt TNFD recommendations and draw inspiration from the ASN Biodiversity Fund to enhance evaluation criteria and apply the BFFI framework more rigorously (TNFD, 2025). By 2035, as biodiversity regulation and disclosure improve, we expect to implement more thematic screens with confidence, ensuring alignment with GFB targets (MSCI, 2023).

Sustainability Linked Fixed Income (20%)

BWF recognizes the key role that debt markets can play not only for providing stable income and a liquid asset, but also as a nature-positive outcome based tool. Raising the fixed income sleeve from 15% to 20% marks a deliberate rebalancing—designed to offset the higher innovation risk and longer return horizons of the Fund's alternative investment initiatives. The allocation follows the Norges Bank Investment Management framework for geographic diversification, 30% Europe (ex-Finland), 50% North America and 20% Emerging Markets (EM), balancing regional depth with yield opportunities (Norges bank source). Within this structure, BWF tilts decisively towards two priority solutions highlighted in WEF's Finance solutions for nature report: Sustainability-Linked Bonds (SLBs) and Green Bonds (WEF report). This market continues to deepen: as of December 2024, green bonds accounted for 57% of total labeled issuance, and forecasts suggest sustained growth in 2025 despite global macroeconomic headwinds (TheWorldBank, 2025). Europe remains the innovation hub, driven by the EU Green Bond Standard, while North America offers scale and liquidity. In emerging markets, select high-yield exposure provides incremental income while fostering transition financing in developing economies. BWF will experiment selectively in the emerging biodiversity-linked bond space, monitoring market development and expanding exposure as demand grows (AXA Investment Managers, 2025).

Real Assets: Green Infrastructure (20%)

Beyond holding infrastructure assets for their offer of long-term, stable and inflation-linked cashflows, significant allocation to investments in Green Infrastructure will be imperative for BWF to meet Finland's binding 2035 net-zero emissions target. The existing portfolio prioritizes renewables (wind, solar), grid modernization & low-carbon transit–all assets that we intend to keep as long as they contribute to reducing carbon intensive activities, particularly with project durations in line with the 2035 commitment.

We specify 70% domestic allocation for this sleeve, putting Finland's goals at the forefront, while the remaining 30% is in the EU as it presents an attractive location (IFSWF Review, 2024).

Real Assets: Forestry (10%)

BWF will reduce its forestry allocation from 15% to 10%, applying a rigorous BFFI screen to remove legacy assets that fall short of strengthened biodiversity criteria. Capital released will be redeployed into the higher-biodiversity impact investments described below. The refined forestry sleeve: 65% Finland, 20% North America and 15% Emerging Markets (e.g. Brazil, Indonesia, Gabon), concentrates exposure in assets that combine sustainable timber value with measurable biodiversity gains, benefiting from knowledge-sharing that surfaces global best practices and enables clearer, reportable stewardship outcomes to reduce regulatory and reputational risk.

Natural Capital (7%)

BWF will pioneer a new asset class for Finland: Natural Asset Companies (NACs), transforming ecological health into measurable and investable value (Intrinsic Exchange Group). This sleeve demonstrates limited correlation with equity and fixed income markets and represents the Fund's most forward-looking commitment: to make natural capital a core component of national wealth (OpsMatters, 2025) (Appendix 8.3: A5). Co-designed with Finland's Ministry of Finance, METSO and Helmi programs and Intrinsic Exchange Group, BWF will prioritize establishing the Borealis NAC– a €500 million domestic pilot designed to aggregate sustainable forest management under one vehicle (Intrinsic Exchange Group, 2025). By aligning with Finland's 2035 Net-Zero and COP15 biodiversity goals, the NAC aims to reverse ecosystem degradation while safeguarding the long-term productivity of the forestry economy. A further €200 million will be allocated to global NACs, demonstrating early support for the emerging market and enabling knowledge exchange as international standards develop.

Private Equity (3%)

As a nascent sector, biodiversity investing is still very much in its infancy, with only 24 "pure-play" biodiversity funds worldwide as of late 2024 (MSCI, 2024). Our 3% private equity sleeve therefore targets early-stage nature-based solutions and tools. Roughly half of this allocation will go into direct private ventures and half into leading biodiversity impact funds (such as Dutch Robeco Biodiversity Equities Fund and Brazilian TFFF). This dual approach lets BWF back cutting-edge technologies (e.g. ecosystem monitoring sensors, natural-solutions infrastructure) while building internal expertise from experienced impact managers, positioning BWF to adopt best-in-class screening, measurement and assessment tools as they emerge.

Timeline and Portfolio Duration

BWF's investment horizon spans generations, yet the transition to a nature-positive portfolio must occur in precise stages. Portfolio duration is therefore managed through phased implementation and progressive de-risking, ensuring long-term stability without sacrificing innovation.

PHASE	YEARS	FOCUS	PORTFOLIO ALLOCATIONS
Stage 1 – Foundation	2025 – 2027	Build financial roots	Align legacy holdings to new allocation; implement biodiversity screens across all asset classes; establish governance and reporting systems.
Stage 2 – Expansion	2027 – 2030	Scale innovation	Launch domestic NAC pilot; expand biodiversity-linked bond exposure; develop partnerships with global funds.
Stage 3 – Consolidation	2030 – 2035	Integrate biodiversity metrics	Incorporate TNFD standards; rebalance toward proven biodiversity funds and successful NAC structures.
Stage 4 – Stewardship	2035 – 2050	Mature and de-risk	Shift toward stable income and nature-based real assets; realize compounding ecological and financial dividends.

4. NAC Spotlight

What is an NAC?

Recognized in the World Economic Forum's (WEF) 2025 Finance Solutions for Nature report as one of the most scalable mechanisms for nature investment, NACs convert ecosystem restoration and biodiversity recovery into a structured, reportable asset base (World Economic Forum, 2025). Precisely, they are a new type of corporate structure designed to hold the rights to manage, maintain and restore natural assets (like forests, wetlands, coral reefs, etc.) and to generate revenues from the ecosystem services those assets provide (such as carbon sequestration, clean water, biodiversity, etc.) (DePillis, 2024).

How does this fit our objectives?

Through the Borealis NAC Platform, BWF directly addresses Finland's most urgent environmental challenge: the accelerating collapse of domestic biodiversity. Finland's governance credibility, data infrastructure and strong forestry institutions uniquely position it to pioneer this structure at scale and set an international benchmark. This sovereign-backed NAC will focus on reversing ecosystem fragmentation, restoring peatlands, protecting old-growth habitats and safeguarding species diversity—interventions that are critical both to reducing stranded asset risk and for Finland's compliance with the COP15 Global Biodiversity Framework and its 2035 Net-Zero Act.

Unlike traditional forestry investments that optimize solely for timber output, NACs integrate habitat protection, species monitoring and structural forest diversity as core performance indicators. In doing so, they close a critical market gap: corporations tasked with reforestation often restore land for production rather than for biodiversity value. The NAC model ensures that biodiversity is not treated as a byproduct of forestry, but as a co-equal outcome alongside sustainable harvest yields. Domestically, NAC operations will scale and financially reinforce Finland's existing, capital-constrained biodiversity programs, including METSO, Helmi, and Prioritised Action Framework for Biodiversity LIFE. These initiatives currently depend on limited grant-based funding that fluctuates with fiscal policy. Integrating them into an NAC framework enables BWF to transform them into a self-sustaining restoration system.

Forestry Ownership

Around 60% of the country's forested land is owned privately by local residents who run small-scale operations – many of which have been passed down over generations. Another 10% is owned by corporations, with the remaining approximately one-third owned by the state (Forestry UBC, 2025). The NAC's expansion will follow a two-stage model for securing land-use and rights while ensuring legal clarity and stakeholder buy-in. The first stage begins by partnering with public agencies to transfer management rights, rather than full ownership, over selected state forest areas and conservation lands. The state will retain ownership, while the NAC manages the ecological assets and implements restoration plans with biodiversity metrics. Once proof of concept is established, private landowners are invited to opt in through leasing contracts that transfer ecosystem service rights (carbon sequestration, biodiversity enhancement, water regulation) to the NAC while they retain land ownership. In exchange, the private land owners will receive steady payments through biodiversity-linked financing, or a share of future credit revenues.

Revenue

In the short term, the NAC's revenue will primarily come from issuing green and biodiversity-linked loans to forestry companies and private forest owners. These loans are designed to finance biodiversity-enhancing practices, such as mixed-species planting, extended harvest rotations, conservation set-asides, and precision forestry technologies (McKinsey&Company, 2018). Each loan incorporates environmental performance conditions where recipients commit to measurable biodiversity improvements. Also, repayment may be made partly in financial terms and partly through the transfer of verified biodiversity credits to the NAC. This mechanism will align incentives early, positioning the NAC not as an anti-logging entity but as a strategic partner helping the forestry industry adapt to sustainability demands. In doing so, the NAC pilots biodiversity measurement methods and builds credibility in tracking ecological outcomes. During this initial phase, loan interest and partial biodiversity credits repayments provide a steady cash flow, bridging the period until nature-based markets mature. In the long term, the NAC's primary revenue sources will shift toward the sale of certified carbon and biodiversity credits, backed by verified improvements in forest carbon stocks and ecological integrity.

Impact on Finland's Forestry Industry

The NAC model complements, rather than replaces, Finland's existing forestry sector. Commercial logging would continue on designated production forests, while NAC management focuses on areas with high biodiversity or carbon-sequestration value, including marginal lands, older growth, as well as regions with declining timber yields. This division of land use allows the industry to maintain core production while meeting national biodiversity and climate targets.

For forestry companies, participation in the NAC framework offers benefits. It reduces regulatory and transition risk as Finland tightens environmental laws to achieve net-zero emissions. Firms can also focus on price premiums in export markets that continue to value traceable and sustainable supply chains. Finally, companies can transfer or lease underperforming forest areas to the NAC management to convert low-yield assets into revenue-generating biodiversity credits.

5. Managing Risks and Key Tradeoffs

This allocation resolves the fund's critical trade-offs. As conservation and restoration efforts get underway, logging yields will be reduced by roughly 16%, but revenues will be sustained by shifting to premium biodiversity-certified exports. Forestry exposure will remain a core pillar, while NACs and biodiversity credits hedge long-term stranded-asset risk. Approximately one-quarter of the portfolio remains domestic, enabling BWF to lead biodiversity restoration and forestry transition programs while avoiding excessive home-market exposure.

BWF operates at the intersection of financial performance, ecological restoration, and national policy. Effective risk management requires a multi-dimensional framework that anticipates systemic shocks while balancing liquidity, biodiversity, and long-term resilience.

1. **Concentration Risk -** Domestic vs Global

To mitigate exposure to Finland's forestry sector, BWF caps forestry exposure at 15% and diversifies into global biodiversity markets through allocations in sustainability-linked bonds, green infrastructure, and Natural Asset Companies (NACs). This ensures Finland remains the fund's ecological centerpiece while avoiding correlated domestic shocks.

Outcome: A balanced geographically diversified portfolio (27% Finland, 34% North America, 21% EU ex-Finland, and 18% APAC & EM) hedges home-market volatility while maintaining domestic influence, whilst providing macro and ecological diversification benefits.

2. **Regulatory & Policy Risk** - Short Term Cashflow vs Policy Compliance

The EU Nature Restoration Law, Biodiversity Strategy 2030, and Sustainable Finance Taxonomy reshape sustainable finance. Non-compliant forestry projects risk being labeled unsustainable, jeopardizing access to capital markets. Anticipating changing requirements, BWF addresses this through:

- Scenario planning for regulatory tightening (carbon caps, biodiversity quotas).
- TNFD-aligned reporting and taxonomy screening to ensure compliance flexibility and preparedness for future biodiversity-related disclosures.
- Strategic diversification into biodiversity-linked bonds and Natural Asset Companies (NACs) that meet EU disclosure and impact requirements.

Outcome: Short-term compliance costs are accepted to preserve long-term market eligibility and green-finance credibility.

3. **Greenwashing & Measurement Risk** - Ecological vs Reputational

BWF integrates the Biodiversity Footprint for Financial Institutions (BFFI) and Iceberg Data Lab metrics to quantify biodiversity outcomes and avoid reputational risk. Investments are verified under ICMA Green and Sustainability-Linked Bond Principles, ensuring transparency, traceability, and measurable ecological performance, preventing inflated ESG claims.

Outcome: Credible reporting ensures reputational resilience and strengthens BWF's position as a credible nature-positive investor.

4. **Financial Risk -** Ecological Projects vs Market Liquidity

BWF's dual-mandate structure balances liquid market assets (55%) with long-duration ecological projects (45%). The staged timeline—Foundation (2025–27), Expansion (2027–30), Consolidation (2030–35), and Stewardship (2035–50)—ensures liquidity while funding innovation. Diversified fixed income and biodiversity-linked instruments provide steady income streams and maintain a 6.5% expected return target over the long term.

Outcome: Liquidity cushions fund innovation; long-duration projects compound ecological and financial dividends.

5. **Ecological & Operational Risk**

Recognizing the physical risks of climate change and biodiversity collapse, BWF enforces strict ecological criteria: no monocultures, preference for native species restoration, and adaptive management across forestry and NAC projects. Drawing on global precedents such as the New Zealand Super Fund, BWF invests in precision forestry and biodiversity-monitoring technologies to mitigate pest, soil degradation, and carbon sink reversal risks.

Outcome: Even with slower carbon uptake, this approach ensures ecosystem resilience and long-term soil health. Short-term carbon gains are moderated to secure enduring biodiversity value and forest productivity. This ensures compliance with EU Habitat Directives, secures ecosystem resilience, and preserves carbon-sink credibility under the 2035 Net-Zero framework.

Decision Framework & Trade-Off Resolution

Each trade-off—carbon sequestration vs. biodiversity, short-term yield vs. forest resilience, domestic concentration vs. global diversification—is managed through BWF's Dual Mandate Matrix, which weighs both financial materiality and ecological integrity, transforming Finland's natural capital into a blueprint for resilient, biodiversity-driven sovereign finance.

Yield Trade-Off: A 16% reduction in short-term logging is offset by biodiversity-certified export premiums and credit revenues.

- Ecological Trade-Off: Slower carbon sequestration is accepted to ensure long-term ecosystem resilience.
- Portfolio Trade-Off: Global biodiversity investments hedge domestic ecological and policy risks.

Trade-Off	BWF Resolution	Rationale
Logging Yield vs Resilience	16% yield cut; biodiversity-certified exports	Maintains profitability while improving habitat quality Meets EU biodiversity criteria while maintaining export value
Domestic vs Global	15% forestry cap; global biodiversity projects	Diversifies risk and EU systemic exposure
Short-Term Cashflow vs Regulation	Allocate to SLBs & NACs	Future-proofs portfolio under EU Taxonomy
Ecology vs Finance	55% liquid / 45% long-term	Balances returns and mission Ensures liquidity under EU prudential rules
Carbon vs Biodiversity	Native restoration > monocultures	Secures long-term ecological stability Aligns with EU Nature Restoration Law

6. Biodiversity Valuation & Metrics Framework

Our framework for metrics is developed around three key aspects: climate, biodiversity and screening, to provide a consistent way to quantify and manage nature-related risks and opportunities across all assets in line with our 3-pillar mandate of forestry sustainability, biodiversity restoration, and capital stability.

1. Climate

The NAC will serve as the operational hub for testing the impact measurement framework. Using the IPCC carbon stock-change approach, each managed forest tract will report annual carbon flux (tCO_2e) and its corresponding internal carbon price exposure (US$/$tCO_2$). Temasek's internal price range for stress testing is US$65 per tonne of carbon dioxide and is expected to progressively increase this to US$100 per tCO_2e by 2030 (Temasek, 2025). This allows the NAC to directly translate ecological performance into financial terms, linking CO_2 removals and carbon credit generation to the company's revenue, and valuation metrics for long-term forestry sustainability. The NAC's goal is to maintain a net carbon sink while optimizing for long-term biomass growth and capital stability.

2. Biodiversity

Biodiversity restoration within the NAC will be tracked through the Shannon Index (H') and Biodiversity Intactness Index (BII), benchmarked to regional baselines. The Shannon Index combines two quantifiable measures: species richness (the number of species in a community) and species equitability (how the number of an individual species compares to the number of other species in the community). It is defined as: H = SUM(pi(ln(pi))), where H = diversity index, pi = proportion of total sample represented by species i, and ln = natural log (EPA). The BII incorporates the aspect of human pressures on the environment and is an estimated percentage of the original number of species and their abundance in any given area, despite human impacts (NHM). These indices quantify the recovery of species diversity and are performance-linked triggers for investor reporting and potential biodiversity credit issuance.

3. Systematic Screening

To ensure capital stability, biodiversity risk management will be linked to the portfolio through systematic screening. This will enable us to map exposure to biodiversity risk, stranded-asset potential, as well as carbon price sensitivity. The results will be consolidated in an internal dashboard showing portfolio-level KPIs, including net carbon intensity (tCO_2e/AUM), mean BII, and % AUM in high-biodiversity-risk assets to inform capital allocation and divestment decisions.

Linking environmental outcomes to financial stability and investor confidence:

By integrating these metrics into both asset operations and portfolio reporting, the company transforms ecological data into financial insight. The internal carbon price exposure quantifies climate transition risk in dollar terms, while biodiversity indices capture physical and regulatory risk to natural capital. Together, they form a dual lens for capital stability and ESG performance.

Regular publication of these KPIs in the company's sustainability disclosures will enhance transparency, attract nature-positive capital, and position the NAC as a model for investable natural assets. Over time, this framework will enable the company to embed impact-linked incentives and deliver measurable returns for both investors and the environment.

7. Evaluation and Conclusion

The path forward is as clear as the challenge. BWF should approve the Borealis Blueprint as its guiding framework, launch a pilot NAC within 12 months and rebalance its portfolio toward the proposed allocation over the next two years. Success will be measured not only in financial returns, but in securing the ecological capital that underpins Finland's economy for generations. Beyond returns, the Borealis framework provides a replicable blueprint for how sovereign funds can integrate biodiversity into global financial architecture—positioning Finland as a policy and market innovator.

8.1 Appendix: Assumptions

A1. Market & Valuation

There will be active markets for carbon and biodiversity credits, enabling the monetization of ecosystem outcomes.
Carbon prices remain stable or rise above the internal benchmark (≈ US$65/$tCO_2$).
Investors continue to seek nature-positive assets and accept natural-capital valuation methods.
Green bonds and blended-finance instruments remain available to fund restoration projects.

A2. Policy & Regulation

EU and national biodiversity laws (Nature Restoration Law, 30×30 targets) remain consistent and enforceable.
NACs are legally recognized and supported as investable conservation structures.
Taskforce on Nature-related Financial Disclosures (TNFD) and International Financial Reporting Standards (IFRS) converge, allowing uniform environmental reporting.
Governments maintain incentives for private conservation investment.

A3. Ecological & Operational

Targeted forest and land areas can achieve measurable restoration within 10–20 years.
Baseline data and remote sensing are reliable enough for credible measurement, reporting and verification.
Climate or pest shocks remain within manageable risk limits.
The NAC has sufficient governance rights over land management to enforce restoration protocols, harvest limits, and conservation zoning.

A4. Financial & Portfolio Integration

Diversification across assets and regions mitigates local ecological and policy risks.
Improvements in carbon and biodiversity metrics correlate with higher asset value and lower financing costs.
The internal carbon price and biodiversity risk scores accurately reflect long-term balance-sheet risks, allowing proactive allocation and de-risking.
Comparable benchmarks (Temasek, AXA) guide performance evaluation

A5. Governance & Stakeholders

Local alignment exist. Landowners, communities, and indigenous groups support conservation and restoration activities, minimizing social risk.
Stakeholders share ecological and operational data openly to facilitate verification and credit issuance.
Political cycles and management turnover will not disrupt ongoing monitoring or the permanence of nature-based assets.

A6. Transition Path

The portfolio transitions gradually from extractive forestry toward natural-capital management.
Tangible biodiversity and carbon gains materialize within 5–10 years, aligning with investor reporting cycles.
Secondary markets will exist for mature NAC or biodiversity-linked assets, ensuring liquidity at exit.

8.2 Appendix: Research Summaries and Quantitative Methods

A1. Supporting Literature

Forest certification and economic insights: a European perspective
(Frontiers in Forests and Global Change, 2024; DOI: 10.3389/ffgc.2024.1464837)
This meta-study reviews how third-party forest-certification systems (FSC, PEFC) influence economic outcomes across Europe. It finds that certified forest owners typically capture price premiums of 2–5 % and benefit from more stable export demand, though certification costs can offset gains for smallholders. These findings support the Borealis Wealth Fund's assumption that Finland's certified timber could command a 25–30 % premium by 2030 as EU procurement increasingly requires certified material.

Secondary wood manufacturers' willingness-to-pay for certified wood products in Italy
(Forest Policy and Economics 86, 2017, p. 45-52; ScienceDirect)
Using a discrete-choice model of 224 Italian manufacturers, this study estimates an average willingness-to-pay of 4.6 % for certified wood inputs and up to 9 % for firms exporting to northern Europe. It confirms that certification adds measurable market value and justifies incorporating certification-driven premiums in the Fund's revenue assumptions.

A2. Quantitative Method for Carbon-Sink Restoration

Objective: Restore Finland's net LULUCF (Land Use, Land-Use Change and Forestry) sequestration to the 2015 level, closing an estimated 17.82 Mt CO2 per year gap between current and target performance. The model uses an established rule-of-thumb from Suomen luonnonsuojeluliitto (SLL) and the Finnish Environment Institute (SYKE): each 1 million m^3 (Mm^3) change in annual harvest volume corresponds to a 1.5 Mt CO2 per year change in the net sink.

Key Calculation: Required harvest reduction = 17.82 ÷ 1.5 = 11.88 Mm^3 per year. This reduction is phased in linearly from 2026 to 2030, increasing by 2.376 Mm^3 each year. By 2030, harvest volumes are 16.3% below 2023 levels, equivalent to 11.88 Mm^3 or about 3.7 million hectares of stands withheld from harvest

Appendix A3 — Data Sources

Dataset/Publication	Main Variable Used	Institution/year
SYKE / SLL Policy Brief	1 Mm^3 ↔ 1.5 Mt CO2 yr^{-1}	SLL / SYKE (2025)
LUKE (2024)	Roundwood removals 72.7 Mm^3 (2023 provisional)	Natural Resources Institute Finland
LUKE / ICOS (2024)	Forest emissions +1.12 Mt CO2; LULUCF +11.8 Mt CO	ICOS Carbon Portal
UNFCCC CRTs (2024)	2015 vs 2023 LULUCF sink values	Government of Finland
Lehtonen et al. (2023)	CCF on peatlands adds ≈ 1 Mt CO_2 yr^{-1} sink	Natural Resources Institute Finland
FAO Open Knowledge (2023)	Forest area 22.8 Mha	FAO / NFI Finland

A4. Methodological Caveats

The 1.5 Mt CO2 per Mm^3 factor is an average derived from national-level analyses. The true sequestration effect depends on which stands are spared from harvest. Peatland forests store a disproportionately large share of Finland's carbon; over 70% of total forest soil carbon. Thus, reductions in harvest volume alone cannot realistically restore the 2015 sink level unless combined with large-scale peatland rewetting and shifts to continuous-cover forestry. In practice, a mixed strategy, moderate harvest reductions coupled with targeted peatland restoration, achieves greater carbon and biodiversity gains with smaller economic costs.

Appendix A5. Policy Interpretation

A linear reduction of approximately 16% in fellings by 2030 could restore the 2015 carbon sink level if achieved solely through reduced harvests. However, this model assumes uniform forest response across all ecosystems, which is not accurate at scale. In reality, restored forests will differ structurally and ecologically from 2015 forests due to soil degradation, drainage history, and climatic changes. Therefore, full sink recovery requires simultaneous peatland rewetting (responsible for roughly 70% of Finland's forest carbon sequestration) alongside harvest moderation. This combined pathway ensures both ecological integrity and economic feasibility.

8.3 Appendix: Methodology and Data Sources for Portfolio Construction

A1. Resources and Methods for Estimating Expected Return and Risk

The portfolio's core asset classes—listed equities, fixed income, and green infrastructure—were allocated and evaluated using a framework inspired by Norges Bank Investment Management (NBIM). NBIM's historical returns by asset class were used as reference benchmarks for estimating the expected return and standard deviation of each corresponding asset class within our portfolio.

For forestry and natural capital (NAC) exposures, return and risk estimates were derived from published research and market reports by AcreTrader and Fiera Capital, respectively. These sources provided indicative return ranges and volatility estimates specific to timberland and natural capital investments.

The private equity (PE) allocation was constructed using a blended approach: expected returns were derived as a weighted average of 50% historical private equity index returns (MSCI Private Equity Return Tracker) and 50% returns from biodiversity and nature-based private market funds, reflecting the thematic orientation of the portfolio.

A2. Excel Workbook

Asset	Weighting	Expected Return	Standard Deviation	Sharpe Ratios		Sources
Equity	**35.0%**	10.6%	13.8%	0.76		NBIM
FI	**20.0%**	3.3%	5.8%	0.57		NBIM
Green Infra	**20.0%**	9.4%	7.3%	1.30		NBIM
Forestry	**10.0%**	9%	7.00%	1.29		Fiera Capital, AcreTrader
NAC	**7.0%**	10%	7.00%	1.43		Fiera Capital, AcreTrader
PE	**3.0%**	11%	18.00%	0.61		Temasek, Robeco, MSCI
Cash	**5.0%**	0.5%				Robeco
	100.0%					
	2%	Risk-free rate				FRED
	8.2%	Expected Return				
	7.1%	Expected standard deviation				SSGA Estimate
	0.87	Sharpe Ratio				

A3. Note on Academic Rigour and Future Development

The analytical framework employed in this project was primarily qualitative, with quantitative estimates drawn from secondary data and industry benchmarks. Due to time and resource constraints, it was not possible to construct a full correlation matrix among asset classes; as such, portfolio-level risk (standard deviation) was not explicitly calculated. Future work should aim to integrate a correlation-based variance–covariance model to derive a more robust estimate of portfolio volatility.

Preliminary Sharpe ratios appear higher than might be expected for comparable institutional portfolios (see below), likely due to reliance on optimistic or unadjusted historical averages. Further refinement will involve stress-testing assumptions, adjusting for inflation and modelling Natural Capital (NAC) as a distinct corporate structure to estimate its expected return distribution more accurately.

A4. Data Sources

- NBIM: https://www.nbim.no/en/the-fund/investments/
- Fiera Capital: https://www.fiera.com/en/insights/natural-capital-white-paper
- AcreTrader: https://www.acretrader.com/
- Temasek: https://www.temasekreview.com.sg/downloads/Temasek-Review-2025-full-version.pdf
- Robeco: https://www.robeco.com/en/insights/expected-returns
- MSCI: https://www.msci.com/our-solutions/indexes/private-equity
- FRED: https://fred.stlouisfed.org/series/IRLTLT01FIM156N
- SSGA: https://www.ssga.com/library-content/assets/pdf/global/mas/2024/investment-trends-among-sovereign-wealth-funds.pdf

A5. NAC Portfolio Benefits

Natural Capital Provides Strong Benefits to a Portfolio

LOW OR NEGATIVE CORRELATION

Low or negative correlation with other asset classes (both traditional and alternative)

Low/Negative Correlations
20 Year (2003-2022)

Correlations	Farmland	Timberland
U.S. Equities	(0.18)	(0.28)
10-Yr U.S. Treasuries	0.10	(0.04)
3-Month T-Bills	0.39	0.60
Corporate Bonds	(0.04)	(0.31)
REITs	(0.02)	(0.23)
Gold	(0.08)	(0.19)
International Equities	0.19	0.06
Emerging Mkts Equities	(0.01)	(0.09)

INFLATION HEDGE

Farmland and timberland vary positively with inflation

Inflation Hedge[1]
20 Year (2003-2022)

Correlations	US CPI
Timberland	**0.50**
3-Month T-Bills	0.37
Farmland	**0.24**
Gold	0.06
10-Yr U.S. Treasuries	(0.20)
Emerging Mkts Equities	(0.30)
International Equities	(0.33)
REITs	(0.49)
Corporate Bonds	(0.52)
U.S. Equities	(0.55)

STORE OF VALUE

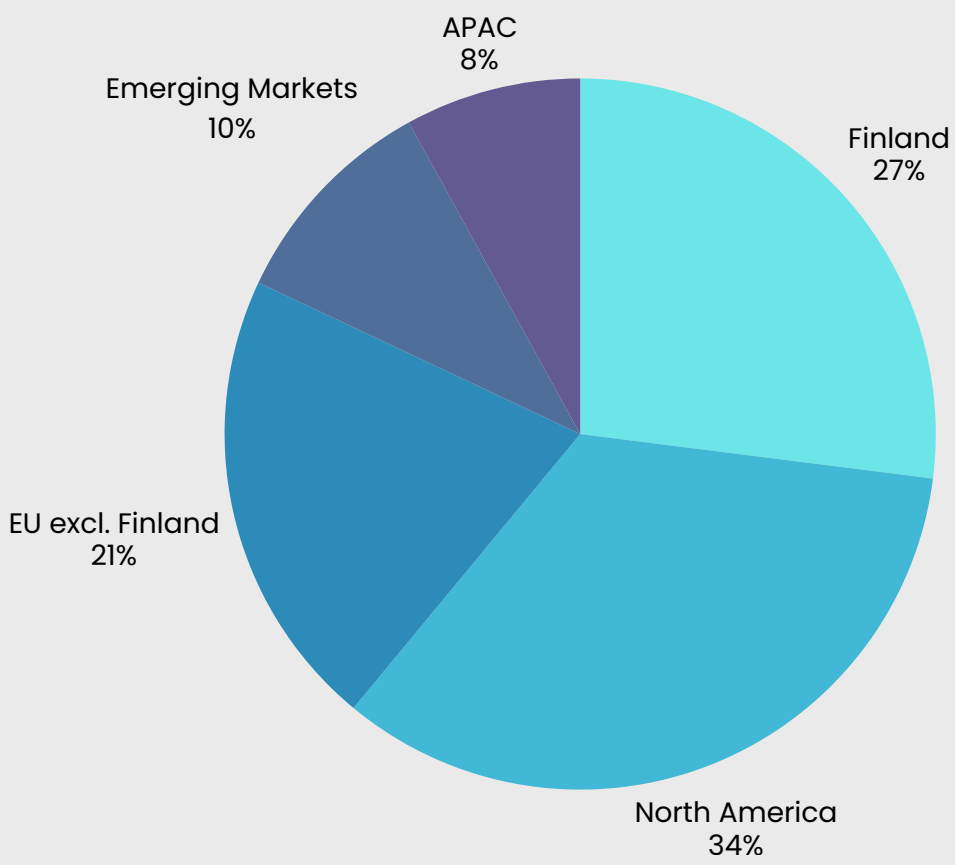
Significant downside protection given higher proportion of value in land

Good Store of Value
(Years with Negative Performance)

Correlations	Farmland	Timberland
'91-'95	0	0
'96-'00	0	0
'01-'05	0	1
'06-'10	0	2
'11-'15	0	0
'16-'23	0	0
Total	**0**	**3**
Avg. Decline	n.a.	(3.4%)
Maximum Decline	n.a.	(5.2%)

Fiera Capital: Natural Capital White Paper https://uk.fieracapital.com/wp-content/uploads/headlines/8927/white-paper-fc-natural-capital-uk-eng.pdf

A6. Geographic Balance of Portfolio



The proposed Borealis Wealth Fund portfolio achieves a balanced global footprint designed to reduce domestic concentration risk of stranded assets, while maintaining Finland's leadership in biodiversity finance. As shown, 27% of assets remain in Finland to support national restoration initiatives, while 73% are diversified internationally: 34% in North America, 21% in the EU (excluding Finland), 8% in APAC, and 10% in emerging markets. This will allow exposure to global biodiversity markets and alignment with international sustainability standards.

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