

Required fields are shown with yellow backgrounds and asterisks.

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SECURITIES AND EXCHANGE COMMISSION  
WASHINGTON, D.C. 20549  
Form 19b-4

File No. \* SR 2023 - \* 09

Amendment No. (req. for Amendments \*)

Filing by New York Stock Exchange LLC

Pursuant to Rule 19b-4 under the Securities Exchange Act of 1934

Initial * <input checked="" type="checkbox"/>	Amendment * <input type="checkbox"/>	Withdrawal <input type="checkbox"/>	Section 19(b)(2) * <input checked="" type="checkbox"/>	Section 19(b)(3)(A) * <input type="checkbox"/>	Section 19(b)(3)(B) * <input type="checkbox"/>
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Pilot <input type="checkbox"/>	Extension of Time Period for Commission Action * <input type="checkbox"/>	Date Expires * <input type="text"/>
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Rule

<input type="checkbox"/> 19b-4(f)(1)	<input type="checkbox"/> 19b-4(f)(4)
<input type="checkbox"/> 19b-4(f)(2)	<input type="checkbox"/> 19b-4(f)(5)
<input type="checkbox"/> 19b-4(f)(3)	<input type="checkbox"/> 19b-4(f)(6)

Notice of proposed change pursuant to the Payment, Clearing, and Settlement Act of 2010  
Section 806(e)(1) \*

Section 806(e)(2) \*

Security-Based Swap Submission pursuant to the Securities Exchange Act of 1934  
Section 3C(b)(2) \*

Exhibit 2 Sent As Paper Document

Exhibit 3 Sent As Paper Document

### Description

Provide a brief description of the action (limit 250 characters, required when Initial is checked \*).

Proposal to amend the NYSE Listed Company Manual

### Contact Information

Provide the name, telephone number, and e-mail address of the person on the staff of the self-regulatory organization prepared to respond to questions and comments on the action.

First Name \* John Last Name \* Carey

Title \* Senior Director, NYSE Group Inc.

E-mail \* John.Carey@ice.com

Telephone \* (212) 656-5640 Fax

### Signature

Pursuant to the requirements of the Securities Exchange of 1934, New York Stock Exchange LLC has duty caused this filing to be signed on its behalf by the undersigned thereunto duty authorized.

Date 01/27/2023

(Title \*)

By Patrick Troy

(Name \*)

Associate General Counsel

NOTE: Clicking the signature block at right will initiate digitally signing the form. A digital signature is as legally binding as a physical signature, and once signed, this form cannot be changed.

Patrick Troy Digitally signed by Patrick Troy  
Date: 2023.01.27 13:04:05 -05'00'

Required fields are shown with yellow backgrounds and astericks.

SECURITIES AND EXCHANGE COMMISSION  
WASHINGTON, D.C. 20549

For complete Form 19b-4 instructions please refer to the EFFS website.

**Form 19b-4 Information \***

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SEC Sub of NAC 1-23-23 on 1-26-23.

The self-regulatory organization must provide all required information, presented in a clear and comprehensible manner, to enable the public to provide meaningful comment on the proposal and for the Commission to determine whether the proposal is consistent with the Act and applicable rules and regulations under the Act.

**Exhibit 1 - Notice of Proposed Rule Change \***

Add Remove View

Ex. 1 SEC Sub of NAC 1-23-23 on 1-2

The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO]-xx-xx). A material failure to comply with these guidelines will result in the proposed rule change being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

**Exhibit 1A - Notice of Proposed Rule Change, Security-Based Swap Submission, or Advanced Notice by Clearing Agencies \***

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The Notice section of this Form 19b-4 must comply with the guidelines for publication in the Federal Register as well as any requirements for electronic filing as published by the Commission (if applicable). The Office of the Federal Register (OFR) offers guidance on Federal Register publication requirements in the Federal Register Document Drafting Handbook, October 1998 Revision. For example, all references to the federal securities laws must include the corresponding cite to the United States Code in a footnote. All references to SEC rules must include the corresponding cite to the Code of Federal Regulations in a footnote. All references to Securities Exchange Act Releases must include the release number, release date, Federal Register cite, Federal Register date, and corresponding file number (e.g., SR-[SRO]-xx-xx). A material failure to comply with these guidelines will result in the proposed rule change being deemed not properly filed. See also Rule 0-3 under the Act (17 CFR 240.0-3)

**Exhibit 2- Notices, Written Comments, Transcripts, Other Communications**

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Copies of notices, written comments, transcripts, other communications. If such documents cannot be filed electronically in accordance with Instruction F, they shall be filed in accordance with Instruction G.

Exhibit Sent As Paper Document

**Exhibit 3 - Form, Report, or Questionnaire**

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Revised Ex. 3 SEC Sub of EP Framew

Copies of any form, report, or questionnaire that the self-regulatory organization proposes to use to help implement or operate the proposed rule change, or that is referred to by the proposed rule change.

Exhibit Sent As Paper Document

**Exhibit 4 - Marked Copies**

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The full text shall be marked, in any convenient manner, to indicate additions to and deletions from the immediately preceding filing. The purpose of Exhibit 4 is to permit the staff to identify immediately the changes made from the text of the rule with which it has been working.

**Exhibit 5 - Proposed Rule Text**

Add Remove View

Ex. 5 SEC Sub of NAC 1-23-23 on 1-2

The self-regulatory organization may choose to attach as Exhibit 5 proposed changes to rule text in place of providing it in Item I and which may otherwise be more easily readable if provided separately from Form 19b-4. Exhibit 5 shall be considered part of the proposed rule change

**Partial Amendment**

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If the self-regulatory organization is amending only part of the text of a lengthy proposed rule change, it may, with the Commission's permission, file only those portions of the text of the proposed rule change in which changes are being made if the filing (i.e. partial amendment) is clearly understandable on its face. Such partial amendment shall be clearly identified and marked to show deletions and additions.

1. Text of the Proposed Rule Change

- (a) Pursuant to the provisions of Section 19(b)(1) of the Securities Exchange Act of 1934 (the “Act”)<sup>1</sup> and Rule 19b-4 thereunder,<sup>2</sup> New York Stock Exchange LLC (the “NYSE” or the “Exchange”) proposes to amend the NYSE Listed Company Manual (“Manual”) to adopt a new listing standard for the listing of Natural Asset Companies.

The text of the proposed rule change is set forth in Exhibit 5 attached hereto.

- (b) The Exchange does not believe that the proposed rule change would have any direct effect, or any significant indirect effect, on any other Exchange rule in effect at the time of this filing.
- (c) Not applicable.

2. Procedures of the Self-Regulatory Organization

Senior management has approved the proposed rule change pursuant to authority delegated to it by the Board of the Exchange. No further action is required under the Exchange's governing documents. Therefore, the Exchange's internal procedures with respect to the proposed rule change are complete.

The person on the Exchange staff prepared to respond to questions and comments on the proposed rule change is:

John Carey  
Senior Director  
NYSE Group, Inc.  
(212) 656-5640

3. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

- (a) Purpose

The Exchange proposes to adopt a new subsection of Section 102 of the Manual (to be designated Section 102.09) to permit the listing of common equity securities of Natural Asset Companies (or “NACs”).

For purposes of proposed Section 102.09, a NAC is a corporation whose purpose is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services, and whose value is based on those natural

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<sup>1</sup> 15 U.S.C. 78s(b)(1).

<sup>2</sup> 17 CFR 240.19b-4.

assets and ecosystem services. Additionally, a NAC may use its funds to support community well-being, provided that such uses do not cause any material adverse impact to the natural assets under its control.

### **Introduction to NACs**

The value of nature to life on earth is readily apparent. Healthy ecosystems produce clean air and water, foster biodiversity, regulate the climate, and provide the food on which our existence depends. For purposes of this proposal, the term “ecosystem” refers to specific entities (structures, functions, and components of the natural world) that produce ecosystem services. These and other benefits derived from ecosystems are called ecosystem services, and in aggregate, economists estimate their value at more than US\$100 trillion dollars per year.<sup>3</sup> Examples of ecosystem services include clean air, water supply, flood protection, productive soils for agriculture, climate stability, habitat for wildlife, among others.

Despite a recognition that nature is immensely valuable, that value generally has not been included in the financial system. Public policy initiatives, like regulatory carbon markets, have made progress toward reflecting the true cost of industrial activities, but most environmental values remain uncaptured by financial reporting. Because financial markets do not include the positive and negative externalities related to nature’s consumption and production, ecosystem services are being degraded at alarming rates. Species extinction is proceeding at a pace never experienced in human history.<sup>4</sup> Fresh water resources are being consumed and polluted. Agriculture is contributing to the loss of natural habitat and soil degradation. These are significant threats to life on earth and the economy.

Recognizing the urgency and opportunity presented by these conditions, investors increasingly express a desire for investment vehicles that will permit them to express a sustainability thesis.<sup>5</sup> Improvements in corporate disclosures,<sup>6</sup> introduction of climate

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<sup>3</sup> Costanza et al (2014). Changes in the global value of ecosystem services, *Global Environmental Change*, 26, 152-158. Available at: <https://doi.org/10.1016/j.gloenvcha.2014.04.002>

<sup>4</sup> IPBES (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). Available at: <https://doi.org/10.5281/zenodo.3831673>

<sup>5</sup> Global Sustainable Investment Alliance (2020). *Global Sustainable Investment Review, 2020*. Available at: <http://www.gsi-alliance.org/wp-content/uploads/2021/08/GSIR-20201.pdf>

<sup>6</sup> The Commission has stated that a number of its disclosure rules may require disclosure related to climate change. Commission Guidance Regarding Disclosure Related to Climate Change, Release No. 33-9106 (Feb. 2, 2010) 75 FR 6290 (Feb. 8, 2010). Also,

and nature-focused indices, and the development of ESG funds screening for preferred or prohibited factors have all expanded the accessibility of sustainable investing. Despite these advances, however, investors still express an unmet need for efficient, pure-play exposure to nature and climate.

Although there is significant demand to deploy financial capital toward sustainability, stewards of natural landscapes have often had little choice other than extractive development to fund their budgets or garner a return on investment. Capital flows directed to biodiversity conservation, renewable energy, regenerative agriculture, and other direct investments needed to facilitate a transition to a sustainable economy are insufficient due in part to the inability to transparently present the economic case to access these investment dollars based on traditional measures for financial performance. The financing gap for biodiversity is estimated between US\$598 and US\$824 billion per year<sup>7</sup> and for climate change is estimated at over US\$5 trillion per year,<sup>8</sup> and likely an order of magnitude larger for the transition to a more sustainable, resilient, and equitable economy.<sup>9</sup>

Ending the overconsumption of and underinvestment in nature requires bringing natural assets into the financial mainstream. To that end, the Exchange proposes to adopt listing standards to introduce a new type of public company called a NAC, a new concept pioneered by Intrinsic Exchange Group Inc. (“IEG”). Founded in 2017, IEG is a private

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the Commission’s Division of Corporation Finance recently reminded registrants that it selectively reviews filings to monitor and enhance compliance with applicable disclosure requirements. Available at:

<https://www.sec.gov/corpfin/sample-letter-climate-change-disclosures>

<sup>7</sup> Deutz, A., Heal, G. M., Niu, R., Swanson, E., Townshend, T., Zhu, L., Delmar, A., Meghji, A., Sethi, S. A., and Tobinde la Puente, J. 2020. *Financing Nature: Closing the global biodiversity financing gap*. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability. Available at: <https://www.nature.org/en-us/what-we-do/our-insights/reports/financing-nature-biodiversity-report/>

<sup>8</sup> Boehm, S., K. Lebling, K. Levin, H. Fekete, J. Jaeger, R. Waite, A. Nilsson, J. Thwaites, R. Wilson, A. Geiges, C. Schumer, M. Dennis, K. Ross, S. Castellanos, R. Shrestha, N. Singh, M. Weisse, L. Lazer, L. Jeffery, L. Freehafer, E. Gray, L. Zhou, M. Gidden, and M. Gavin. 2021. *State of Climate Action 2021: Systems Transformation Required to Limit Global Warming to 1.5°C*. Washington, DC: World Resources Institute: <https://doi.org/10.46830/wrirpt.21.00048>.

<sup>9</sup> Force for Good (2021). *Capital as a Force for Good, 2021 Report*. Available at: [https://www.forcegood.org/frontend/img/2021\\_report/pdf/Funding\\_the\\_SDGs\\_and\\_a\\_Sustainable\\_Future.pdf#toolbar=0](https://www.forcegood.org/frontend/img/2021_report/pdf/Funding_the_SDGs_and_a_Sustainable_Future.pdf#toolbar=0) Chapter 2.

company structured as a corporation organized under the laws of the State of Delaware that advises public sector and private landowners on the creation of NAC structures and strategies.

NACs will be corporations that hold the rights to the ecological performance (i.e., the value of natural assets and production of ecosystem services) produced by natural or working areas, such as national reserves or large-scale farmlands, and have the authority to manage the areas for conservation, restoration, or sustainable management. These rights can be licensed like other “run with the land” rights (such as mineral rights, water rights, or air rights) and NACs are expected to license these rights from sovereign nations, private landowners, or companies with significant property holdings. Alternatively, a NAC may itself own the underlying terrestrial or marine areas it manages.

Under the proposed amendments to the Manual, capital raised through an NYSE-listed NAC’s initial public offering or follow-on offerings must be used to implement the conservation, restoration, or sustainable management plans articulated in its prospectus, fund its ongoing operations, or otherwise fulfill its purpose to maximize ecological performance (i.e., the value of natural assets and the production of ecosystem services). While the purpose of a NAC is to maximize ecological performance, under the proposed rules, a NAC would not be prohibited from also operating a traditional business (e.g., eco-tourism in a natural landscape, or producer of regenerative food crops in a working landscape) provided that doing so is consistent with the NAC’s charter. However, all NACs are prohibited from directly or indirectly conducting unsustainable extractive activities that lead to the degradation of the ecosystems it is trying to protect, such as mining. Additionally, a NAC could monetize those ecosystem services which are currently visible in the market (e.g., through the sale of carbon credits) and the related revenues and expenses would be reported in the financial statements of the NAC prepared under generally accepted accounting principles (“GAAP”) and filed with the SEC as part of the NAC’s required annual report on Form 10-K, 20-F or 40-F, as applicable. In order to align the interests of local communities with the objectives of maximizing the value of natural assets and the production of ecosystem services, a NAC would also be able to use its funds to support local community well-being (e.g., education, health), provided that such uses do not cause any material adverse impact to the natural assets under its control.

Because most ecosystem services are not yet monetized and integrated into markets, investors will need information beyond its GAAP financial statements to understand the value of a NAC. Therefore, the Exchange proposes to require each NAC to produce new materials called Statements of Ecological Performance (the “Statements”) that measure the productivity, value, and condition of the area whose ecological performance rights are held by the NAC. These Statements are based on the Ecological Performance Framework (the “Framework”) developed by IEG.

The Statements would report dozens of distinct ecosystem services measured through a discipline called Ecosystem Service Valuation (“ESV”). ESV is an economic discipline

that has been in existence for decades and is used by governments, companies, and courts across the world to link environmental statistics for a given area to economic values that are used to support major financial, policy, and legal decisions ranging from ordinary course planning and management to natural disaster relief and civil litigation.

Under the proposed amendments to the Manual, NACs will conduct an ESV at least annually to prepare the Statements. The Statements of Ecological Performance and ESV must be reviewed and attested to by a public accounting firm that is registered with the Public Company Accounting Oversight Board (“PCAOB”) and is independent from the NAC and NAC licensor, if applicable, under the independence standard set forth in Rule 2-01 of Regulation S-X (“Independent Reviewer”).

In addition to the GAAP financial statements required under SEC disclosure rules and the proposed Statements that would be derived through an ESV, NYSE proposes to require NACs to provide a number of unique disclosures designed to provide safeguards and transparency on the NAC’s social and environmental objectives. These include requiring NACs to adopt and publish an Environmental and Social Policy, a Biodiversity Policy, a Human Rights Policy, consistent with the United Nations Guiding Principles on Business and Human Rights,<sup>10</sup> and an Equitable Benefit Sharing Policy.

Finally, to the extent the NAC has a license agreement with a natural asset owner, the NAC will be required under applicable SEC rules to disclose all material information about the license (including any material amendments to the license over time) in the registration statement filed in connection with its IPO and in its subsequent periodic SEC filings.

### **Relationship with IEG**

The Exchange and IEG have entered into an agreement pursuant to which IEG has granted the Exchange an exclusive license in the United States to use the Framework in connection with the listing of NACs on the Exchange (although the Framework will remain proprietary to IEG). IEG has agreed to seek to identify and develop NACs for listing on the Exchange, in addition to marketing the listing and trading of NACs on the Exchange and providing training with respect to the NAC structure and the Framework to NYSE personnel and currently listed and potential listed NACs. While IEG will seek to promote the listing of NACs on the NYSE, the determination of the suitability for listing of any applicant NACs will solely be made by the NYSE and IEG will have no role in the listing qualification process.

### **Definitions of Key Terms Used in this Proposal, in the context of a NAC**

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<sup>10</sup> United Nations (2011). *Guiding principles on business and human rights: Implementing the United Nations "Protect, Respect and Remedy" framework*. Available at: [https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr\\_en.pdf](https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr_en.pdf)

**Biodiversity** – Defined as “the variability among living organisms from all sources including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.<sup>11</sup>

**Community Well-being** – Refers to the combination of social, economic, environmental, cultural, and political conditions of individuals and their communities as essential for them to flourish and fulfil their potential.<sup>12</sup>

**Consumer Surplus Value** – The value obtained by consumers of a good or service beyond what is actually paid for the good or service. This is the extra welfare or utility that people obtain for free from the consumption of ecosystem goods and services.

**Cost-based Value** – Values based on expenditures involved in preventing, avoiding, mitigating, restoring, or replacing the loss of ecosystems and/or ecosystem services.

**Ecological Performance** – The value of natural assets and the production of ecosystem services.

**Ecological Performance Rights** –The rights to the ecological performance (i.e., the value of natural assets and production of ecosystem services) of a designated area, including the authority to manage the area. These rights are granted to a NAC, from a natural asset owner, as provided through a license or other legal instrument.

**Ecosystem Services** – The benefits people derive from ecosystems, many of which are provided outside market settings. These include the direct and indirect contributions from nature to economies and people’s wellbeing. The term is used to include both goods and services. Examples of ecosystem services include air filtration, water supply, flood protection, soil quality regulation, climate stability, and habitat for wildlife.

**Ecosystems** – The specific entities (structures, functions, and components of the natural world) that produce ecosystem services. The term is used by ecologists to define units within the natural world based on the interactions of plants, animals, and micro-organisms with the non-living environment.

**Ecosystem Service Valuation or ESV** – The assignment of an economic value to an ecosystem service using one of many valuation methodologies accepted today.

**Exchange Value** – The market price or price point equivalent of an ecosystem service represented by where demand and supply curves meet. This value type represents a

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<sup>11</sup> Convention on Biological Diversity (1992) Convention on Biological Diversity, Secretariat of the Convention on Biological Diversity, Montreal, Canada.

<sup>12</sup> Wiseman, J., Brasher, K. (2008) Community wellbeing in an unwell world: trends, challenges, and possibilities. *Journal of Public Health Policy*, 29: 353-366.



realized market price or its potential price.

**Extent** – Refers to a spatial area measure in hectares or acres. The extent of the NAC will refer to the total area of the NAC at its most aggregate level; in the Statements of Underlying Quality, extent will be reported by ecosystem type. In the Statements on Natural Assets, the extent will refer to the areas supplying the ecosystem services being measured and valued.

**Hybrid Areas** – Areas that integrate natural areas with working areas and/or built infrastructure in a single NAC to produce the most value within a diverse landscape.

**IEG Ecological Performance Framework** – IEG has developed a specific framework for NACs to derive and report on ecosystem service values and on the quality of the natural assets being managed. In addition, the Framework defines the components and structure of the Statements of Ecological Performance to ensure the values are reported transparently and consistently.

**Independent Reviewer** – A public accounting firm registered with the PCAOB independent of a NAC and a NAC’s licensor.

**Local Communities** – refers to groups of people—including indigenous peoples and other local groups—who have direct ties to and derive livelihood or cultural values from the area to which the NAC holds the license.

**Natural Areas** – Areas managed by a NAC where the NAC’s focus is on creating new conservation areas (e.g., intact landscapes, or seascapes); protecting existing conservation areas; or restoring degraded areas to protect and enhance biodiversity and ecosystem service production.

**Natural Assets** – A statistical representation of ecosystems for accounting purposes that defines them as productive units of ecosystem services. Natural assets can be monetized directly or indirectly. Like traditional assets, they have economic value and are expected to provide a future benefit. The term in the singular form refers to an ecosystem type (e.g., a delineated forest).

**Natural Asset Companies (NACs)** – Corporations that hold the rights to the ecological performance of natural, hybrid, or working areas, and have the authority to manage the areas for conservation, restoration, or sustainable management.

**Natural Production** – The production and use of ecosystem goods and services by Natural Assets.

**Statement of Natural Assets** – A statement that provides information on the net present value of natural assets producing ecosystem services managed by a NAC.

**Statement of Natural Production** – A statement that provides information on the annual flows of ecosystem services managed by a NAC.

**Statement of the Quality of Underlying Assets** – A statement that provides both qualitative and quantitative information on the overall health and condition of the underlying natural assets being managed by the NAC.

**Statements of Ecological Performance** – A suite of statements with information on the ecological performance of a NAC, including a Statement of Natural Production, a Statement of Natural Assets, and a Statement of the Quality of Underlying Assets. These statements are unique to NACs and are reported in addition to traditional financial statements.

**Sustainable Activities** – From an ecological perspective, sustainable activities cannot extract resources at a faster rate than they are replenished. For an activity to be deemed sustainable there should be no directly induced degradation of the condition of the ecosystems (which can be measured through the indicators in the Statement of the Quality of Underlying Assets).

**Total Economic Value** – A concept of value that disaggregates the different types of economic values that people place on ecosystems and/or natural resources, including non-use values, option values, indirect use value and direct use values.

**Working Areas** – Areas primarily designated for agricultural production and managed by a NAC. With respect to a Working Area, a NAC’s focus is on converting existing production practices from conventional methods, which degrade ecosystems, to regenerative agriculture methods, which increase the health of the soil and the surrounding water, provide room for nature, improve the nutritional value of food, and increase farm income.

### **The IEG Ecological Performance Framework**

IEG has developed the Ecological Performance Framework (“Framework”), specifically to value NACs. The Framework builds upon widely utilized Ecosystem Service Valuation (“ESV”) methodologies, approaches, and standards. The Framework defines the components and structure of the Statements of Ecological Performance to ensure transparency, robustness, and consistency in the reporting of values and information in the Statements of Ecological Performance.

The Framework to be used by NACs is grounded on the measurement, valuation approaches, and ecosystem service categories in the United Nations System of Environmental and Economic Accounting – Ecosystem Accounting Framework (“SEEA EA Framework”). Most of the ecosystem service categories used in the Framework directly reflect the categories (names and definitions) used in the SEEA EA Framework as well as the SEEA EA Framework’s guidelines for the biophysical measurement of ecosystem services and their related valuation.

The Framework differs from the SEEA EA Framework by including additional ecosystem service values and valuation approaches that are designed to provide transparent information on the Total Economic Value (“TEV”) of natural assets and the underlying productive capacity of nature. Specifically, the Framework builds on the SEEA EA Framework by also including a larger set of ecosystem services (38 in total) that must be considered for potential inclusion when conducting an ESV. These ecosystem services are classified into three categories - including provisioning, regulating and maintenance, as well as cultural services. In addition, non-use values are presented as a separate category of value attributed to the ecosystem(s). These categories are used to classify the different ways in which people benefit from ecosystem service production.

The Framework builds upon the efforts of these and other existing frameworks by:

1. focusing on the monetary valuation of the natural assets managed by the NAC;
2. focusing on the positive externalities from conservation and restoration rather than the negative impacts or risks from ecosystem degradation;
3. building on the SEEA EA Framework standards to value a comprehensive suite of ecosystem services and their Total Economic Value;
4. proposing a financial reporting framework that buttresses GAAP financial reporting with the unique values in the Statements; and
5. directly tying the value of nature to a financial instrument (the NAC) and market mechanism (through the listing of the NAC on the NYSE) to enable the transformation of the natural asset value to financial capital.

### **Initial Listing Requirements -- Required Charter Provisions**

As a condition to initial listing, the NYSE proposes to require a NAC’s charter to state the following:

1. The purpose of the company is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services, with the objective of maximizing ecological performance. The NAC may also engage in other activities that do not cause any material adverse impact to the natural assets for which it is responsible, including: (a) supporting community well-being; and (b) engaging in sustainable commercial activities.
2. NAC funds (including any proceeds from the sale of the company’s securities at any time) must be used primarily to meet the NAC’s operational needs to meet its responsibilities with respect to the natural assets under its control and to provide for the long-term capital needs of the NAC in fulfilling that purpose. In addition,

provided that any such uses do not cause any material adverse impact to the natural assets for which the NAC is responsible, funds may be used to support community well-being.

3. The NAC will be prohibited from engaging directly in unsustainable extractive activities (including, but not limited to, traditional fossil fuel development, mining, unsustainable logging, or perpetuating industrial agriculture) or using its funds to finance such activities.

If any of the foregoing provisions of the NAC's charter are eliminated or materially amended in a manner that is inconsistent with their required form at any time, the NAC will be subject to delisting from the NYSE.

### **Initial Listing Requirements -- NAC Policies**

Proposed Section 102.09 of the Manual provides that a NAC seeking to list on the NYSE must adopt the following written policies (collectively, the "NAC Policies") and post them on its website by the earlier of the date that the NAC's initial public offering closes or five business days following the NAC's initial listing date:

1. An Environmental and Social Policy that articulates the objectives and principles that will guide the NAC to achieve sound environmental and social performance. Such policy must include requirements to conduct a process of environmental and social assessment, and establish, as soon as practicable after listing, an Environmental and Social Management System ("ESMS").<sup>13</sup> The ESMS should be designed to:
  - i) Identify and assess environmental and social risks and impacts,
  - ii) Identify measures to avoid, minimize and mitigate the negative risks and impacts, and
  - iii) Promote improved environmental and social performance.
2. A Biodiversity Policy that articulates a commitment to achieving no net loss, and where possible a net positive impact on biodiversity. The Biodiversity Policy should be based on the mitigation hierarchy, a planning and management approach for addressing impacts to biodiversity and ecosystem services through avoidance, minimization, restoration, and offsetting.

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<sup>13</sup> The ESMS should be consistent with generally accepted international standards, such as the "IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts."

3. A Human Rights Policy that articulates a commitment to human rights, consistent with the United Nations Guiding Principles on Business and Human Rights,<sup>14</sup> including a commitment to recognize and respect people’s rights in accordance with customary, national, and international human rights laws, in particular those of indigenous peoples.
4. An Equitable Benefit Sharing Policy that articulates the NAC’s commitment for sharing benefits with local communities. In any case where a NAC enters into a license agreement with a natural asset owner (e.g., a governmental entity or private landowner, rather than direct ownership by the NAC) with respect to the ecological performance rights of a designated area, such licensor must also be subject to the applicable provisions of the Equitable Benefit Sharing Policy and the NAC must include in its license agreement with the licensor a provision requiring the licensor to comply with the applicable terms of the Equitable Benefit Sharing Policy.

The Equitable Benefit Sharing Policy must require an equitable benefit sharing arrangement for the distribution of shares of the NAC’s common stock to local communities (i.e., those who have direct ties to and derive livelihood or cultural values from the applicable area). The NAC’s common stock distribution must be completed no later than the time of closing of the NAC’s IPO and must meet the following requirements at a minimum:

- If the NAC has entered into a license agreement with respect to public lands, shares representing at least 50% of the shares of the NAC’s outstanding shares as of the closing of the IPO must be distributed to local communities.
- If the NAC owns the land or has entered into a license agreement with respect to private lands, shares representing at least 5% of the shares of the NAC outstanding as of the closing of the IPO must be distributed to local communities.

The foregoing distributions of shares of common stock may be placed in a trust or equivalent structure, for the benefit of the intended beneficiaries. Any trust (or equivalent) holding shares of the NAC for this purpose must be under the majority control of trustees that are fully independent of both the NAC and, where applicable, the licensor, and/or be representative of the intended beneficiaries.

The Equitable Benefit Sharing Policy must provide that the NAC will (a) deposit its cash and other financial assets in accounts with a bank custodian regulated by the U.S. Office of the Comptroller of the Currency (an “Authorized Bank”); and (b) where the NAC has entered into a license agreement with a natural asset owner, include in its license agreement a provision requiring the licensor to place any shares of the NAC it owns in

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<sup>14</sup> United Nations (2011). *Guiding Principles on Business and Human Rights: Implementing the United Nations “Protect, Respect and Remedy” Framework*. Available at: [https://www.ohchr.org/documents/publications/guidingprinciplesbusinesshr\\_en.pdf](https://www.ohchr.org/documents/publications/guidingprinciplesbusinesshr_en.pdf).

the custody of an Authorized Bank and deposit the proceeds from any NAC share sales by the licensor and any distributions received from the NAC in accounts with an Authorized Bank, pending the distribution of such assets in a manner consistent with the NAC's Equitable Benefit Sharing Policy.

The NAC must review the adequacy of the Equitable Benefit Sharing Policy at least annually and publish on its website a detailed description of its activities under the Equitable Benefits Sharing Policy during each fiscal year no later than 90 days after the end of the first part fiscal year of the NAC's listing and each subsequent fiscal year (the "Annual EBS Report"). The Annual EBS Report must include an attestation by an Independent Reviewer (the "EBS Independent Reviewer") regarding compliance by the NAC and, if applicable, the licensor, with the Equitable Benefits Sharing Policy during the applicable fiscal period, including a review of the accounts maintained by the NAC and the licensor at Authorized Banks.

The NAC's compliance with the requirements of its Equitable Benefits Sharing Policy must be reviewed periodically either by (i) a committee consisting solely of directors who meet the independence requirements of Section 303A of the Manual or (ii) the NAC's independent directors acting as a group. Such committee or the independent directors, as the case may be, must meet for this purpose at least annually and such meeting must include an executive session in which management does not participate and a discussion with the EBS Independent Reviewer at which management must not be present.

#### **Initial and Continued Listing Requirements -- Statements**

Proposed Section 102.09 will provide that, prior to its initial listing, the NAC must publish on its public web site and file or furnish with the SEC as part of a Form 8-K or Form 6-K, as applicable, Statements that have been prepared consistent with the Framework developed by IEG. The Framework (including instructions for the preparation of the Statements and templates for the Statements) will be posted on nyse.com and the required contents of the Statements are described in detail below. The Statements as published by the NAC must be reviewed by an Independent Reviewer and be accompanied by an examination report prepared by such Independent Reviewer in compliance with the PCAOB's attestation standards.

#### **Initial and Continued Listing Requirements -- Audit Committee**

As described above, a listed NAC would be subject to all of the corporate governance requirements set forth in Section 303A.00, including the requirement of Section 303A.06 that a company must have an independent audit committee and the provisions of Section 303A.07 setting forth additional requirements for the audit committee. The Exchange proposes to amend Section 303A.07 to establish additional responsibilities specific to the audit committee of a NAC. As proposed, Section 303A.07 would require that (in addition to the requirements of Section 303A.07(b), the NAC's audit committee charter must address the following:

1. That the audit committee's purpose includes assisting board oversight of (1) the integrity of the NAC's Statements, (2) the qualifications and independence of the Independent Reviewer and (3) the performance of the Independent Reviewer.
2. The audit committee of the NAC must:
  - i) at least annually, obtain and review a report by the Independent Reviewer describing: the Independent Reviewer's internal quality-control procedures; any material issues raised by the most recent internal quality-control review, or peer review, of the Independent Reviewer, or by any inquiry or investigation by governmental or professional authorities, within the preceding five years, respecting one or more independent audits carried out by the Independent Reviewer, and any steps taken to deal with any such issues; and (to assess the Independent Reviewer's independence) all relationships between the Independent Reviewer and the NAC. After reviewing the foregoing report and the Independent Reviewer's work throughout the year, the audit committee will be in a position to evaluate the Independent Reviewer's qualifications, performance, and independence. This evaluation should include the review and evaluation of the lead partner of the Independent Reviewer. In making its evaluation, the audit committee should take into account the opinions of management and the NAC's internal auditors (or other personnel responsible for the internal audit function). In addition to assuring the regular rotation of the lead partner responsible for the Statements Review, the audit committee should further consider whether, in order to assure continuing independence of the Independent Reviewer, there should be regular rotation of the firm undertaking the Statements Review itself. The audit committee should present its conclusions with respect to the Independent Reviewer to the full board and meet to review and discuss the NAC's annual Statements; Meetings may be telephonic if permitted under applicable corporate law; polling of audit committee members, however, is not permitted in lieu of meetings.
  - ii) meet separately, periodically, with management and the Independent Reviewer to discuss the Statements and the conduct of the Statements Review. To perform its oversight functions most effectively, the audit committee must have the benefit of separate sessions with management and the Independent Reviewer. These separate sessions may be more productive than joint sessions in surfacing issues warranting committee attention.
  - iii) review with the Independent Reviewer any problems in the conduct of their review or difficulties and management's response. The audit committee must regularly review with the Independent Reviewer any difficulties the Independent Reviewer encountered in the course of its review, including any restrictions on the scope of the Independent Reviewer's activities or on access

to requested information, and any significant disagreements with management.

- iv) set clear hiring policies for employees or former employees of the Independent Reviewer. Employees or former employees of the Independent Reviewer may be valuable additions to the NAC's management. Such individuals' familiarity with the business, and personal rapport with the employees, may be attractive qualities when filling a key opening. However, the audit committee should set hiring policies taking into account the pressures that may exist for personnel of the Independent Reviewer consciously or subconsciously seeking a job with the NAC they review.
- v) report regularly to the board of directors with respect to the preparation of the Statements and the performance of the Independent Reviewer. The audit committee should review with the full board any issues that arise with respect to the quality or integrity of the Statements or the performance and independence.

#### **Initial Listing Requirements -- NAC License Agreements**

While it is possible that a NAC may own the land/geographic area with respect to whose natural assets it has the ecological performance rights, the Exchange anticipates that many NACs will not own the land and will need to acquire those rights by entering into a license agreement with a natural asset owner (e.g., a governmental entity or private landowner, rather than direct ownership by the NAC) with respect to the ecological performance rights of a designated area.<sup>15</sup> Where a NAC's rights to the ecological performance of natural assets are created by such a license agreement, the Exchange proposes that the term of such license at the time of initial listing must be a minimum of ten years from the date of closing of the NAC's initial public offering that any NAC whose license is terminated or materially breached by either party would be subject to delisting.

#### **Initial and Continued Listing Requirements -- Initial and Ongoing Quantitative and Corporate Governance Requirements Applicable to NACs**

To qualify for listing as a NAC, an applicant issuer would be required to meet the quantitative listing requirements applicable to the listing of common equities of operating companies as set forth in Sections 102.01(A), (B), and (C) of the Manual. Proposed Section 102.06(F) would provide that listed NACs would be subject to all of the

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<sup>15</sup> The Exchange notes that it will be important for NACs in their offering materials and subsequent public disclosure documents to be clear in distinguishing the rights to the natural assets and geographic area from the rights to the ecological performance and to clearly specify, where appropriate, the limits of the NAC's rights as an owner or licensee.



continued listing requirements that are applicable to operating companies listed under Chapter One of the Manual. To provide additional clarity, the Exchange also proposes to: (i) amend Section 303A.00 to specify that Section 303A in its entirety applies to NACs listed under Section 102.09; and (ii) amend Chapter Eight of the Manual to provide that NACs would be subject to all of the quantitative continued listing standards for operating companies set forth in Chapter Eight of the Manual. These specific amendments would be to provide additional clarity for users of the Manual. Consistent with the text of proposed Section 102.06(F), these proposed amended rules are not intended to be an exclusive list of rules to which a NAC would be subject, as NACs will be subject to every provision of the Manual to which operating companies are subject.

### **Continued Listing Requirements -- Material News**

A NAC will be required to immediately disclose, pursuant to the Exchange's immediate release policy set forth in Sections 202.05 and 202.06 of the Manual, any event (e.g., a forest fire) that is anticipated to have a material adverse effect with respect to any of the criteria included in the Statements (as described below). As soon thereafter as possible, the NAC must disclose in a Form 8-K or Form 6-K, as applicable, its estimates of the changes to the previously presented Statements of such event.

### **Continued Listing Requirements -- Periodic Publication of Statements and Occurrence of a Late Statement Delinquency**

Each year after initial listing, a NAC must publish on its public web site and file or furnish with the SEC as part of a Form 8-K or Form 6-K, as applicable, annual Statements that have been prepared consistent with the Framework. These Statements must be reviewed by the Independent Reviewer and must be accompanied by an examination report prepared by such Independent Reviewer in compliance with the PCAOB's attestation standards. The Statements must cover the same fiscal periods as the audited financial statements included in the NAC's annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable. The NAC should utilize its best efforts to publish its annual Statements no later than the filing of its annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable. In the event that the annual Statements are not completed by the filing due date of the NAC's annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable, such annual Statements are required to be published no later than 180 days after the end of the fiscal year to which such annual Statements relate (the "NAC Statement Due Date" and the failure of a listed NAC to timely publish its annual Statements, a "NAC Late Statement Delinquency"). In the event that the company is unable to file its Form 10-K, Form 20-F, or Form 40-F, as applicable, by the NAC Statement Due Date, the company should not delay the publication of its Statements, but rather should publish its Statements of Ecological Performance on or before that date.

Upon the occurrence of a NAC Late Statement Delinquency, the Exchange will promptly send written notification (the "NAC Late Statement Delinquency Notification") to an affected NAC of the procedures set forth below. Within five days of the date of the NAC Late Statement Delinquency Notification, the company will be required to (a) contact the

Exchange to discuss the status of the delinquent annual Statements (the “Delinquent NAC Statement”) and (b) issue a press release disclosing the occurrence of the NAC Late Statement Delinquency, the reason for the NAC Late Statement Delinquency, and, if known, the anticipated date such NAC Late Statement Delinquency will be cured via the publication of the Delinquent NAC Statement. If the company has not issued the required press release within five days of the date of the NAC Late Statement Delinquency Notification, the Exchange will issue a press release stating that the company has incurred a NAC Late Statement Delinquency and providing a description thereof.

### **Continued Listing Requirements -- NAC Non-Reliance Event**

In the event that a NAC concludes that its previously issued Statements should no longer be relied upon because of an error in such Statements (a “NAC Non-Reliance Event,” and the disclosure of such NAC Non-Reliance Event, a “NAC Non-Reliance Disclosure”), it will be required to comply with the NAC Late Statement Delinquency Notification procedures set forth above. If the NAC does not publish amended Statements within 60 days of the issuance of the NAC Non-Reliance Disclosure (an “Extended NAC Non-Reliance Disclosure Event” and, together with a NAC Late Statement Delinquency, a “NAC Reporting Delinquency”) for purposes of the cure periods described below a NAC Reporting Delinquency will be deemed to have occurred on the date of original issuance of the NAC Non-Reliance Disclosure. If the Exchange believes that a NAC is unlikely to publish the amended Statements within 60 days after a NAC Non-Reliance Disclosure or that the errors giving rise to such NAC Non-Reliance Disclosure are particularly severe in nature, the Exchange may, in its sole discretion, determine earlier than 60 days that the applicable NAC has incurred a NAC Publication Delinquency as a result of such NAC Non-Reliance Disclosure.

### **Continued Listing Requirements -- Cure Periods for NAC Publication Delinquencies.**

During the six-month period from the date of the NAC Publication Delinquency (the “Initial NAC Statement Cure Period”), the Exchange will monitor the company and the status of the Delinquent NAC Statement, including through contact with the company, until the NAC Publication Delinquency is cured. If the company fails to cure the NAC Publication Delinquency within the Initial NAC Statement Cure Period, the Exchange may, in the Exchange’s sole discretion, allow the company’s securities to be traded for up to an additional six-month period (the “Additional NAC Statement Cure Period”) depending on the company’s specific circumstances. If the Exchange determines that an Additional NAC Statement Cure Period is not appropriate, suspension and delisting procedures will commence in accordance with the procedures set out in Section 804.00 of the Listed Company Manual. A NAC will not be eligible to follow the procedures outlined in Sections 802.02 and 802.03 with respect to these criteria.

In determining whether an Additional NAC Statement Cure Period after the expiration of the Initial NAC Statement Cure Period is appropriate, the Exchange will consider the likelihood that the Delinquent NAC Statement can be filed during the Additional NAC

Statement Cure Period. The Exchange strongly encourages companies to provide ongoing disclosure on the status of the Delinquent NAC Statement to the market through press releases and will also take the frequency and detail of such information into account in determining whether an Additional NAC Statement Cure Period is appropriate. If the Exchange determines that an Additional NAC Statement Cure Period is appropriate, and the company fails to publish the Delinquent NAC Statement by the end of such Additional NAC Statement Cure Period, suspension and delisting procedures will commence immediately in accordance with the procedures set out in Section 804.00. In no event will the Exchange continue to trade a NAC's securities if that company has failed to cure its NAC Statement Delinquency on the date that is twelve months after the applicable NAC Statement Due Date.

#### **Continued Listing Requirements -- Filing Delinquencies and NAC Statement Delinquencies are Treated Separately.**

For purposes of Section 802.01E, NACs will also be subject to the provisions with respect to delinquencies in filing periodic reports as set forth in that rule (a "Filing Delinquency"). A Filing Delinquency is a separate event of noncompliance from a NAC Publication Delinquency. Consequently, a NAC can be deemed to have cured a Filing Delinquency while remaining noncompliant due to an ongoing NAC Publication Delinquency or vice versa.

#### **Continued Listing Requirements -- Framework and Statements**

The Framework (which provides instructions for the preparation of the Statements) will be publicly accessible on nyse.com.<sup>16</sup>

The Exchange, in consultation with IEG, will have sole authority to determine whether and how to propose amendments to the Framework from time to time and will provide reasonable advance notice of the effectiveness of any such amendments. The Exchange will post the amended text of the Framework on nyse.com, along with a description and explanation of the amendments. Additionally, the Exchange will maintain on nyse.com a publicly-accessible archive of historical versions of the Framework. The Exchange will have sole authority with respect to the interpretation of the Framework for purposes of compliance by listed NACs with reporting requirements under NYSE Rules.

#### **Continued Listing Requirements -- Components and Form of the Statements**

NYSE-listed NACs must adopt, publish, maintain and review three categories of Statements: 1) Statement of Natural Production, 2) Statement of Natural Assets and 3) Statement of the Quality of Underlying Assets. These statements must be published annually, representing the same accounting period as the NAC's audited financial statements.

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<sup>16</sup> The text of the Framework is included in Exhibit 3 to this filing.

### **Statement of Natural Production:**

The Statement of Natural Production provides information on the annual flows of ecosystem services provided by the natural assets under management by a NAC in biophysical and monetary units. This Statement presents the annual total economic value captured for each ecosystem service, and annual values aggregated across all ecosystem types within the NAC.

#### Components of a Statement of Natural Production:

1. **Flows of Ecosystem Services.** The Statement of Natural Production will itemize all the ecosystem services that were valued through the ESV, from a base list of 38 potential ecosystem services.
2. **Biophysical Measure** refers to the amount of ecosystem service provided, measured in biophysical units. The appropriate measurement unit will depend on the ecosystem service type. The amount or quantity of ecosystem services will reflect the total amount provided and valued by all the ecosystems found within the NAC. In cases where the amount provided is greater than the amount valued, only the amount valued should be noted in this cell, specifying the unit of measurement (e.g., tons of carbon or number of hectares providing the service). When total units are not relevant indicators, then an average value can be provided here (e.g., average temperature reduction across the landscape). The intent is to provide transparent information on the quantification and measurement of the ecosystem service.
3. **Total Economic Value Captured** refers to the total monetary value derived for each ecosystem service through the ESV conducted by the NAC. This total value can include multiple types of economic values, such as direct, indirect, and/or option values. More information about the types of value captured and scope of the values reported will be provided in the Footnotes, including confidence intervals for each estimate and/or ranges derived through different valuation methods. This value will be presented in current dollars.

**Footnotes** will be included, in tabular form, to provide further details on the information noted above (The Statement of Natural Production). They will provide transparency by including more disaggregated information about the scope of the valuations, the types of economic values estimated, and their precision. Footnotes will list the ecosystem services identified but not included and the reason for their exclusion. For the ecosystem service valued, the footnotes will provide detailed information on the biophysical quantities of ecosystem service production and the method of measurement. If there is a discrepancy between the amount produced and the amount valued, this will also be noted here.

As there can be more than one valuation conducted per ecosystem service, the Statement allows for multiple valuations to be conducted and presented under **Valuation 1 and**

**Valuation 2** headings. It will include sub columns to present the different **Types of Values** that were derived for a given ecosystem service. These columns should report the type of TEV captured and if relevant, the valuation method (e.g., direct use value from market prices). This information presents the scope of the valuation and is particularly valuable in cases where complementary valuations may have been deemed necessary and/or possible. The **Value per Unit** will refer to the dollar value used for the singular unit of ecosystem service, corresponding to the biophysical measurement unit (e.g., value of a ton of carbon). In some cases, an average value may be provided to reflect different unit values used in the valuation (e.g., the Visual Amenity value of a landscape may be presented as an average value per hectare). The **Value** column reflects the economic value derived for the ecosystem service listed using the unit price and quantities noted in the previous columns. The **Range or Confidence Interval** column summarizes the upper and lower bounds of the value presented, as estimated through the methodologies employed. For example, the valuation may be sensitive to key assumptions or variables, which can be presented in this column for transparency of the range of results that can be obtained. Errors may also be disaggregated by the step of the methodology, including those from the derivation of the biophysical unit to those from the valuation method employed. **Methodological Notes** will describe the measurement and valuation methodologies, including key assumptions, beneficiaries, and other key information to better interpret the results. The details of each method will be explained in more detail in the technical report of the ESV study.

If the original valuation was conducted by ecosystem type (e.g., forest, wetland, and cropland) and results were presented as such, these disaggregated results will be included here, through separate lines for each ecosystem service within each ecosystem type. The extent of each ecosystem type will outline the size of each ecosystem (e.g., number of hectares). If the valuation is deemed more accurate as a system-wide valuation (one that includes the interactions between ecosystem types but does not attribute a specific value contribution to each ecosystem), then the ecosystem type column can be described as “system-wide valuation”. If the valuations are deemed additive, these totals are summed following guidelines to avoid double counting, as set in Step 5 of “Steps to Conduct an ESV” below,<sup>17</sup> to provide a total value aggregated across all ecosystem services in the **Total Economic Value** cell. If the valuations are not additive (they represent non-additive values or were conducted for validation of the results), then the more rigorous valuation should be used in the Total Economic Value cell.

If ecosystem services were identified or deemed to be present but could not be included or valued due to their incommensurability, lack of data, irrelevance, or license agreement limitations; these should be listed in the footnotes and an explanation for their exclusion should be provided in the methodological notes.

### **Statement of Natural Assets:**

The Statement of Natural Assets reports information on the potential production value of

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<sup>17</sup> See Section “Conducting Ecosystem Service Valuations” below.

natural assets managed by a NAC, in monetary terms. This will be measured through the Net Present Value of ecosystem service value flows, using a 100-year time horizon, a 2% discount rate, and an assumption that the ESV remains the same as the current year for the whole temporal horizon.

Components of a Statement of Natural Assets:

1. **Natural Assets** refers to the particular ecosystem types being managed by the NAC. Examples include forests, wetlands, agricultural areas, and coral reefs. If the valuation was done for the NAC as a whole, this can describe by noting it was a “system-wide” valuation.
2. **Extent** refers to the size of the ecosystem producing the ecosystem service being valued, which is a spatial area measurement (e.g., number of hectares). This is either reported by each ecosystem type, or if the valuation was done for the NAC as a whole, then by the number of hectares supplying the service (i.e., the total area that produces the ecosystem service valued).
3. **Ecosystem Services** refers to the list of the ecosystem services that were valued through the ESV, from the potential base list of 38 potential ecosystem services.
4. **Ecosystem Service Category** identifies each ecosystem service listed under the category that it belongs (i.e., Provisioning, Regulating and Maintenance, Cultural, or Non-use Values).
5. **Annual Value** refers to the annual value (in current dollars) of each ecosystem service, (by each ecosystem type, when applicable) as determined through the ESV.
6. **Net Present Value** refers to the value of the assets under management (in dollars), calculated using the Net Present Value (“NPV”) method, which aggregates the expected future benefits over 100 years, using a 2% discount rate. This represents the future flow of annual ecosystem services based on the current year’s valuation and assuming a constant value over time.
7. **Total Value** sums the values for all ecosystem services provided by all the natural assets managed by the NAC. Footnotes will be provided as necessary to provide further detailed information.

**Statement of the Quality of Underlying Assets:**

The Statement of the Quality of Underlying Assets reports quantitative and qualitative information on the health and condition of the ecosystems being managed by the NAC on an annual basis.

The information in this Statement is separate and complementary to the values captured in the other Statements and will focus on biodiversity metrics and report in non-monetary units. Biodiversity is integral in measuring ecosystem condition, as it contributes to the composition, structure, and function of ecosystems. Areas with higher biodiversity tend to have increased ecosystem productivity, stability, and resilience – being able to withstand and recover from natural and anthropogenic stresses over time.<sup>18</sup>

NACs will report on the Key Performance Indicators (“KPIs”) for the underlying assets under management, in both quantitative and qualitative terms as outlined below.

Components of a Statement of the Quality of Underlying Assets:

1. Quantitative KPIs will measure the state of key components of biodiversity being managed by NACs, the extent of the NAC’s ecosystems, and progress towards management goals. In addition, for natural areas, ecological capacity-to-produce indicators will be required when the ESV focuses on direct use values. The Statement will outline KPIs, unit of measurement, method for measurement or data source, and notes (which provide further explanation of the KPI and how the data can be interpreted, including the rationale/justification for selection of a particular metric, and expected directional change over time). Quantitative KPIs for natural, working, and hybrid areas are included below and further guidance on how to measure several of these indicators is provided in the section “Steps to conduct an ESV.”
2. A Qualitative Description of the Underlying Assets provides a descriptive account of the state and condition of the assets under management highlighting key species and habitats. It will describe management objectives, management approach, and progress towards maintaining and improving the overall health and condition of the natural assets. It will consider aspects of ecological integrity, connectivity, or fragmentation, as well as how threats and pressures from the surrounding area are being managed. For working and hybrid areas, a descriptive account of the state of the assets along with progress towards implementing regenerative practices will be included.

Quantitative KPIs for Natural Areas:

- For species level indicators, *either* a **Species Threat Abatement and Restoration** metric (“STAR”)<sup>19</sup> score *or* **Species Richness & Abundance** counts will be reported.

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<sup>18</sup> Le Provost, G., Schenk, N.V., Penone, C. et al. 2002. The supply of multiple ecosystem services requires biodiversity across spatial scales. *Nat Ecol Evol*. <https://doi.org/10.1038/s41559-022-01918-5>.

<sup>19</sup> Mair et al. (2021). A metric for spatially explicit contributions to science-based species targets. *Nature Ecology & Evolution*. 5 (June 2021) 836-844. <https://doi.org/10.1038/s41559-021-01432-0>

The specific indicators chosen will be based on what is most appropriate and feasible.

- STAR is a biodiversity metric that allows the quantification of the potential contributions that species threat abatement and restoration actions offer towards reducing global extinction risk. Drawing on the IUCN Red List of Threatened Species (the most comprehensive global assessment of the status of biodiversity), the metric combines data on species, the threats they face and their risk of extinction.
- Species Richness refers to the number of species within a given area. Species richness counts that cover multiple taxa (e.g., mammals, birds, reptiles, amphibians, plants, insects, or fish) will be reported.
- Species Abundance refers to the total number of individuals of a species in a given area. Abundance will be reported for target species. Where counts are not feasible, other measures such as biomass and/or percentage cover may be used.<sup>20</sup>
- Ecosystem Capacity. KPIs related to the ecosystem's long-term capacity to produce ecosystem services will be required when there are direct use values within the ESV. For each direct use value (e.g., the value of current fish catch), a corresponding KPI will be required to reflect the capacity of the ecosystem to sustain that ecosystem service in the future (e.g., reproduction rate of fish or fish abundance). The direct use of some services, such as provisioning services (e.g., hunting wild animals or wild fish catch) and some cultural services (e.g., amenity value or recreational uses), if extracted unsustainably, can result in ecosystem degradation. To avoid this, this KPI will be developed to provide information on the ecological capacity to produce the ecosystem service being valued given current use levels.<sup>21</sup>
- Area of Ecosystems under Management refers to the size or extent of the ecosystems being managed by a NAC. Results will reflect total area under management, disaggregated into areas by ecosystem type.
- Where applicable, Total Area under Restoration will be reported, referring to either the spatial area where restoration has been successfully completed or where restoration is currently being implemented in accordance with a restoration plan.
- Percentage of Natural Asset Management Objectives Met. Each NAC will have a specific management plan that will seek to manage, grow, and/or restore its natural assets, based on the local context. Within the Management Plan, a set of targets will be prioritized and tracked through measurable indicators. This KPI will report the

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<sup>20</sup> UN SEEA (2018) Biodiversity Accounting.  
[https://seea.un.org/files/seea\\_eea\\_biodiversity\\_accounting.pdf](https://seea.un.org/files/seea_eea_biodiversity_accounting.pdf).

<sup>21</sup> Hein L, Bagstad K, Edens B, Obst C, de Jong R, Lesschen JP (2016) Defining ecosystem Assets for Natural Capital Accounting. *PLoS ONE* 11(11): e0164460. Doi: 10.1371/journal.pone.0164460



degree to which prioritized targets are met every year. Measurement will be based on the Management Plan objectives, targets and outcomes from the NAC's monitoring and evaluation system, for the given reporting period.

Quantitative KPIs for Working Areas:

- Rate of Water Infiltration is a measure of how fast water enters the soil.
- Insect Species Richness and Abundance where richness refers to the number of different insect species and abundance refers to the number of individuals of target insect species, in a given area.
- Bird Species Richness and Abundance where richness refers to the number of different bird species and abundance refers to the number of individuals of target bird species, in a given area.
- Plant Species Richness refers to the number of different plant species in a given area.
- Percentage of Regenerative Management Objectives Met. Each NAC will have a specific Regenerative Management Plan that will guide it through the transition towards a regenerative system, based on the local context. Within the Management Plan, a set of targets will be prioritized and tracked through measurable indicators. This KPI will report the degree to which prioritized targets are met every year. These will be based on the Regenerative Management Plan objectives, targets and outcomes from the NAC's monitoring and evaluation system, for the given reporting period.

KPIs for Hybrid Areas:

The Natural Areas KPIs above will be reported, as well as Working Area KPIs, if there is an agricultural component of the hybrid NAC.

### **Conducting Ecosystem Service Valuations**

Ecosystem service valuations (ESVs) are the foundation for determining the values of NACs. The ESV process consists of using well-established methods to calculate the monetary value of ecosystem services. These values are used in the Statements of Natural Production and Natural Assets.

The Framework includes the Steps to Conduct an ESV, outlined below, and the Components and Structure of the Ecological Performance Statements. The general approach for valuing ecosystem services to be used by NACs is grounded in the

guidelines outlined in the SEEA EA framework<sup>22</sup> and builds on it to include a wider breadth of potential economic values and valuation approaches. The objective of the Framework is to estimate the Total Economic Value produced by the ecosystems managed within a NAC through the generation of ecosystem services.

The steps outlined below represent the required approach for conducting ESVs for NACs. These will be conducted every year (in line with the NAC's accounting period) and provide the necessary information to report on the NAC's ecosystem service production. The initial Year 1 valuation study is of particular importance because it will largely set the scope for the NAC, by specifying the ecosystem services to be valued and the general approach to be taken for their valuation. This initial valuation will set the expectations for future ESVs to ensure consistency and replicability. Every year, the analysis should use the most current data and aim to report on that year's values, which will require an annual measurement of change in the value of the assets.

The ESV study will also derive many of the KPIs on ecosystem quality and condition, which will be complementary to the values obtained in the ESV and will be used in the Statement of the Quality of Underlying Assets.

It is important that experienced experts with knowledge of the subject matter (ecosystem service valuations) and of local ecosystems be involved (including local experts). Methods should also be transparently and clearly explained, be replicable, traceable, and lend themselves for meaningful reporting on an annual basis (i.e., to report annual changes). Once systems have been established, local capacity can be built for ongoing data collection and monitoring.

### **Steps to Conduct an ESV Study for a NAC**

To obtain an economic value for the natural asset and ecosystem services produced by a given NAC, an initial Year 1 ESV study will be conducted. This study will also include the steps necessary to derive several KPIs tied to the Statement of the Quality of Underlying Assets. The following steps are described in more detail in the sections that follow:

1. Define Spatial Boundary
2. Determine Ecosystems Present, their Extent, Quality and Attributes
3. Identify Ecosystem Services and Conduct a Preliminary Assessment of their Relative Value

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<sup>22</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>.

4. Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units
5. Assign an Economic Value to Ecosystem Services
6. Calculate the Asset Value

#### Step 1. Define Spatial Boundary

The first step to conduct the ESV is to define the spatial boundary of the NAC. The initial boundary will represent the total area under NAC management. This step requires identifying clearly defined geographical boundaries, based on what a NAC can legally manage and the areas that they can commit to the NAC's charter. If areas within the NAC are excluded due to limitations in the license agreements, this should be noted. Note that a NAC can include multiple ecosystem types, land uses, and multiple sites. Primary data, remotely sensed data<sup>23</sup> and/or authoritative secondary data can be used to determine the area for this boundary. The resolution of the data and method used to estimate this extent should be stated as well as any potential sources of error in the estimation of the extent.

#### OUTPUT:

- Map of the study area that will make up the NAC and its total spatial extent

#### Step 2. Determine Ecosystems Present, their Extent, Quality, and Attributes

The entire spatial area of a NAC must be allocated to a relevant ecosystem type. This step identifies, characterizes, and determines the ecosystems within the NAC boundary and states their extent, quality, and other attributes of interest for ecosystem service production and ecosystem quality KPIs. This information should reflect current conditions (using the most recently available data) with the intention of giving a snapshot of the ecosystems present in the current accounting period (the most recent year that corresponds to the audited financial statements).

The spatial boundaries established in the previous step will cover one or more distinct ecosystems. In this step, the entire area is allocated to a discrete ecosystem type which can be treated as distinct spatial units for accounting purposes. To better understand the attributes of the NAC, its ecosystems, and to aid the valuation process, ecosystem types present, and their condition must be identified and described in this step.

First, ecosystems should be categorized using official ecosystem classification systems, aiming to be as granular, accurate, and precise as possible and to

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<sup>23</sup> Remote sensing refers to the use of satellite or aircraft-based sensor technologies to get information on the biophysical characteristics of areas on Earth.

include local ecological knowledge on boundaries and functionality.<sup>24</sup> If local classification systems are not available, internationally recognized ecosystem typologies should be used. In addition, to aid comparisons and high-level evaluations, NACs should also use or map onto IUCN's Global Ecosystem Typology 2.0 (Ecosystem Functional Group)<sup>25</sup>, independent of the ecosystem classification used.

Geographical Information Systems (GIS) maps should be used to demonstrate the extent and configuration of each ecosystem type, such as forests, wetlands, agricultural land, and other land cover types (including water bodies). GIS maps compile information by analyzing satellite and aerial imagery as well as other remote sensed or manually acquired data. The resolution of land cover data will impact the composition of ecosystem types that is captured. A higher resolution (i.e., 100m<sup>2</sup> or more granular) should be used. For NACs with smaller areas, a resolution of at least 30m<sup>2</sup> should be used. The process of identifying ecosystem types and mapping GIS data to ecosystem types should be clearly stated, including the resolution of the data and the definitions for each ecosystem type.

In addition, ecosystems should be characterized with key descriptor attributes like their global uniqueness, proximity to populations, protected status, habitat suitability, and attributes related to ecological integrity, connectivity, or fragmentation, existing threats, and/or management regimes. This information will complement the classification and description of the ecosystems and help to structure the valuation.

The extent (or size) of each ecosystem type (e.g., forest, wetland, or cropland) should be measured. Extent is measured in terms of spatial area (e.g., hectares). If attributes of interest were identified, those should also be spatially measured and reported (e.g., hectares of protected forests). If developed lands, such as roads or residential areas, are included within the NAC's overall boundaries, their corresponding extent should also be provided.

The ecosystem quality KPIs outlined below should also be scoped within this step in order to determine how these will be measured and reported, according to the Components of the Statement of the Quality of Underlying Assets. These include the following indicators:

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<sup>24</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

<sup>25</sup> Keith, D., Ferrer-Paris, J., Nicholson, E., & Kingsford, R. (2020). *IUCN Global Ecosystem Typology 2.0 Descriptive profiles for biomes and ecosystem functional groups*. International Union for Conservation of Nature and Natural Resources (IUCN). <https://portals.iucn.org/library/sites/library/files/documents/2020-037-En.pdf>

For Natural Areas:

For species level indicators, *either* a **Species Threat Abatement and Restoration metric (“STAR”)**<sup>26</sup> score *or* **Species Richness & Abundance** counts should be scoped. The specific indicators chosen will be based on what is most appropriate and feasible.

- STAR scores can be calculated for an area being managed by a NAC in three phases. Initially, an estimated STAR score can be calculated to determine the potential to reduce species extinction risk, based on published data from the IUCN Red List.<sup>27</sup> This value can be revised to a calibrated STAR score with on-the-ground verification of threats and species presence, establishing a baseline against which conservation management can be planned and targets set. This will then enable NACs to demonstrate in time the delivery of a realized STAR score, which takes into account the measurable reduction of threats generated by the NAC’s management activities.<sup>28</sup>
- Species Richness counts will be scoped covering multiple taxa (e.g., mammals, birds, reptiles, amphibians, plants, insects, or fish) and present a reliable representation of current local species richness.
  - Species will be selected based on abundance and the key role they play in the functioning of the local ecosystems.
  - The basis for selection of the species included in the richness count should be transparently presented. Species to include can be determined through a scientific assessment of what is relevant (based on local, regional, or global significance) and through local expert opinion. The methods employed for conducting species count will need to be justified and an explanation provided for how the data can be interpreted.
- Species Abundance will be reported for target species. Where counts are not feasible, other measures, such as biomass and/or percentage cover, may be used.<sup>29</sup>

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<sup>26</sup> Mair et al. (2021). A metric for spatially explicit contributions to science-based targets. *Nature Ecology & Evolution*. 5 (June 2021) 836-844. <https://doi.org/10.1038/s41559-021-01432-0>.

<sup>27</sup> Access to the STAR Estimated Heat-map layers is currently accessed through the Integrated Biodiversity Assessment Tool (IBAT) STAR portal (<https://www.ibat-alliance.org/star>)

<sup>28</sup> The Biodiversity Consultancy (2022). Species Threat Abatement and Restoration (STAR) A Global Metric Supporting Nature-Positive Action. *IBAT*. <https://www.ibat-alliance.org/pdf/star-industry-briefing-note.pdf>

<sup>29</sup> UN SEEA (2018) Biodiversity Accounting. [https://seea.un.org/sites/seea.un.org/files/seea\\_eea\\_biodiversity\\_accounting.pdf](https://seea.un.org/sites/seea.un.org/files/seea_eea_biodiversity_accounting.pdf).

- Selection of target species will be based on the key role they play in the functioning of the ecosystem and/or because they provide information on the overall condition of the ecosystem, like keystone species, indicator species, umbrella species, rare or locally endemic species, or globally threatened species.
- Target species will be determined through a scientific assessment, local expert opinion and should be coherent with the indicators of Species Richness. The basis for the selection of target species will need to be justified and an explanation provided for how the data can be interpreted, including the expected directional change over time. If some species are of greater importance, relative to others, in determining the overall condition of the ecosystem, this should also be noted.

Species Richness and Abundance should be measured across ecosystems using the most appropriate field sampling methods (e.g., transect counts, acoustic recording, environmental DNA) and/or authoritative secondary data (e.g., official government data, data used for published work, recognized global data sources used by subject matter experts). When authoritative secondary data is used, validated sources should be prioritized.

For Working Areas, the following indicators of ecosystem quality should be scoped:

- Rate of water infiltration
- Insect species richness and abundance of target species
- Bird species richness and abundance of target species
- Plant species richness

To determine how to estimate these ecosystem quality indicators for natural and working areas, the analyst conducting the assessment should define the boundaries of the study based on the NAC's boundaries. Next existing information for the area of study will be reviewed. Where existing information is sufficiently current, valid, granular, and comprehensive, this information should be used to determine values for these indicators. When there is not sufficient information, the appropriate data collection methods should be used as part of Step 4 of this Framework ("Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units"). The initial Year 1 indicators may need to rely on existing authoritative data sources (e.g., IUCN's Red List of Threatened Species) and identify gaps and potential errors (including a measurement of error, if possible). Subsequent year valuations can enrich the ecosystem characterization and ecosystem quality KPIs by filling information gaps through streamlined data collection and improved monitoring methods.

Where there is GIS spatial analysis, it should be complemented with field data collection, when necessary, in order to validate the characterization of ecosystems and fill in data gaps, including field measures, validation of species presence, and interviews with locals

and experts. Both the spatial analysis and the field data collection should be led by experts using the best available practices. More in-depth data collection will be conducted in Step 4. The complexities and particularities of each local context should be considered in the approach that will be adopted.

Once ecosystem characterization and ecosystem quality KPI methods are established in the initial study, local capacity can be built to continuously collect data for future ecosystem service valuations.

### OUTPUTS:

- A section for the Technical Report outlining:
  - Definition of each ecosystem type in the NAC
  - Extent of each ecosystem type that makes up the natural assets under management
  - Key descriptive, geographical, and ecosystem quality-related attributes for the ecosystems identified
  - Description of the approach to select and measure the ecosystem quality KPIs for the identified/categorized ecosystems within the NAC

### Step 3. Identify Ecosystem Services and Conduct a Preliminary Assessment of their Relative Value

This step identifies the ecosystem services that are being produced in the study area. This step will involve consultation with local stakeholders and subject matter experts, as well as an initial review of the information available to determine ecosystem services that are present, those that can be valued based on data availability, and their rough scales of ecological, economic, and social importance.

The full potential scope of ecosystem services to be considered in the valuation includes 38 general categories. Although all ecosystem services being produced should be identified and an effort should be made to value all the ecosystem services identified, there may be cases when some ecosystem services are not measurable or do not have enough data available to conduct a meaningful valuation. It is also possible that a NAC's ownership or license agreement may be limited with respect to some ecosystem services, in which case these limitations must be transparently disclosed. It is expected that the ESV for a NAC includes at least six different ecosystem service categories of the 38, and that multiple regulating services are included. The intention in deriving the inventory of ecosystem services to include should be to provide a complete and diverse set of ecosystem service values and to include services that most directly reflect ecological integrity and local relevance. In particular, there should be a clear presentation of the ecosystem services that are identified, those that are quantifiable, and those that are

monetizable. To maintain consistency and comparability between ecosystem types and among NACs, the Framework includes a list, adapted from the SEEA EA framework,<sup>30</sup> which should be used in the ESV study.<sup>31</sup>

To identify ecosystem services that are present, the first task is to conduct a preliminary desktop value assessment of the ecosystem services commonly produced by the ecosystems within the NAC. A desktop assessment entails the use of existing data to identify the types of ecosystem services that could be produced by the ecosystems present and their relative value. A benefit transfer exercise can be used for this task to determine what ecosystem services may be present in the area and the economic values that other studies have assigned to these ecosystem services. Alternatively, or in addition, basic configurations for tools such as INVEST<sup>32</sup> and/or ARIES<sup>33</sup> can be used to determine which ecosystem services may be present and their relative importance.<sup>34</sup> Each ecosystem may produce a different bundle of ecosystem services. For example, wetlands will likely produce water purification services, provide nursery spaces for fish, and flood regulation services (among others), while silvopastoral systems will likely produce biomass for livestock, habitat for bird species, and micro-climate regulation, among others. The suite or bundle of potential ecosystem services that will be included should be as extensive as possible and must include multiple regulating services. Expert opinion and judgement and local community consultation should also be used to identify ecosystem services produced in the NAC.

Subsequently, the desktop value assessment (benefit transfer valuation and/or rapid model-based ecosystem assessment) will estimate a first, rough approximation of the value of different ecosystem services. This should be used as a guide to prioritize a more in-depth analysis of ecosystem service provision. This preliminary assessment is

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<sup>30</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Table 6.3, pg. 131.

<sup>31</sup> See Exhibit 3, Framework at Table 2.

<sup>32</sup> Natural Capital Project, 2022. *INVEST 3.12.0.post26+ug.g230fb3d User's Guide*. Stanford University, University of Minnesota, Chinese Academy of Sciences, The Nature Conservancy, World Wildlife Fund, and Stockholm Resilience Centre.

<sup>33</sup> Villa, F., K.J. Bagstad, B. Voigt, G.W. Johnson, R. Portela, M. Honzak, and D. Batker. 2014. A methodology for adaptable and robust ecosystem services assessment. *PLoS ONE* 9(3):e91001. ARIES FOR SEEA Available at <https://aries.integratedmodelling.org/aries-for-seea-user-guide/>

<sup>34</sup> A list of selected ecosystem service modeling tools can be found In United Nations (2022). *Guidelines on Biophysical Modelling for Ecosystem Accounting*. United Nations Department of Economic and Social Affairs, Statistics Division, New York. Available at: <https://seea.un.org/content/supplemental-materials-and-tables-guidelines-biophysical-modelling#Table%204>



particularly important for the initial valuation when ecosystem services present may not be known and when data gaps may limit the ability to value all ecosystem services.

The desktop assessment should be complemented with an on-the-ground, site-based assessment to identify the most current and locally relevant ecosystem services present. This assessment will be conducted through a combination of field observations, interviews, surveys and/or focus groups with local stakeholders and experts knowledgeable of the study area. What is considered most important will vary depending on the stakeholder group providing input as many viewpoints as possible should be included to inform the identification process. The information gathered at this stage will be recorded and used to validate and/or expand the list of ecosystem services to be valued.

If identified ecosystem services cannot be valued with primary valuation methods due to data gaps, time constraints, or analytical capacity; an expert-informed estimate, combined with a rigorous desktop analysis may be proposed to conduct the ecosystem service quantification and valuation. This can include a more refined benefit transfer exercise that can be used to estimate conservative values while better, primary data is gathered (in subsequent years). Given that desktop analyses may result in more error and uncertainty, conservative values should be prioritized when adopting this approach. If a valuation is still not possible, the justification for their exclusion should be clearly stated and the ecosystem service should still be listed as present but not valued. This includes limitations due to license agreement constraints or due to risks of double-counting with information in the company's GAAP financial statements.

After the initial Year 1 valuation is conducted, subsequent valuations should include the list of ecosystem services valued the previous years and start by validating their relative values and continued importance and existence, at this step. If additional ecosystem services are identified (i.e., they were previously unknown or not legally available for inclusion at the time of the initial valuation) and these are deemed material and suitable for inclusion in the ESV, these must be added to the list of ecosystem services for valuation that year.

#### OUTPUTS:

- List of ecosystem services identified as present in the NAC
- An initial gap assessment that identifies ecosystem services that cannot be measured, included, and/or valued the current year, including the reason for their exclusion
- Subset of ecosystem services prioritized for valuation
- Subset of ecosystem services where a desktop-based study can be used to estimate an approximate value

- Expected value ranges or relative importance based on a desktop assessment and consultation with local stakeholders and experts used to guide the ESV study

#### Step 4. Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units

Once both the ecosystems and ecosystem services produced by the NAC have been identified and determined to be within the scope of the NAC's license agreement, a study will be conducted to quantify the biophysical amount of ecosystem services produced using measurable units relevant to each ecosystem service (e.g., amount of carbon sequestered and stored; tons of biomass produced; or rate of pollination). In addition, the ecosystem quality KPIs will be measured, refined, and/or analyzed, as needed, based on the data gaps and field measurement needs identified in Step 2.

For ecosystem services, measurement at this stage focuses on the supply of the ecosystem service being valued. In particular, this step requires a biophysical analysis of the production and flow of ecosystem services. A combination of existing data for the region, direct measurement, indirect measurements, and modelling using ecosystem assessment tools should be utilized for ecosystem service measurement. The following steps outline the expectations for biophysical measurement of ecosystem services:

1. Determine the method of measurement, metrics, and tools to be used

Measuring the biophysical quantity of the ecosystem service production requires understanding the dynamics and processes that produce ecosystem services, translating this understanding into mathematical functions or models, and collecting good quality data from the site being studied in order to populate the models. This is the core objective of this step.

When possible, both the actual flow valued in the ESV and the capacity of the ecosystem to produce the service should be measured. Information on the ecosystem service flow will be needed to derive the economic value of that service. Information on the capacity to produce may be used to refine the valuation or as a complementary indicator of sustainability when direct use values of provisioning ecosystem services as well as certain cultural ones (e.g., recreation, amenity value) are included in the ESV.<sup>35</sup> For example, fish catch is a measure that may be used to report the use value of wild fish. However, the current reproductive rate of said fish species is a measure of the capacity to produce that service that complements this ESV and that can be reported as a KPI to better interpret the economic value of fish catch, as a provisioning service. Thus, when direct use values for ecosystem services are included, an indicator on the capacity to produce should be included as an indicator of ecosystem quality or as a description of the

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Hein L, Bagstad K, Edens B, Obst C, de Jong R, Lesschen JP (2016). Defining Ecosystem Assets for Natural Capital Accounting. *PLoS ONE* 11(11): e0164460. <https://doi.org/10.1371/journal.pone.0164460>

condition of the ecosystem, in relation to that service. In some cases, information on biophysical capacity can also be used to derive an option value in Step 5.

When measuring the physical flow of ecosystem services, one must determine what would be provided in the absence of the ecosystem in its current state. Therefore, the measurement should reflect the total amount of ecosystem service produced every year (e.g., the total amount of fish produced and/or caught every year). This is different from measuring the change in the flow associated with a particular action, or its marginal value.<sup>36</sup> For purposes of valuing natural assets, it is recommended that the valuation is established relative to a counterfactual baseline where there would be nothing provided (e.g., a value of zero). When a value of zero is difficult to establish, the baseline can be modeled as if the ecosystem was barren land. The baseline assumption should be clearly stated in each instance. Overall, the measurement of the ecosystem flow will reflect the full amount of the ecosystem services provided every year (the accounting period).

To ensure that biophysical processes are well understood, it is recommended that a NAC engage subject matter experts on each service (e.g., hydrologists for water services, agro-ecologists for biomass production and pollination, fisheries experts) in order to set up appropriate measurement methods and identify indicators and data that best describes ecosystem service production. The table below entitled “Recommended Measurement Methods by Ecosystem Service Categories” provides general recommendations on measurement methods. Also, some tools have already developed systematized methods (functions or models) to measure the production of ecosystem services which can be used in this step. SEEA’s Guidance for Biophysical Modelling identifies models suitable for different ecosystem services.<sup>37</sup> For example, the INVEST<sup>38</sup> and ARIES<sup>39</sup> tools model several ecosystem services included in the list of IEG’s ecosystem services. These models identify critical biophysical parameters that determine ecosystem service provision, the expected relationship between these parameters, and outline data needs. Locally relevant models can also be built by the analyst conducting the valuation. The most reliable measurement methods should be chosen based on the data available, the

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<sup>36</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>.

<sup>37</sup> United Nations (2022). *Guidelines on Biophysical Modelling for Ecosystem Accounting*. United Nations Department of Economic and Social Affairs, Statistics Division, New York.

<sup>38</sup> Natural Capital Project, 2022. *INVEST 3.12.0.post26+ug.g230fb3d User’s Guide*. Stanford University, University of Minnesota, Chinese Academy of Sciences, The Nature Conservancy, World Wildlife Fund, and Stockholm Resilience Centre.

<sup>39</sup> Villa, F., K.J. Bagstad, B. Voigt, G.W. Johnson, R. Portela, M. Honzak, and D. Batker. 2014. A methodology for adaptable and robust ecosystem services assessment. *PLoS ONE* 9(3):e91001. ARIES FOR SEEA Available at: <https://aries.integratedmodelling.org/aries-for-seea-user-guide/>

need to conduct annual reports, and the objective of capturing as much of the ecosystem's Total Economic Value as possible.

Once tools and models have been identified and set up, measurement should become a more streamlined process for reporting in the years following the initial valuation. Since consistency with previous years' valuations should be maintained when measuring ecosystem services, subsequent analyses will be expected to adhere to previous methods and focus on updating data sources to reflect annual changes, as possible.

To ensure transparency in measurement approach and methods, it is required that a conceptual model is provided, outlining the main factors or components of the ecosystem considered, their modelled relationships, direction of flow (between ecosystem components and structures, external factors, and potential users), outputs and underlying assumptions for the derivation of ecosystem service values.

### **Recommended Measurement Methods by Ecosystem Service Categories**

<b>Ecosystem Service Category</b>	<b>Recommended Measurement Method(s)</b>
Provisioning services	Measurement should be done in terms of the physical flows or outputs that are produced by ecosystems (e.g., total weight of fish caught). These realized flows should be complemented with information on the capacity to produce the ecosystem service in order to verify the sustainability of ecosystem service use and any impact on the condition of the ecosystem supplying the service (e.g., fish stock or fish growth rates assessed for the species).
Regulating and Maintenance services	<p>Regulating services are often measured through the functions or processes performed and therefore require careful characterization of the structural and dynamic factors that allow the ecosystem to function. A conceptual model that outlines the relationships, direction of flow, and underlying assumptions must be presented.</p> <p>Soil, air, and water quality changes should be measured in terms of concentrations at a given site and enabled by the ecosystems being studied. These should be presented in units compatible with the valuation method (e.g., yearly averages). Pollination can be measured as the rate of pollination and/or number of pollinators. Flood regulation may require data on expected storms and their intensity and a measure of the characteristics of the ecosystem providing the service (e.g., vegetation density).</p> <p>Most regulating services will require measurement at fine spatial scales and require some biophysical modelling (e.g., hydrological balances for water regulation or sediment transport for soil erosion and/or water quality parameters).</p>

	Often measures may need to be translated into an index or indicator that can be used for valuation (e.g., pollutants in water quality may need to be mapped to a water quality ladder outlining measures as indicative of good, fair, or poor water quality).
Cultural services	<p>The link between biophysical measurement and the realization of cultural ecosystem services is often hard to define and model. In some cases, the frequency of cultural service use directly measures the provision of the service, making the biophysical landscape implicit in the use patterns. For example, recreation services may start with directly measuring visitation to a given site as the core measurement variable of the ecosystem service. In this case, the biophysical unit may be the spatial area that provides the service.</p> <p>When possible, an attempt should be made to integrate a measure of the quality and condition of the ecosystem and/or its capacity to sustain these services, in order to enrich the valuation exercise. Information from the Statements of the Quality of Underlying Assets can be used to complement and enrich the characterization of the ecosystem's ecosystem service production potential.</p>
Non-use values	Since non-use values, and sometimes option values, are not dependent on current uses, these values can emphasize the value of biophysical production without having to equate them to their use (e.g., hectares of the ecosystem).

## 2. Collect the data for biophysical measurements

Once measurement methods have been selected and data needs have been identified, primary data (through field observations, surveys, or remote sensing) and secondary data from authoritative sources (e.g., official government data, data used for published work, recognized global data sources used by subject matter experts) should be collected. Data collection at this stage focuses on the production of the service (e.g., kilograms of fish catch relative to fish stock, rate of pollination, tons of nutrients removed), which will be used to derive an ecosystem service value.

To determine what data should be included and assure its quality, the following criteria should be followed:

- Accuracy (is the data correct?)
- Completeness (what does it cover and not cover?)
- Reliability (does it contradict trusted data sources?)

- Relevance (is the data needed for the calculations that will be applied?)
- Timeliness (how recent is it? can it be used for real-time reporting?)

Once data is identified and collected, the analysis is conducted through the chosen method and/or model. The initial study will require more time to identify data and set up measurement processes. However, given that annual reporting on ecosystem service values is required, methods and data sources should be streamlined to ensure consistency, using key indicators and data proxies that can be updated on an annual basis.

Data gaps and underlying assumptions should be clearly outlined in the method description. If data gaps exist, preventing the measurement of identified ecosystem services, an expert informed desktop analysis combined with authoritative secondary data should be used to fill value gaps. If there are gaps that cannot be filled with this approach, a transparent and clear justification for the exclusion of identified ecosystem services should be provided. In addition, ecosystem services identified but not measured and/or valued should be listed in the Footnotes of the Statement of Natural Production and the reason for their exclusion noted in the Methodological Notes column.

A measurement of error should be provided for every ecosystem service quantified and a sensitivity analysis should be conducted with a focus on the parameters of greatest uncertainty and largest influence on the results. This can also be done through the calculation of result ranges, given different assumptions or scenarios. In addition, a qualitative description of potential errors and known uncertainties should be provided.

### 3. Standardize measurement units

The temporal and spatial dimensions of the measurement analysis must be determined and stated. Often, the biophysical units of measurement of a given ecosystem service may not be compatible with valuation frameworks due to the use of different temporal and spatial dimensions (e.g., water flow may be in volume per second, yet economic valuation may require data on average consumption per year). For this reason, data should be translated into units suitable for valuation, such as annual estimates and two-dimensional spatial units (e.g., hectares, acres, square kilometers). The exact unit will depend on the ecosystem service, data availability, and the method used for measurement. As an example, water provision could be measured in cubic meters per year while carbon sequestration is measured in tons of carbon per acre. These units will have to be translated into a common unit (e.g., per hectare per year) in order to conduct the valuation.

### **Complete Measurement of KPIs**

Data for the ecosystem quality KPIs determined in Step 2 that will populate the Statement of the Quality of Underlying Assets should be collected to complement, expand, or validate the selected indicators and approach outlined and scoped.

Where field measurement is possible, it should follow appropriate sampling methods and robust statistical models to be able to present a result for each indicator. If secondary, authoritative data sources are used, these should be validated, and an analysis of potential error should be included.

Data quality assurance should follow the same criteria as those established for the ecosystem service valuation, checking for accuracy, completeness, reliability, relevance, and timeliness.

Similarly, the initial Year 1 study will set up the approach and measurement processes that will be used to track and monitor each KPI in subsequent years. Therefore, methods and data sources should be streamlined to ensure consistency, transparency, and replicability on an annual basis. Data gaps and underlying assumptions should be clearly outlined in the method description. If data gaps exist, preventing the measurement of key indicators or species, those may be proposed for inclusion in subsequent years.

If certain KPIs are deemed more critical to ensuring ecosystem functionality and/or continued resilience of the landscape, those should be identified as such. It is possible that not all KPIs are of equal importance, and some may deserve greater attention relative to others. In these cases, the study must provide this qualifying information regarding the relative importance of some KPIs versus others. Additionally, contextual information should be provided to help interpret the results and determine whether there is a desirable trend in the indicators, in terms of ensuring ecological functionality in the long run.

#### OUTPUTS:

- Contributions to the Technical Report that include the results of the biophysical quantification of ecosystem service production, methods used for measurement, error estimates, and conceptual models outlining the scope and logic behind the analysis of ecosystem service provision.
- Contributions to the Technical Report with the measurement values for ecosystem quality KPIs. The write up will include the methods used for measurement, error estimates, data sources, and additional contextual information to support the interpretation of the values.
- A database with data collected for analysis, data sources, and workbook with measurement results standardized with clearly defined units that include spatial and temporal dimensions.

#### Step 5. Assign an Economic Value to the Ecosystem Services

The next step is to value ecosystem services based on accepted methods and best practices within the discipline. These values will then be used in the NAC's Ecological Performance Statements.

1. Determine valuation method for each ecosystem service

There are many methods for conducting ESVs as outlined in “Recommended Valuation Methods” below, some of which are adapted from the descriptions provided in the SEEA EA Framework.<sup>40</sup>

**Recommended Valuation Methods**

<b>Direct Market Methods: Observable markets with direct market prices.</b>
Where well-functioning markets exist for ecosystem services (there is competition and minimal price distortions), prices can be used to represent the ecosystem services value. For example, fees paid to landowners for hunting leases may reflect the value placed on the ecosystem’s production of habitat for recreation (hunting). Most ecosystem services are not currently provided in markets. In cases where markets exist, prices tend to underestimate the total economic value of the ecosystem service. Also, given that certain goods and services are often provided by public institutions or are highly regulated (e.g., water supply), the prices for these services will be heavily distorted and may need to be complemented or substituted with another valuation method that provides a better measure of the total economic value of the ecosystem service. If the price paid embodies other significant factors of production (e.g., inputs, labor, technology), an indirect market price method should be considered, such as residual value estimates.
<b>Indirect Market Methods: Prices in related markets are used as proxies.</b>
<b>Referential markets:</b> In the absence of a direct market for the unique good or service, a similar marketed good or service can be used to infer the value. The good or service should be sufficiently similar. For example, in subsistence economies, prices for the same products traded in markets (e.g., fish harvest sold at nearby ports) can be used to estimate the value of the good (e.g., fish) obtained for one’s own consumption.
<b>Residual values and resource rent methods:</b> If the price of a final good embodies the ecosystem service but also includes other significant factors of production (e.g., labor and technology), then these should be subtracted from the price to isolate the contribution of nature. These methods estimate a value by taking the gross value of the final marketed good to which the ecosystem service provides an input (e.g., crops) and then deducting the cost of all other inputs, including labor, produced assets, and intermediate inputs.
<b>Productivity or production function methods:</b> In this method, the ecosystem service is considered an input in the production function of a marketed good. Thus, changes in the service will lead to changes in the output of the marketed good, holding other things equal. The value of the service is determined by first estimating the marginal product (contribution)

<sup>40</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>



of the ecosystem service as the change in the value of production as a result of a marginal change in the supply of the ecosystem service. Then, the marginal product is multiplied by the price of the marketed good to derive a marginal value product for the ecosystem services. Third, this marginal value product is multiplied by the physical quantity of the provided ecosystem service to obtain the value of the ecosystem service. It is often used to estimate the value of water supply or pollination to agriculture.<sup>41</sup>

**Revealed Preference Methods: Uses consumer purchasing decisions and/or observed behavior to infer values for ecosystem services.**

**Hedonic price valuations:** This method estimates the differential premium on property values or rental values (or other composite goods) that arises from the effect of an ecosystem characteristic (e.g., clean air, local parks) on those values. This method is commonly used to measure the amenity services provided to residents in particular locations. In order to obtain a measure of this effect, all other characteristics of the property (including size, number of rooms, central heating, garage space, etc.) are standardized and need to be included in the analysis. Consideration should also be given to the geographical, neighborhood and ecosystem characteristics of the properties.

**Averting behavior:** This method uses expenditures or observed behavior to prevent or mitigate a negative effect of an environmental impact. These expenditures (including time spent) are used to represent the value of the ecosystem service. Examples of this include extra expenditures to improve water quality or air quality.

**Travel cost:** This method is commonly used to value the recreational value of a given site. The cost of travel and opportunity cost of visitors' time to a given recreational or cultural site is collected and used to build a demand curve to infer the implicit price of the ecosystem service (e.g., recreation). The area under the demand curve provides a measure of the willingness to pay (measured through the expenditures and time spent of different visitors) to visit the site. The method is similar to the estimation of a demand curve based on the quantity demanded at different prices.

**Cost-Based Methods: The cost of damages that would be incurred by communities in the absence of ecosystem services.**

**Replacement costs:** Estimates the cost of replacing the ecosystem service through something that provides the same contribution to benefits. It is also known as the substitute cost or alternative cost approach. The substitutes can be either a consumption item (e.g., an air filtration unit for a household substituting for air filtration services of trees) or an input factor (e.g., sorghum substituting for non-priced forage in the case of a rangeland grazing ecosystem services) or a capital factor (e.g., water treatment plant). In all cases, if the substitute provides an identical contribution, the price of the ecosystem service is the cost of using the substitute

<sup>41</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

to provide the same benefits as provided by a single quantity unit of the ecosystem service (e.g., price for a ton of forage).

**Avoided costs:** The cost of damages that would be incurred by communities in the absence of ecosystem services. Often, expected damage functions are built based on historical data of damages associated with different levels of ecosystem service provision. This method is often used to estimate storm protection benefits provided by natural areas (such as wetlands). Historical data for storm damages can be regressed depending on wetland extent, controlling for factors such as storm intensity, population density, and exposure factors.

**Mitigation or restoration costs:** The costs of recovering from and preventing further damages due to ecosystem degradation. This valuation method is common in legal settings, and it is used for the purpose of making the public whole again following an environmental damage.

**Stated Preference Methods:** Often used in marketing studies, these methods are based on rigorous surveys asking respondents their willingness to pay or willingness to accept payment for the provision of different levels of ecosystem services. These are often used to estimate consumer surplus and non-use values.

**Contingent valuation:** Survey-based stated preference technique that elicits people's behavior in constructed markets. In a contingent valuation questionnaire, a hypothetical market is described where the good/service in question can be traded. This contingent market defines the good itself, the institutional context in which it would be provided, and the way it would be financed. Respondents are asked about their willingness to pay for, or willingness to accept, a hypothetical change in the level of provision of the good, usually by asking them if they would accept a particular scenario. Respondents are assumed to behave as though they were in a real market.

**Choice modelling or conjoint analysis:** Surveys that isolate levels of the environmental good or service in order to build a valuation function based on multiple data points collected in different contexts presented in the survey. An individual is offered a set of alternative levels of supply of goods or services, in which the characteristics vary according to defined dimensions of quality and cost. By analyzing preferences across these different bundles of characteristics, it is possible to obtain the value placed by the individuals on each of the characteristics, provided: (i) the bundles include a cost variable; and (ii) a baseline bundle is included that represents the status quo.

**Benefit Transfer Method:** The use of existing data from published valuation studies to infer the value of an ecosystem or service. This method draws on the valuation methods above and can be adopted when primary data is lacking.

**The benefit transfer method** uses secondary data (i.e., published data) to estimate the value of a service at a target site. Similar to a house appraisal valuation, where “comparable sales” are used to predict the house's current value, this method uses comparable sites to predict ecosystem service values that lack primary data. The value can be refined to adjust for specific

variables that may influence its value, such as size of the asset or income effects, through a function transfer method.

The application of a given ESV method will be based on the ecosystem and ecosystem service type, the type of economic value that is believed to be most material, and the data available. For example, travel cost methods are often used to estimate the recreational value of an ecosystem since the method looks at distance travelled to get to a unique site. Hedonic valuations are often used to estimate the value obtained by homeowners from visual amenity services related to proximity to an ecosystem. The chosen method for each ecosystem service should be well-justified, researched and explained, including the type of economic value that will be targeted, key assumptions, and limitations. See below "Recommended Ecosystem Service Valuation Approaches" for recommended valuation methods by ecosystem service type.

Different types of values can be estimated through different valuation methods and framings. For example, a direct market method will measure the exchange value of a good or service (the price point given current demand and supply). Stated preference methods can also measure the value obtained by consumers above the price point, or the consumer surplus obtained through the consumption of a good or service. Cost-based approaches can measure the value of producing the ecosystem service and do not necessarily integrate demand-based factors (e.g., the expected price or the consumer surplus). Value types can also be categorized according to the Total Economic Value concept. In this lens, ecosystems can also be valuable to society simply because of their existence (non-use values) or the value placed in having the option to benefit from it (option value). Values relevant to the estimation of Total Economic Value should be explored and the target values sought through the valuation should be clearly outlined as part of the method description for a NAC valuation. The objective of a NAC is to capture as much of the Total Economic Value of the natural asset as possible.

Above all, a NAC should prioritize rigor, consistency, and transparency in the methods used, value types included, and underlying assumptions to allow reviewers to interpret the values obtained and compare them through time and to other NACs. By noting whether a value is an exchange or consumer surplus value, or a market or non-market value, or whether it is a direct use, indirect use, option, or non-use value, a more accurate interpretation of the results will be enabled. Given that the objective for the ESV is to capture the Total Economic Value, transparent information on value types will help reviewers understand the completeness of the valuation and the type of value being captured. Transparency and replicability will help to conduct subsequent valuations for future reporting.

Exchange values will often provide a conservative value in units that are comparable to market prices. These value types are recommended by SEEA's EA Framework.<sup>42</sup> More specifically, SEEA's EA Framework of method prioritization, as is stated in their guidelines, is as follows:

- i. Methods where the price for the ecosystem service is directly observable;
- ii. Methods where the price for the ecosystem service is obtained from markets for similar goods and services;
- iii. Methods where the price for the ecosystem service is embodied in a market transaction;
- iv. Methods where the price for the ecosystem services is based on revealed expenditures (costs) for related goods and services;
- v. Methods where the price for the ecosystem service is based on expected expenditures or markets.

For NACs, exchange values based on market prices can be prioritized and included when there are well-functioning markets for the ecosystem service. Well-functioning markets are ones where there is competition and minimal price distortions (e.g., subsidies or price manipulations). For example, timber may have mature markets, with healthy competition, and hence prices serve as an indicator of timber direct use values. Because most ecosystem services do not have markets, other methods are often needed to capture more of the ecosystem service's total economic value.

It is important to note that exchange values and/or market-based methods may result in lower value estimates by excluding some indirect benefits and/or consumer surplus values. Since the objective of a NAC is to capture Total Economic Value, including values outside markets, other methods are often needed. Particularly, when consumer surplus is believed to be high and/or there are few market interactions, a cost-based and/or willingness-to-pay approach should be considered to complement or conduct the valuation. Also, if option values are identified and measurable, these should be estimated and included. When these additional valuations are conducted, they should be done transparently and clearly, pointing out the types of values being captured. Most importantly, the practitioner will have to justify the decision to adopt a given valuation method based on what seems best suited given the data available, the beneficiaries of the service, the characteristics of the market, and the completeness of the estimate. This

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<sup>42</sup>

United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

decision will have to be explained in a Methods section of the technical report that will describe the ESV study.

Although the most appropriate valuation methods will depend on the local context and data available, some general recommendations are provided in the table below.

### **Recommended Ecosystem Service Valuation Approaches**

<b>Ecosystem Service Category</b>	<b>Recommended Valuation Method(s)</b>
<b>Provisioning services</b>	<p>Valuation should be framed in terms of the physical flows that are harvested and/or consumed (e.g., number and weight of unprocessed fish caught). Direct market prices or indirect market prices are often used for these services. These should reflect prices when the service first enters the supply chain (harvest price rather than retail price) to avoid inclusion of other factors of production.</p> <p>If the price of the good includes other significant inputs (e.g., labor and other costs of production), an indirect market price method, such as residual values or production function methods, should be considered.</p> <p>Methods that estimate consumer surplus should be considered when market prices leave significant value gaps and/or where the good may be significantly underpriced in the market setting.</p> <p>For example, water markets are often subsidized and heavily regulated, resulting in very low values. In these cases, other methods, such as referential markets, productivity methods or stated preference methods should be considered.</p> <p>In subsistence economies, similar goods or service sold in market settings (referential markets) can be used as proxies.</p>
<b>Regulating and maintenance services</b>	<p>Regulating services are often measured through indirect market methods or cost-based methods, since they often provide inputs into the production of other ecosystem services (e.g., pollinating services are inputs into crop production) and can either be estimated through a substitute factor of production and its associated cost or through the marginal profit or cost savings that the service generates.</p> <p>In some cases, these services can be valued based on observed market transactions, such as data from payments for ecosystem services schemes or emissions trading schemes. However, there will be limits as to where these methods can be used to estimate exchange values, depending on the institutional arrangements involved or the way in</p>

	<p>which services are quantified within the schemes (e.g., often management actions are used as a proxy for quantities).<sup>43</sup></p> <p>For carbon markets, year appropriate social cost of carbon estimates accepted by the IPCC should be used (i.e., the difference between social cost and market cost). These are often based on avoided costs.</p> <p>Soil, air, and water quality changes should be measured in terms of concentrations levels attributed to natural ecosystems and presented as a representative yearly value. A cost-based approach to mitigate can be considered or an indirect market or revealed preference method that captures the value placed on these improvements.</p>
<b>Cultural services</b>	<p>Appropriate valuation methods will differ greatly from one cultural service to another.</p> <p>Recreational services are often valued through either travel cost estimates or stated preference methods (yielding consumer surplus estimates). These methods require the estimation of recreational days.</p> <p>Visual amenities are often valued through hedonic price estimates.</p> <p>Educational and scientific services may be measured through indirect markets (replacement costs, observed markets, or as factors of production).</p> <p>Where appropriate, spiritual, artistic, and symbolic services can be qualified, noting that valuation will yield a small portion of the value that people place on them.</p>
<b>Non-use values</b>	<p>Non-use values (bequest and existence values) should be calculated at the level of the ecosystem (e.g., a unique forest or wetland and everything it embodies) and should be reported as a separate flow of value (i.e., an ecosystem service) obtained every year.</p> <p>Bequest and existence values are generally (and almost exclusively) valued through stated preference methods. Often option values can also be valued through stated preference methods.</p>

Once all ecosystem services that will be included have been matched to a potential valuation method, a technical report should be drafted to present the methods chosen,

<sup>43</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

with a supporting literature review that outlines best practices on the method. The types of economic values that will be captured for each ecosystem service should be clearly indicated and be as specific as possible. For example, wild fish may be valued at an ex-vessel price and identified as such. A consumer surplus value should be described as explicitly as possible (e.g., the average willingness to pay above current prices).

There should also be a thorough review to check for potential double counting before and while conducting the valuations. Valuation estimates that are additive and complementary should be adopted to avoid double counting. If valuations are additive, their addition should be presented in a transparent manner, accompanied with a conceptual model, noting how they are additive, while noting the types of values obtained (e.g., direct, indirect, or option values relevant to a given population). When there are multiple values for the same ecosystem service and type of value, these should be presented separately to illustrate their additionality or the range of values available (e.g., they may be valued differently by different beneficiaries). Finally, if there are values with large margins of error, there should be at least one other validation method conducted to validate results.

Adding across value types for a given ecosystem service may be possible, as long as the valuations are framed to be additive at the outset. Therefore, where multiple valuations are conducted for a given service, there should be clear indication of their complementarity or overlap with respect to the object of valuation. If the potential for double counting is identified and significant, the more complete and rigorous valuation type should be prioritized and used as the final value in the Ecological Performance Statements. When two valuations are conducted for the same flow of ecosystem service for the purpose of validation, they can be presented separately but they will not be added in the total ecosystem service value column. Only the valuation that is deemed most rigorous and defensible will be used to derive a total asset value.

## 2. Conduct the valuation

To conduct the valuation, the physical units of ecosystem services are given a dollar value. Once the measurement units are standardized in a unit suitable for valuation, the valuation method will seek to estimate the value obtained by a given set of beneficiaries. Depending on the method, additional data may be needed to reflect the beneficiaries, their willingness to pay for or accept the service, or to reflect other socio-economic, demographic, or market data that determines the value to people's wellbeing. In many cases, the biophysical measurement approach will be closely intertwined with the valuation approach (Step 4). For example, coastal flood regulation may be measured in terms of the vegetation present and its ability to reduce flood levels within exposed structures. The unit of measurement for valuation may be the cost of replacing these structures, and the model will likely integrate these parameters (costs) into the measurement method.

In general, a pilot study or test run should first be conducted to test and validate the model being used for the valuation of each ecosystem service. If a statistical model is

being used, an adequate sample size should be used in order to make results representative of the target population. The statistical model should be reviewed for potential errors and tested and validated. Descriptive statistics should be provided as well as econometric results. If secondary data is being used, validation methods should be conducted.

It is important to note data gaps and the proportion of the total value that was captured in the ESV with the information available. If needed, a desktop valuation should be considered to fill data gaps. A desktop analysis is different from a desktop assessment (such as the one conducted in step 2) by being more thorough and in-depth than the initial “assessment”. If a desktop analysis is included to complement or conduct the valuation, the values should be derived in a rigorous manner, accounting for potential errors and uncertainty and include other quality assurance methods. If a benefit transfer method is adopted to fill in data gaps, it should be done in the most rigorous manner possible, and a degree of confidence should be stated. Also, a range of possible values should be stated for the benefit transfer value. It is expected that in subsequent years, benefit transfer estimates will be replaced by a primary valuation method.

Given that NACs will have to report on the value of their natural assets every year, the valuation process should be streamlined to produce consistent estimates every year. Above all, data sources should be consistent and regularly updated data should be prioritized. If some variables cannot be updated every year (e.g., replacement costs of using alternative technologies or survey-based valuations), the year when the data was collected should be noted for transparency and an informed assumption of how applicable these are for the current year should be used, with an explicit attempt to reflect current conditions. It may be that the biophysical data can be updated more frequently than the value per unit (e.g., water quality data may be more frequently measured than the willingness to pay for changes in water quality). In this case, the change in the biophysical measure can be updated and the value per unit change should be clearly noted with the date when the estimate was carried out.

### 3. Adding ecosystem service flows

The values derived for each ecosystem service will be presented as an annual flow of benefits. To calculate a value for the NAC as a total, the flow of ecosystem service values must be added. Often, valuations will first calculate a value per hectare across the landscape, which can be used to derive the value for the total extent of the natural assets. These aggregations should be transparent. Double counting can happen when adding across categories of ecosystem services that overlap in their object of valuation. Regulating (or intermediary) services are often valued as factors of production to other provisioning or cultural services (final services). For example, soil quality improvements may be valued in terms of the contribution they provide to crop production. In such case, if crops are valued as a provisioning service in addition to soil quality’s contribution to those crops, there would be double counting. In order to avoid double counting, regulating services (and/or intermediary services) should be reviewed for potential overlap with other final goods and services included in the valuation as well as those



reported in the company's traditional financial accounting statements. If double counting risks are identified and found to be significant, only the more rigorous and complete valuation should be kept when adding services together.

### OUTPUTS:

- Contributions to the Technical Report with annual values per ecosystem service, a measurement of error per ecosystem service value or a range of values possible with the methods employed, a level of confidence for the values obtained, a clear description of the method employed, data sources, best practices followed, type of value captured, and total economic value for the NAC provided as annual estimates.
- Models used and data used in their original format with the purpose of aiding replication of the analysis during the review process.

### Step 6. Calculate the Value of the Assets

Once the annual values of the ecosystem services have been determined, these are used to calculate the underlying asset value of the NAC, as a producer of multiple ecosystem services. The Net Present Value ("NPV") of the natural assets should be calculated, using the future flow of ecosystem services generated by the assets. This is consistent with the US EPA and the SEEA EA approach, which describes NPV as follows:

"The net present value (NPV) is the value of an asset determined by estimating the stream of income expected to be earned in the future and then discounting the future income back to the present accounting period.<sup>44</sup> In ecosystem accounting, it is applied by aggregating the NPV of expected future returns for each ecosystem service supplied by an ecosystem asset."<sup>45</sup>

The formula for calculating NPV is:

$$NPV = \sum_{t=1}^n \frac{R_t}{(1+i)^t}$$

Where:

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<sup>44</sup> United Nations (2014). *System of Environmental-Economic Accounting 2012—Central Framework*. Page 151 para. 5.110.

<sup>45</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Page 184.

$R_t$  = Net cash inflow or outflow in period  $t$

$i$  = Discount rate

$t$  = Number of time periods

Assets will be valued by taking the sum of the discounted future flows of values for all the ecosystems services provided and calculating their Net Present Value. Each unique ecosystem type may be presented separately as a natural asset with its corresponding value or they may be valued as a system of interacting ecosystems that produce an overall “system-wide” value. The system will correspond to the boundaries of the NAC and the set of ecosystems within it.

There are three important considerations when calculating an NPV for natural assets:

1. the amount and/or value of future streams of benefits in comparison to the present assessment,
2. the discount rate (representing the opportunity cost of money and time preferences of the beneficiaries); and
3. the life of the asset (the length of time expected for the flow of ecosystem services to be provided).

In the context of a NAC, future streams of benefits will be estimated to be the same as they are today. This approach is recommended to maintain a consistent and transparent approach across NACs and avoid the uncertainty introduced through forecasting. If foreseeable risks or changes in future ecosystem functioning are evident and have high certainty, the analyst should recognize these and note them in the NAC’s public disclosure documents filed with the SEC. For example, there may be foreseeable land cover changes due to climate change, which will imply a shifting baseline for the ESV in the future. Also, these notes may be complemented with a description of how ecosystem quality is expected to improve, or ecosystem service quantity is expected to increase as a result of the proposed management objectives and how these changes may be expected to impact ecosystem service values in the future. The expected increase in value can be included as a growth rate or yearly percentage increase within those notes, and they may be provided as a range of scenarios. For healthy ecosystems, with high performing KPIs, an additional valuation exercise may be conducted to estimate the economic value of continued resilience. This may be done through informed projections and/or scenarios. Information on expected growth rates is not required in the Statements but NACs should consider whether it constitutes material disclosure, which should be included in their public disclosure documents filed with the SEC.

With respect to the discount rate and temporal horizon, IEG recommends the use of a 2% discount rate and that the NPV be estimated based on a 100-year lifetime for the asset. This will ensure consistency across the different valuations and NACs, and follows a

standard approach often used by the SEEA EA framework to illustrate NPV calculations.<sup>46</sup>

The rationale for a low discount rate and long asset life relates to the distinct characteristics of natural assets when compared to other types of capital (like manufactured or produced capital). Natural assets are long term, productive assets. When managed effectively, natural assets can appreciate in value, by providing a consistent amount of valuable ecosystem services far into the future and through their self-regenerating capacities. Also, unlike other types of capital, natural assets often cannot be substituted and hence have a higher opportunity cost than other types of capital.

The results of the ESV NPV calculations must be recorded on the Statement of Natural Assets. These may be broken down by ecosystem type and/or presented as “system-wide” values. All calculations and variables used should be disclosed, including discount rate and asset life.

#### OUTPUTS:

- Net Present Value Calculations for the value of the natural assets
- Contributions to the Technical Report outlining the method used to calculate asset values, the results of the calculations, and any other information considered in this section
- If applicable, notes on future threats, shifting baselines, and potential improvements in ecosystem service production and value given effective conservation management, including margins of error or ranges according to different scenarios

In summary, each of the Steps to Conduct an ESV will generate a set of outputs and reports which will be compiled into a single Technical Report that documents the final process, methods, and findings for all the required outputs of the ESV study. Although the ESV steps are iterative and complementary, the final outputs produced at each step provide the information needed to populate the Statements of Natural Production and Natural Assets, and most of the ecosystem quality KPIs for the Statement of the Quality of Underlying Assets. Additional information to complete the Statement of the Quality of the Underlying Assets will be derived from the evaluation of the management performance of the NAC.

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<sup>46</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Page. 345

(b) Statutory Basis

The Exchange believes that the proposed rule change is consistent with Section 6(b)(5) of the Act,<sup>47</sup> in that it is designed to promote just and equitable principles of trade, to foster cooperation and coordination with persons engaged in regulating, clearing, settling, processing information with respect to, and facilitating transactions in securities, to remove impediments to and perfect the mechanism of a free and open market and a national market system, and, in general, to protect investors and the public interest, and is not designed to permit unfair discrimination between customers, issuers, brokers, or dealers.

The proposed listing standard for NACs is consistent with the protection of investors and the public interest because, among other things, it includes rigorous quantitative financial requirements and corporate governance requirements. Specifically, the proposed listing standard requires NACs to meet the same quantitative initial and continued listing standards as are applied to operating companies listed on the NYSE. In addition, NACs would be subject, without exception, to all of the other rules applicable to NYSE listed operating companies.<sup>48</sup>

The proposed rule change is designed to perfect the mechanism of a free and open market in that it will facilitate the listing and trading of an additional type of security and will therefore enhance competition among market participants, to the benefit of investors and the marketplace. There is significant and growing interest in investing in asset classes that are consistent with the objective of protecting and improving the environment. The Exchange believes that the listing of NACs will provide investors with an investment vehicle that meets this demand. The Exchange also believes that the development of NACs will provide a source of funding to maintain and restore natural assets.

The charter provisions each NAC would be required to adopt under the proposed rule are also consistent with the protection of investors and the public interest because they are designed to ensure that the NAC conducts its operations in a manner consistent with the ecological and socially equitable goals that would motivate investors when investing in the NAC. Specifically, these proposed charter requirements would include the following provisions:

- The purpose of the company is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services, with

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<sup>47</sup> 15 U.S.C. 78f(b)(5).

<sup>48</sup> While NACs will be subject to all of the requirements of the Manual, the Exchange proposes some rule language specific to NACs to ensure that readers of those sections will clearly understand their applicability to NACs. Specifically, the Exchange proposes to amend Section 303A to specify that NACs will be subject to the same corporate governance requirements as operating companies and similarly proposes to amend Chapter Eight of the Manual to specify that NACs are subject to all of the continued listing requirements specified in that chapter for operating companies.

the objective of maximizing ecological performance. The NAC may also engage in other activities that do not cause any material adverse impact to the natural assets for which it is responsible, including: (a) supporting community well-being; and (b) engaging in sustainable commercial activities.

- NAC funds (including any proceeds from the sale of the company's securities at any time) must be used primarily to meet the NAC's operational needs to meet its responsibilities with respect to the natural assets under its control and to provide for the long-term capital needs of the NAC in fulfilling that purpose. In addition, provided that any such uses do not cause any material adverse impact to the natural assets for which the NAC is responsible, funds may be used to support community well-being.
- The NAC will be prohibited from engaging directly in unsustainable extractive activities (including, but not limited to, traditional fossil fuel development, mining, unsustainable logging, or perpetuating industrial agriculture) or using its funds to finance such activities.

If any of the foregoing provisions of the NAC's charter are eliminated or materially amended in a manner that is inconsistent with their required form at any time, the NAC will be subject to delisting from the NYSE.

Similarly, the various policies that the NAC would be required to adopt and publicize (including an Environmental and Social Policy, a Biodiversity Policy, a Human Rights Policy, and an Equitable Benefits Sharing Policy) would protect investors by establishing clear standards that the NAC must abide by in seeking to address its stated ecological and social goals.

In addition, the Exchange believes that the review conducted by the Independent Reviewer with respect to the initial and periodic statements filed by each NAC are consistent with investor protection and the public interest because they are designed to ensure that such statements are prepared in a manner that is consistent with the requirements of the Framework. Further, this thorough independent expert review of each NAC's Statements will protect investors by providing significant assurance as to the reliability of those Statements. The proposal would also amend Section 802.01E of the Manual to create non-compliance and delisting procedures for NACs that fail to timely publish their Statements. The proposed requirements for the audit committee of the NAC to oversee the preparation of the Statements and the performance of the Independent Reviewer are consistent with the protection of investors as they will help assure the accuracy and completeness of the Statements and the quality of the Independent Reviewer's review.

Similarly, as is the case with all listed companies, NACs would be required to immediately disclose pursuant to the Exchange's immediate release policy set forth in Sections 202.05 and 202.06 of the Manual any material event, including any event that is anticipated to have a material adverse effect with respect to any of the criteria included in the Statement of Ecological Performance (e.g., a forest fire). It is therefore in the interests

of investors to have a rigorous rule to address delinquencies with respect to disclosures and to require immediate disclosure of material events.

4. Self-Regulatory Organization's Statement on Burden on Competition

The Exchange does not believe that the proposed rule change will impose any burden on competition not necessary or appropriate in furtherance of the purposes of the Act. A listing under the proposed rule would be available in a non-discriminatory way to any company satisfying its requirements, as well as all other applicable NYSE listing requirements. In addition, the Exchange faces competition for listings but the proposed rule change does not impose any burden on the competition with other exchanges; any competing exchange could similarly adopt rules to allow the listing of NACs.

5. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants or Others

The Exchange has neither solicited nor received written comments on the proposed rule change.

6. Extension of Time Period for Commission Action

The Exchange does not consent at this time to an extension of any time period for Commission action.

7. Basis for Summary Effectiveness Pursuant to Section 19(b)(3) or for Accelerated Effectiveness Pursuant to Section 19(b)(2)

Not applicable.

8. Proposed Rule Change Based on Rules of Another Self-Regulatory Organization or of the Commission

Not applicable.

9. Security-Based Swap Submissions Filed Pursuant to Section 3C of the Act

Not applicable.

10. Advance Notices Filed Pursuant to Section 806(e) of the Payment, Clearing and Settlement Supervision Act

Not applicable.

11. Exhibits

Exhibit 1 – Form of Notice of Proposed Rule Change for Federal Register

Exhibit 3 – Text of the Ecological Performance Framework

Exhibit 5 – Proposed Rule Text

SECURITIES AND EXCHANGE COMMISSION  
(Release No. 34- ; File No. SR-NYSE-2023-09)

[Date]

Self-Regulatory Organizations; New York Stock Exchange LLC; Notice of Filing of Proposed Rule Change to Amend the NYSE Listed Company Manual to Adopt Listing Standards for Natural Asset Companies

Pursuant to Section 19(b)(1)<sup>1</sup> of the Securities Exchange Act of 1934 (“Act”)<sup>2</sup> and Rule 19b-4 thereunder,<sup>3</sup> notice is hereby given that on January 27, 2023, New York Stock Exchange LLC (“NYSE” or the “Exchange”) filed with the Securities and Exchange Commission (the “Commission”) the proposed rule change as described in Items I, II, and III below, which Items have been prepared by the self-regulatory organization. The Commission is publishing this notice to solicit comments on the proposed rule change from interested persons.

I. Self-Regulatory Organization’s Statement of the Terms of Substance of the Proposed Rule Change

The Exchange proposes to amend the NYSE Listed Company Manual (“Manual”) to adopt a new listing standard for the listing of Natural Asset Companies. The proposed rule change is available on the Exchange’s website at [www.nyse.com](http://www.nyse.com), at the principal office of the Exchange, and at the Commission’s Public Reference Room.

II. Self-Regulatory Organization’s Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

In its filing with the Commission, the self-regulatory organization included statements concerning the purpose of, and basis for, the proposed rule change and discussed any comments

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<sup>1</sup> 15 U.S.C. 78s(b)(1).

<sup>2</sup> 15 U.S.C. 78a.

<sup>3</sup> 17 CFR 240.19b-4.



it received on the proposed rule change. The text of those statements may be examined at the places specified in Item IV below. The Exchange has prepared summaries, set forth in sections A, B, and C below, of the most significant parts of such statements.

A. Self-Regulatory Organization's Statement of the Purpose of, and the Statutory Basis for, the Proposed Rule Change

1. Purpose

The Exchange proposes to adopt a new subsection of Section 102 of the Manual (to be designated Section 102.09) to permit the listing of common equity securities of Natural Asset Companies (or "NACs").

For purposes of proposed Section 102.09, a NAC is a corporation whose purpose is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services, and whose value is based on those natural assets and ecosystem services. Additionally, a NAC may use its funds to support community well-being, provided that such uses do not cause any material adverse impact to the natural assets under its control.

**Introduction to NACs**

The value of nature to life on earth is readily apparent. Healthy ecosystems produce clean air and water, foster biodiversity, regulate the climate, and provide the food on which our existence depends. For purposes of this proposal, the term "ecosystem" refers to specific entities (structures, functions, and components of the natural world) that produce ecosystem services. These and other benefits derived from ecosystems are called ecosystem services, and in aggregate, economists estimate their value at more than US\$100 trillion dollars per year.<sup>4</sup>

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<sup>4</sup> Costanza et al (2014). Changes in the global value of ecosystem services, *Global Environmental Change*, 26, 152-158. Available at:

Examples of ecosystem services include clean air, water supply, flood protection, productive soils for agriculture, climate stability, habitat for wildlife, among others.

Despite a recognition that nature is immensely valuable, that value generally has not been included in the financial system. Public policy initiatives, like regulatory carbon markets, have made progress toward reflecting the true cost of industrial activities, but most environmental values remain uncaptured by financial reporting. Because financial markets do not include the positive and negative externalities related to nature's consumption and production, ecosystem services are being degraded at alarming rates. Species extinction is proceeding at a pace never experienced in human history.<sup>5</sup> Fresh water resources are being consumed and polluted. Agriculture is contributing to the loss of natural habitat and soil degradation. These are significant threats to life on earth and the economy.

Recognizing the urgency and opportunity presented by these conditions, investors increasingly express a desire for investment vehicles that will permit them to express a sustainability thesis.<sup>6</sup> Improvements in corporate disclosures,<sup>7</sup> introduction of climate and

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<https://doi.org/10.1016/j.gloenvcha.2014.04.002>

<sup>5</sup> IPBES (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). Available at:

<https://doi.org/10.5281/zenodo.3831673>

<sup>6</sup> Global Sustainable Investment Alliance (2020). *Global Sustainable Investment Review, 2020*. Available at: <http://www.gsi-alliance.org/wp-content/uploads/2021/08/GSIR-20201.pdf>

<sup>7</sup> The Commission has stated that a number of its disclosure rules may require disclosure related to climate change. Commission Guidance Regarding Disclosure Related to Climate Change, Release No. 33-9106 (Feb. 2, 2010) 75 FR 6290 (Feb. 8, 2010). Also, the Commission's Division of Corporation Finance recently reminded registrants that it selectively reviews filings to monitor and enhance compliance with applicable disclosure requirements. Available at: <https://www.sec.gov/corpfin/sample-letter-climate-change-disclosures>

nature-focused indices, and the development of ESG funds screening for preferred or prohibited factors have all expanded the accessibility of sustainable investing. Despite these advances, however, investors still express an unmet need for efficient, pure-play exposure to nature and climate.

Although there is significant demand to deploy financial capital toward sustainability, stewards of natural landscapes have often had little choice other than extractive development to fund their budgets or garner a return on investment. Capital flows directed to biodiversity conservation, renewable energy, regenerative agriculture, and other direct investments needed to facilitate a transition to a sustainable economy are insufficient due in part to the inability to transparently present the economic case to access these investment dollars based on traditional measures for financial performance. The financing gap for biodiversity is estimated between US\$598 and US\$824 billion per year<sup>8</sup> and for climate change is estimated at over US\$5 trillion per year,<sup>9</sup> and likely an order of magnitude larger for the transition to a more sustainable, resilient, and equitable economy.<sup>10</sup>

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<sup>8</sup> Deutz, A., Heal, G. M., Niu, R., Swanson, E., Townshend, T., Zhu, L., Delmar, A., Meghji, A., Sethi, S. A., and Tobinde la Puente, J. 2020. *Financing Nature: Closing the global biodiversity financing gap*. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability. Available at: <https://www.nature.org/en-us/what-we-do/our-insights/reports/financing-nature-biodiversity-report/>

<sup>9</sup> Boehm, S., K. Lebling, K. Levin, H. Fekete, J. Jaeger, R. Waite, A. Nilsson, J. Thwaites, R. Wilson, A. Geiges, C. Schumer, M. Dennis, K. Ross, S. Castellanos, R. Shrestha, N. Singh, M. Weisse, L. Lazer, L. Jeffery, L. Freehafer, E. Gray, L. Zhou, M. Gidden, and M. Gavin. 2021. *State of Climate Action 2021: Systems Transformation Required to Limit Global Warming to 1.5°C*. Washington, DC: World Resources Institute: <https://doi.org/10.46830/wriipt.21.00048>.

<sup>10</sup> Force for Good (2021). *Capital as a Force for Good, 2021 Report*. Available at: [https://www.forcegood.org/frontend/img/2021\\_report/pdf/Funding\\_the\\_SDGs\\_and\\_a\\_Sustainable\\_Future.pdf#toolbar=0](https://www.forcegood.org/frontend/img/2021_report/pdf/Funding_the_SDGs_and_a_Sustainable_Future.pdf#toolbar=0) Chapter 2.

Ending the overconsumption of and underinvestment in nature requires bringing natural assets into the financial mainstream. To that end, the Exchange proposes to adopt listing standards to introduce a new type of public company called a NAC, a new concept pioneered by Intrinsic Exchange Group Inc. (“IEG”). Founded in 2017, IEG is a private company structured as a corporation organized under the laws of the State of Delaware that advises public sector and private landowners on the creation of NAC structures and strategies.

NACs will be corporations that hold the rights to the ecological performance (i.e., the value of natural assets and production of ecosystem services) produced by natural or working areas, such as national reserves or large-scale farmlands, and have the authority to manage the areas for conservation, restoration, or sustainable management. These rights can be licensed like other “run with the land” rights (such as mineral rights, water rights, or air rights) and NACs are expected to license these rights from sovereign nations, private landowners, or companies with significant property holdings. Alternatively, a NAC may itself own the underlying terrestrial or marine areas it manages.

Under the proposed amendments to the Manual, capital raised through an NYSE-listed NAC’s initial public offering or follow-on offerings must be used to implement the conservation, restoration, or sustainable management plans articulated in its prospectus, fund its ongoing operations, or otherwise fulfill its purpose to maximize ecological performance (i.e., the value of natural assets and the production of ecosystem services). While the purpose of a NAC is to maximize ecological performance, under the proposed rules, a NAC would not be prohibited from also operating a traditional business (e.g., eco-tourism in a natural landscape, or producer of regenerative food crops in a working landscape) provided that doing so is consistent with the NAC’s charter. However, all NACs are prohibited from directly or indirectly conducting

unsustainable extractive activities that lead to the degradation of the ecosystems it is trying to protect, such as mining. Additionally, a NAC could monetize those ecosystem services which are currently visible in the market (e.g., through the sale of carbon credits) and the related revenues and expenses would be reported in the financial statements of the NAC prepared under generally accepted accounting principles (“GAAP”) and filed with the SEC as part of the NAC’s required annual report on Form 10-K, 20-F or 40-F, as applicable. In order to align the interests of local communities with the objectives of maximizing the value of natural assets and the production of ecosystem services, a NAC would also be able to use its funds to support local community well-being (e.g., education, health), provided that such uses do not cause any material adverse impact to the natural assets under its control.

Because most ecosystem services are not yet monetized and integrated into markets, investors will need information beyond its GAAP financial statements to understand the value of a NAC. Therefore, the Exchange proposes to require each NAC to produce new materials called Statements of Ecological Performance (the “Statements”) that measure the productivity, value, and condition of the area whose ecological performance rights are held by the NAC. These Statements are based on the Ecological Performance Framework (the “Framework”) developed by IEG.

The Statements would report dozens of distinct ecosystem services measured through a discipline called Ecosystem Service Valuation (“ESV”). ESV is an economic discipline that has been in existence for decades and is used by governments, companies, and courts across the world to link environmental statistics for a given area to economic values that are used to support major financial, policy, and legal decisions ranging from ordinary course planning and management to natural disaster relief and civil litigation.

Under the proposed amendments to the Manual, NACs will conduct an ESV at least annually to prepare the Statements. The Statements of Ecological Performance and ESV must be reviewed and attested to by a public accounting firm that is registered with the Public Company Accounting Oversight Board (“PCAOB”) and is independent from the NAC and NAC licensor, if applicable, under the independence standard set forth in Rule 2-01 of Regulation S-X (“Independent Reviewer”).

In addition to the GAAP financial statements required under SEC disclosure rules and the proposed Statements that would be derived through an ESV, NYSE proposes to require NACs to provide a number of unique disclosures designed to provide safeguards and transparency on the NAC’s social and environmental objectives. These include requiring NACs to adopt and publish an Environmental and Social Policy, a Biodiversity Policy, a Human Rights Policy, consistent with the United Nations Guiding Principles on Business and Human Rights,<sup>11</sup> and an Equitable Benefit Sharing Policy.

Finally, to the extent the NAC has a license agreement with a natural asset owner, the NAC will be required under applicable SEC rules to disclose all material information about the license (including any material amendments to the license over time) in the registration statement filed in connection with its IPO and in its subsequent periodic SEC filings.

### **Relationship with IEG**

The Exchange and IEG have entered into an agreement pursuant to which IEG has granted the Exchange an exclusive license in the United States to use the Framework in

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<sup>11</sup> United Nations (2011). *Guiding principles on business and human rights: Implementing the United Nations "Protect, Respect and Remedy" framework*. Available at: [https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr\\_en.pdf](https://www.ohchr.org/sites/default/files/documents/publications/guidingprinciplesbusinesshr_en.pdf)

connection with the listing of NACs on the Exchange (although the Framework will remain proprietary to IEG). IEG has agreed to seek to identify and develop NACs for listing on the Exchange, in addition to marketing the listing and trading of NACs on the Exchange and providing training with respect to the NAC structure and the Framework to NYSE personnel and currently listed and potential listed NACs. While IEG will seek to promote the listing of NACs on the NYSE, the determination of the suitability for listing of any applicant NACs will solely be made by the NYSE and IEG will have no role in the listing qualification process.

**Definitions of Key Terms Used in this Proposal, in the context of a NAC**

**Biodiversity** – Defined as “the variability among living organisms from all sources including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.<sup>12</sup>

**Community Well-being** – Refers to the combination of social, economic, environmental, cultural, and political conditions of individuals and their communities as essential for them to flourish and fulfil their potential.<sup>13</sup>

**Consumer Surplus Value** – The value obtained by consumers of a good or service beyond what is actually paid for the good or service. This is the extra welfare or utility that people obtain for free from the consumption of ecosystem goods and services.

**Cost-based Value** – Values based on expenditures involved in preventing, avoiding, mitigating, restoring, or replacing the loss of ecosystems and/or ecosystem services.

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<sup>12</sup> Convention on Biological Diversity (1992) Convention on Biological Diversity, Secretariat of the Convention on Biological Diversity, Montreal, Canada.

<sup>13</sup> Wiseman, J., Brasher, K. (2008) Community wellbeing in an unwell world: trends, challenges, and possibilities. *Journal of Public Health Policy*, 29: 353-366.

**Ecological Performance** – The value of natural assets and the production of ecosystem services.

**Ecological Performance Rights** –The rights to the ecological performance (i.e., the value of natural assets and production of ecosystem services) of a designated area, including the authority to manage the area. These rights are granted to a NAC, from a natural asset owner, as provided through a license or other legal instrument.

**Ecosystem Services** – The benefits people derive from ecosystems, many of which are provided outside market settings. These include the direct and indirect contributions from nature to economies and people’s wellbeing. The term is used to include both goods and services. Examples of ecosystem services include air filtration, water supply, flood protection, soil quality regulation, climate stability, and habitat for wildlife.

**Ecosystems** – The specific entities (structures, functions, and components of the natural world) that produce ecosystem services. The term is used by ecologists to define units within the natural world based on the interactions of plants, animals, and micro-organisms with the non-living environment.

**Ecosystem Service Valuation or ESV** – The assignment of an economic value to an ecosystem service using one of many valuation methodologies accepted today.

**Exchange Value** – The market price or price point equivalent of an ecosystem service represented by where demand and supply curves meet. This value type represents a realized market price or its potential price.

**Extent** – Refers to a spatial area measure in hectares or acres. The extent of the NAC will refer to the total area of the NAC at its most aggregate level; in the Statements of Underlying Quality, extent will be reported by ecosystem type. In the Statements on



Natural Assets, the extent will refer to the areas supplying the ecosystem services being measured and valued.

**Hybrid Areas** – Areas that integrate natural areas with working areas and/or built infrastructure in a single NAC to produce the most value within a diverse landscape.

**IEG Ecological Performance Framework** – IEG has developed a specific framework for NACs to derive and report on ecosystem service values and on the quality of the natural assets being managed. In addition, the Framework defines the components and structure of the Statements of Ecological Performance to ensure the values are reported transparently and consistently.

**Independent Reviewer** – A public accounting firm registered with the PCAOB independent of a NAC and a NAC’s licensor.

**Local Communities** – refers to groups of people—including indigenous peoples and other local groups—who have direct ties to and derive livelihood or cultural values from the area to which the NAC holds the license.

**Natural Areas** – Areas managed by a NAC where the NAC’s focus is on creating new conservation areas (e.g., intact landscapes, or seascapes); protecting existing conservation areas; or restoring degraded areas to protect and enhance biodiversity and ecosystem service production.

**Natural Assets** – A statistical representation of ecosystems for accounting purposes that defines them as productive units of ecosystem services. Natural assets can be monetized directly or indirectly. Like traditional assets, they have economic value and are expected to provide a future benefit. The term in the singular form refers to an ecosystem type (e.g., a delineated forest).

**Natural Asset Companies (NACs)** – Corporations that hold the rights to the ecological performance of natural, hybrid, or working areas, and have the authority to manage the areas for conservation, restoration, or sustainable management.

**Natural Production** – The production and use of ecosystem goods and services by Natural Assets.

**Statement of Natural Assets** – A statement that provides information on the net present value of natural assets producing ecosystem services managed by a NAC.

**Statement of Natural Production** – A statement that provides information on the annual flows of ecosystem services managed by a NAC.

**Statement of the Quality of Underlying Assets** – A statement that provides both qualitative and quantitative information on the overall health and condition of the underlying natural assets being managed by the NAC.

**Statements of Ecological Performance** – A suite of statements with information on the ecological performance of a NAC, including a Statement of Natural Production, a Statement of Natural Assets, and a Statement of the Quality of Underlying Assets. These statements are unique to NACs and are reported in addition to traditional financial statements.

**Sustainable Activities** – From an ecological perspective, sustainable activities cannot extract resources at a faster rate than they are replenished. For an activity to be deemed sustainable there should be no directly induced degradation of the condition of the ecosystems (which can be measured through the indicators in the Statement of the Quality of Underlying Assets).

**Total Economic Value** – A concept of value that disaggregates the different types of economic values that people place on ecosystems and/or natural resources, including non-use values, option values, indirect use value and direct use values.

**Working Areas** – Areas primarily designated for agricultural production and managed by a NAC. With respect to a Working Area, a NAC’s focus is on converting existing production practices from conventional methods, which degrade ecosystems, to regenerative agriculture methods, which increase the health of the soil and the surrounding water, provide room for nature, improve the nutritional value of food, and increase farm income.

**The IEG Ecological Performance Framework**

IEG has developed the Ecological Performance Framework (“Framework”), specifically to value NACs. The Framework builds upon widely utilized Ecosystem Service Valuation (“ESV”) methodologies, approaches, and standards. The Framework defines the components and structure of the Statements of Ecological Performance to ensure transparency, robustness, and consistency in the reporting of values and information in the Statements of Ecological Performance.

The Framework to be used by NACs is grounded on the measurement, valuation approaches, and ecosystem service categories in the United Nations System of Environmental and Economic Accounting – Ecosystem Accounting Framework (“SEEA EA Framework”). Most of the ecosystem service categories used in the Framework directly reflect the categories (names and definitions) used in the SEEA EA Framework as well as the SEEA EA Framework’s guidelines for the biophysical measurement of ecosystem services and their related valuation.

The Framework differs from the SEEA EA Framework by including additional ecosystem service values and valuation approaches that are designed to provide transparent information on the Total Economic Value (“TEV”) of natural assets and the underlying productive capacity of nature. Specifically, the Framework builds on the SEEA EA Framework by also including a larger set of ecosystem services (38 in total) that must be considered for potential inclusion when conducting an ESV. These ecosystem services are classified into three categories - including provisioning, regulating and maintenance, as well as cultural services. In addition, non-use values are presented as a separate category of value attributed to the ecosystem(s). These categories are used to classify the different ways in which people benefit from ecosystem service production.

The Framework builds upon the efforts of these and other existing frameworks by:

1. focusing on the monetary valuation of the natural assets managed by the NAC;
2. focusing on the positive externalities from conservation and restoration rather than the negative impacts or risks from ecosystem degradation;
3. building on the SEEA EA Framework standards to value a comprehensive suite of ecosystem services and their Total Economic Value;
4. proposing a financial reporting framework that buttresses GAAP financial reporting with the unique values in the Statements; and
5. directly tying the value of nature to a financial instrument (the NAC) and market mechanism (through the listing of the NAC on the NYSE) to enable the transformation of the natural asset value to financial capital.

**Initial Listing Requirements -- Required Charter Provisions**

As a condition to initial listing, the NYSE proposes to require a NAC's charter to state the following:

1. The purpose of the company is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services, with the objective of maximizing ecological performance. The NAC may also engage in other activities that do not cause any material adverse impact to the natural assets for which it is responsible, including: (a) supporting community well-being; and (b) engaging in sustainable commercial activities.
2. NAC funds (including any proceeds from the sale of the company's securities at any time) must be used primarily to meet the NAC's operational needs to meet its responsibilities with respect to the natural assets under its control and to provide for the long-term capital needs of the NAC in fulfilling that purpose. In addition, provided that any such uses do not cause any material adverse impact to the natural assets for which the NAC is responsible, funds may be used to support community well-being.
3. The NAC will be prohibited from engaging directly in unsustainable extractive activities (including, but not limited to, traditional fossil fuel development, mining, unsustainable logging, or perpetuating industrial agriculture) or using its funds to finance such activities.

If any of the foregoing provisions of the NAC's charter are eliminated or materially amended in a manner that is inconsistent with their required form at any time, the NAC will be subject to delisting from the NYSE.

**Initial Listing Requirements -- NAC Policies**

Proposed Section 102.09 of the Manual provides that a NAC seeking to list on the NYSE must adopt the following written policies (collectively, the “NAC Policies”) and post them on its website by the earlier of the date that the NAC’s initial public offering closes or five business days following the NAC’s initial listing date:

1. An Environmental and Social Policy that articulates the objectives and principles that will guide the NAC to achieve sound environmental and social performance. Such policy must include requirements to conduct a process of environmental and social assessment, and establish, as soon as practicable after listing, an Environmental and Social Management System (“ESMS”).<sup>14</sup> The ESMS should be designed to:
  - i) Identify and assess environmental and social risks and impacts,
  - ii) Identify measures to avoid, minimize and mitigate the negative risks and impacts, and
  - iii) Promote improved environmental and social performance.
2. A Biodiversity Policy that articulates a commitment to achieving no net loss, and where possible a net positive impact on biodiversity. The Biodiversity Policy should be based on the mitigation hierarchy, a planning and management approach for addressing impacts to biodiversity and ecosystem services through avoidance, minimization, restoration, and offsetting.
3. A Human Rights Policy that articulates a commitment to human rights, consistent with the United Nations Guiding Principles on Business and Human Rights,<sup>15</sup>

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<sup>14</sup> The ESMS should be consistent with generally accepted international standards, such as the “IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.”

<sup>15</sup> United Nations (2011). *Guiding Principles on Business and Human Rights: Implementing the United Nations “Protect, Respect and Remedy” Framework*. Available at:

including a commitment to recognize and respect people's rights in accordance with customary, national, and international human rights laws, in particular those of indigenous peoples.

4. An Equitable Benefit Sharing Policy that articulates the NAC's commitment for sharing benefits with local communities. In any case where a NAC enters into a license agreement with a natural asset owner (e.g., a governmental entity or private landowner, rather than direct ownership by the NAC) with respect to the ecological performance rights of a designated area, such licensor must also be subject to the applicable provisions of the Equitable Benefit Sharing Policy and the NAC must include in its license agreement with the licensor a provision requiring the licensor to comply with the applicable terms of the Equitable Benefit Sharing Policy.

The Equitable Benefit Sharing Policy must require an equitable benefit sharing arrangement for the distribution of shares of the NAC's common stock to local communities (i.e., those who have direct ties to and derive livelihood or cultural values from the applicable area). The NAC's common stock distribution must be completed no later than the time of closing of the NAC's IPO and must meet the following requirements at a minimum:

- If the NAC has entered into a license agreement with respect to public lands, shares representing at least 50% of the shares of the NAC's outstanding shares as of the closing of the IPO must be distributed to local communities.
- If the NAC owns the land or has entered into a license agreement with respect to private lands, shares representing at least 5% of the shares of the NAC outstanding as of the closing of the IPO must be distributed to local communities.

The foregoing distributions of shares of common stock may be placed in a trust or equivalent structure, for the benefit of the intended beneficiaries. Any trust (or equivalent) holding shares of the NAC for this purpose must be under the majority control of trustees that are fully independent of both the NAC and, where applicable, the licensor, and/or be representative of the intended beneficiaries.

The Equitable Benefit Sharing Policy must provide that the NAC will (a) deposit its cash and other financial assets in accounts with a bank custodian regulated by the U.S. Office of the Comptroller of the Currency (an “Authorized Bank”); and (b) where the NAC has entered into a license agreement with a natural asset owner, include in its license agreement a provision requiring the licensor to place any shares of the NAC it owns in the custody of an Authorized Bank and deposit the proceeds from any NAC share sales by the licensor and any distributions received from the NAC in accounts with an Authorized Bank, pending the distribution of such assets in a manner consistent with the NAC’s Equitable Benefit Sharing Policy.

The NAC must review the adequacy of the Equitable Benefit Sharing Policy at least annually and publish on its website a detailed description of its activities under the Equitable Benefits Sharing Policy during each fiscal year no later than 90 days after the end of the first part fiscal year of the NAC’s listing and each subsequent fiscal year (the “Annual EBS Report”). The Annual EBS Report must include an attestation by an Independent Reviewer (the “EBS Independent Reviewer”) regarding compliance by the NAC and, if applicable, the licensor, with the Equitable Benefits Sharing Policy during the applicable fiscal period, including a review of the accounts maintained by the NAC and the licensor at Authorized Banks.

The NAC’s compliance with the requirements of its Equitable Benefits Sharing Policy must be reviewed periodically either by (i) a committee consisting solely of directors who meet



the independence requirements of Section 303A of the Manual or (ii) the NAC's independent directors acting as a group. Such committee or the independent directors, as the case may be, must meet for this purpose at least annually and such meeting must include an executive session in which management does not participate and a discussion with the EBS Independent Reviewer at which management must not be present.

#### **Initial and Continued Listing Requirements -- Statements**

Proposed Section 102.09 will provide that, prior to its initial listing, the NAC must publish on its public web site and file or furnish with the SEC as part of a Form 8-K or Form 6-K, as applicable, Statements that have been prepared consistent with the Framework developed by IEG. The Framework (including instructions for the preparation of the Statements and templates for the Statements) will be posted on nyse.com and the required contents of the Statements are described in detail below. The Statements as published by the NAC must be reviewed by an Independent Reviewer and be accompanied by an examination report prepared by such Independent Reviewer in compliance with the PCAOB's attestation standards.

#### **Initial and Continued Listing Requirements -- Audit Committee**

As described above, a listed NAC would be subject to all of the corporate governance requirements set forth in Section 303A.00, including the requirement of Section 303A.06 that a company must have an independent audit committee and the provisions of Section 303A.07 setting forth additional requirements for the audit committee. The Exchange proposes to amend Section 303A.07 to establish additional responsibilities specific to the audit committee of a NAC. As proposed, Section 303A.07 would require that (in addition to the requirements of Section 303A.07(b), the NAC's audit committee charter must address the following:

1. That the audit committee's purpose includes assisting board oversight of (1) the integrity of the NAC's Statements, (2) the qualifications and independence of the Independent Reviewer and (3) the performance of the Independent Reviewer.
2. The audit committee of the NAC must:
  - i) at least annually, obtain and review a report by the Independent Reviewer describing: the Independent Reviewer's internal quality-control procedures; any material issues raised by the most recent internal quality-control review, or peer review, of the Independent Reviewer, or by any inquiry or investigation by governmental or professional authorities, within the preceding five years, respecting one or more independent audits carried out by the Independent Reviewer, and any steps taken to deal with any such issues; and (to assess the Independent Reviewer's independence) all relationships between the Independent Reviewer and the NAC. After reviewing the foregoing report and the Independent Reviewer's work throughout the year, the audit committee will be in a position to evaluate the Independent Reviewer's qualifications, performance, and independence. This evaluation should include the review and evaluation of the lead partner of the Independent Reviewer. In making its evaluation, the audit committee should take into account the opinions of management and the NAC's internal auditors (or other personnel responsible for the internal audit function). In addition to assuring the regular rotation of the lead partner responsible for the Statements Review, the audit committee should further consider whether, in order to assure continuing independence of the Independent Reviewer, there should be

regular rotation of the firm undertaking the Statements Review itself. The audit committee should present its conclusions with respect to the Independent Reviewer to the full board and meet to review and discuss the NAC's annual Statements; Meetings may be telephonic if permitted under applicable corporate law; polling of audit committee members, however, is not permitted in lieu of meetings.

- ii) meet separately, periodically, with management and the Independent Reviewer to discuss the Statements and the conduct of the Statements Review. To perform its oversight functions most effectively, the audit committee must have the benefit of separate sessions with management and the Independent Reviewer. These separate sessions may be more productive than joint sessions in surfacing issues warranting committee attention.
- iii) review with the Independent Reviewer any problems in the conduct of their review or difficulties and management's response. The audit committee must regularly review with the Independent Reviewer any difficulties the Independent Reviewer encountered in the course of its review, including any restrictions on the scope of the Independent Reviewer's activities or on access to requested information, and any significant disagreements with management.
- iv) set clear hiring policies for employees or former employees of the Independent Reviewer. Employees or former employees of the Independent Reviewer may be valuable additions to the NAC's management. Such individuals' familiarity with the business, and personal rapport with the

employees, may be attractive qualities when filling a key opening. However, the audit committee should set hiring policies taking into account the pressures that may exist for personnel of the Independent Reviewer consciously or subconsciously seeking a job with the NAC they review.

- v) report regularly to the board of directors with respect to the preparation of the Statements and the performance of the Independent Reviewer. The audit committee should review with the full board any issues that arise with respect to the quality or integrity of the Statements or the performance and independence.

#### **Initial Listing Requirements -- NAC License Agreements**

While it is possible that a NAC may own the land/geographic area with respect to whose natural assets it has the ecological performance rights, the Exchange anticipates that many NACs will not own the land and will need to acquire those rights by entering into a license agreement with a natural asset owner (e.g., a governmental entity or private landowner, rather than direct ownership by the NAC) with respect to the ecological performance rights of a designated area.<sup>16</sup> Where a NAC's rights to the ecological performance of natural assets are created by such a license agreement, the Exchange proposes that the term of such license at the time of initial listing must be a minimum of ten years from the date of closing of the NAC's initial public offering that any NAC whose license is terminated or materially breached by either party would be subject to delisting.

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<sup>16</sup> The Exchange notes that it will be important for NACs in their offering materials and subsequent public disclosure documents to be clear in distinguishing the rights to the natural assets and geographic area from the rights to the ecological performance and to clearly specify, where appropriate, the limits of the NAC's rights as an owner or licensee.

**Initial and Continued Listing Requirements -- Initial and Ongoing Quantitative and Corporate Governance Requirements Applicable to NACs**

To qualify for listing as a NAC, an applicant issuer would be required to meet the quantitative listing requirements applicable to the listing of common equities of operating companies as set forth in Sections 102.01(A), (B), and (C) of the Manual. Proposed Section 102.06(F) would provide that listed NACs would be subject to all of the continued listing requirements that are applicable to operating companies listed under Chapter One of the Manual. To provide additional clarity, the Exchange also proposes to: (i) amend Section 303A.00 to specify that Section 303A in its entirety applies to NACs listed under Section 102.09; and (ii) amend Chapter Eight of the Manual to provide that NACs would be subject to all of the quantitative continued listing standards for operating companies set forth in Chapter Eight of the Manual. These specific amendments would be to provide additional clarity for users of the Manual. Consistent with the text of proposed Section 102.06(F), these proposed amended rules are not intended to be an exclusive list of rules to which a NAC would be subject, as NACs will be subject to every provision of the Manual to which operating companies are subject.

**Continued Listing Requirements -- Material News**

A NAC will be required to immediately disclose, pursuant to the Exchange's immediate release policy set forth in Sections 202.05 and 202.06 of the Manual, any event (e.g., a forest fire) that is anticipated to have a material adverse effect with respect to any of the criteria included in the Statements (as described below). As soon thereafter as possible, the NAC must disclose in a Form 8-K or Form 6-K, as applicable, its estimates of the changes to the previously presented Statements of such event.

**Continued Listing Requirements -- Periodic Publication of Statements and Occurrence of a Late Statement Delinquency**

Each year after initial listing, a NAC must publish on its public web site and file or furnish with the SEC as part of a Form 8-K or Form 6-K, as applicable, annual Statements that have been prepared consistent with the Framework. These Statements must be reviewed by the Independent Reviewer and must be accompanied by an examination report prepared by such Independent Reviewer in compliance with the PCAOB's attestation standards. The Statements must cover the same fiscal periods as the audited financial statements included in the NAC's annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable. The NAC should utilize its best efforts to publish its annual Statements no later than the filing of its annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable. In the event that the annual Statements are not completed by the filing due date of the NAC's annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable, such annual Statements are required to be published no later than 180 days after the end of the fiscal year to which such annual Statements relate (the "NAC Statement Due Date" and the failure of a listed NAC to timely publish its annual Statements, a "NAC Late Statement Delinquency"). In the event that the company is unable to file its Form 10-K, Form 20-F, or Form 40-F, as applicable, by the NAC Statement Due Date, the company should not delay the publication of its Statements, but rather should publish its Statements of Ecological Performance on or before that date.

Upon the occurrence of a NAC Late Statement Delinquency, the Exchange will promptly send written notification (the "NAC Late Statement Delinquency Notification") to an affected NAC of the procedures set forth below. Within five days of the date of the NAC Late Statement Delinquency Notification, the company will be required to (a) contact the Exchange to discuss the status of the delinquent annual Statements (the "Delinquent NAC Statement") and (b) issue a press release disclosing the occurrence of the NAC Late Statement Delinquency, the reason for

the NAC Late Statement Delinquency, and, if known, the anticipated date such NAC Late Statement Delinquency will be cured via the publication of the Delinquent NAC Statement. If the company has not issued the required press release within five days of the date of the NAC Late Statement Delinquency Notification, the Exchange will issue a press release stating that the company has incurred a NAC Late Statement Delinquency and providing a description thereof.

#### **Continued Listing Requirements -- NAC Non-Reliance Event**

In the event that a NAC concludes that its previously issued Statements should no longer be relied upon because of an error in such Statements (a “NAC Non-Reliance Event,” and the disclosure of such NAC Non-Reliance Event, a “NAC Non-Reliance Disclosure”), it will be required to comply with the NAC Late Statement Delinquency Notification procedures set forth above. If the NAC does not publish amended Statements within 60 days of the issuance of the NAC Non-Reliance Disclosure (an “Extended NAC Non-Reliance Disclosure Event” and, together with a NAC Late Statement Delinquency, a “NAC Reporting Delinquency”) for purposes of the cure periods described below a NAC Reporting Delinquency will be deemed to have occurred on the date of original issuance of the NAC Non-Reliance Disclosure. If the Exchange believes that a NAC is unlikely to publish the amended Statements within 60 days after a NAC Non-Reliance Disclosure or that the errors giving rise to such NAC Non-Reliance Disclosure are particularly severe in nature, the Exchange may, in its sole discretion, determine earlier than 60 days that the applicable NAC has incurred a NAC Publication Delinquency as a result of such NAC Non-Reliance Disclosure.

#### **Continued Listing Requirements -- Cure Periods for NAC Publication Delinquencies.**

During the six-month period from the date of the NAC Publication Delinquency (the “Initial NAC Statement Cure Period”), the Exchange will monitor the company and the status of

the Delinquent NAC Statement, including through contact with the company, until the NAC Publication Delinquency is cured. If the company fails to cure the NAC Publication Delinquency within the Initial NAC Statement Cure Period, the Exchange may, in the Exchange's sole discretion, allow the company's securities to be traded for up to an additional six-month period (the "Additional NAC Statement Cure Period") depending on the company's specific circumstances. If the Exchange determines that an Additional NAC Statement Cure Period is not appropriate, suspension and delisting procedures will commence in accordance with the procedures set out in Section 804.00 of the Listed Company Manual. A NAC will not be eligible to follow the procedures outlined in Sections 802.02 and 802.03 with respect to these criteria.

In determining whether an Additional NAC Statement Cure Period after the expiration of the Initial NAC Statement Cure Period is appropriate, the Exchange will consider the likelihood that the Delinquent NAC Statement can be filed during the Additional NAC Statement Cure Period. The Exchange strongly encourages companies to provide ongoing disclosure on the status of the Delinquent NAC Statement to the market through press releases and will also take the frequency and detail of such information into account in determining whether an Additional NAC Statement Cure Period is appropriate. If the Exchange determines that an Additional NAC Statement Cure Period is appropriate, and the company fails to publish the Delinquent NAC Statement by the end of such Additional NAC Statement Cure Period, suspension and delisting procedures will commence immediately in accordance with the procedures set out in Section 804.00. In no event will the Exchange continue to trade a NAC's securities if that company has failed to cure its NAC Statement Delinquency on the date that is twelve months after the applicable NAC Statement Due Date.



**Continued Listing Requirements -- Filing Delinquencies and NAC Statement Delinquencies are Treated Separately.**

For purposes of Section 802.01E, NACs will also be subject to the provisions with respect to delinquencies in filing periodic reports as set forth in that rule (a “Filing Delinquency”). A Filing Delinquency is a separate event of noncompliance from a NAC Publication Delinquency. Consequently, a NAC can be deemed to have cured a Filing Delinquency while remaining noncompliant due to an ongoing NAC Publication Delinquency or vice versa.

**Continued Listing Requirements -- Framework and Statements**

The Framework (which provides instructions for the preparation of the Statements) will be publicly accessible on nyse.com.<sup>17</sup>

The Exchange, in consultation with IEG, will have sole authority to determine whether and how to propose amendments to the Framework from time to time and will provide reasonable advance notice of the effectiveness of any such amendments. The Exchange will post the amended text of the Framework on nyse.com, along with a description and explanation of the amendments. Additionally, the Exchange will maintain on nyse.com a publicly-accessible archive of historical versions of the Framework. The Exchange will have sole authority with respect to the interpretation of the Framework for purposes of compliance by listed NACs with reporting requirements under NYSE Rules.

**Continued Listing Requirements -- Components and Form of the Statements**

NYSE-listed NACs must adopt, publish, maintain and review three categories of Statements: 1) Statement of Natural Production, 2) Statement of Natural Assets and 3)

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<sup>17</sup> The text of the Framework is included in Exhibit 3 to this filing.

Statement of the Quality of Underlying Assets. These statements must be published annually, representing the same accounting period as the NAC's audited financial statements.

**Statement of Natural Production:**

The Statement of Natural Production provides information on the annual flows of ecosystem services provided by the natural assets under management by a NAC in biophysical and monetary units. This Statement presents the annual total economic value captured for each ecosystem service, and annual values aggregated across all ecosystem types within the NAC.

Components of a Statement of Natural Production:

1. **Flows of Ecosystem Services.** The Statement of Natural Production will itemize all the ecosystem services that were valued through the ESV, from a base list of 38 potential ecosystem services.
2. **Biophysical Measure** refers to the amount of ecosystem service provided, measured in biophysical units. The appropriate measurement unit will depend on the ecosystem service type. The amount or quantity of ecosystem services will reflect the total amount provided and valued by all the ecosystems found within the NAC. In cases where the amount provided is greater than the amount valued, only the amount valued should be noted in this cell, specifying the unit of measurement (e.g., tons of carbon or number of hectares providing the service). When total units are not relevant indicators, then an average value can be provided here (e.g., average temperature reduction across the landscape). The intent is to provide transparent information on the quantification and measurement of the ecosystem service.
3. **Total Economic Value Captured** refers to the total monetary value derived for each ecosystem service through the ESV conducted by the NAC. This total value can

include multiple types of economic values, such as direct, indirect, and/or option values. More information about the types of value captured and scope of the values reported will be provided in the Footnotes, including confidence intervals for each estimate and/or ranges derived through different valuation methods. This value will be presented in current dollars.

**Footnotes** will be included, in tabular form, to provide further details on the information noted above (The Statement of Natural Production). They will provide transparency by including more disaggregated information about the scope of the valuations, the types of economic values estimated, and their precision. Footnotes will list the ecosystem services identified but not included and the reason for their exclusion. For the ecosystem service valued, the footnotes will provide detailed information on the biophysical quantities of ecosystem service production and the method of measurement. If there is a discrepancy between the amount produced and the amount valued, this will also be noted here.

As there can be more than one valuation conducted per ecosystem service, the Statement allows for multiple valuations to be conducted and presented under **Valuation 1 and Valuation 2** headings. It will include sub columns to present the different **Types of Values** that were derived for a given ecosystem service. These columns should report the type of TEV captured and if relevant, the valuation method (e.g., direct use value from market prices). This information presents the scope of the valuation and is particularly valuable in cases where complementary valuations may have been deemed necessary and/or possible. The **Value per Unit** will refer to the dollar value used for the singular unit of ecosystem service, corresponding to the biophysical measurement unit (e.g., value of a ton of carbon). In some cases, an average value may be provided to reflect different unit values used in the valuation (e.g., the Visual Amenity value of a

landscape may be presented as an average value per hectare). The **Value** column reflects the economic value derived for the ecosystem service listed using the unit price and quantities noted in the previous columns. The **Range or Confidence Interval** column summarizes the upper and lower bounds of the value presented, as estimated through the methodologies employed. For example, the valuation may be sensitive to key assumptions or variables, which can be presented in this column for transparency of the range of results that can be obtained. Errors may also be disaggregated by the step of the methodology, including those from the derivation of the biophysical unit to those from the valuation method employed. **Methodological Notes** will describe the measurement and valuation methodologies, including key assumptions, beneficiaries, and other key information to better interpret the results. The details of each method will be explained in more detail in the technical report of the ESV study.

If the original valuation was conducted by ecosystem type (e.g., forest, wetland, and cropland) and results were presented as such, these disaggregated results will be included here, through separate lines for each ecosystem service within each ecosystem type. The extent of each ecosystem type will outline the size of each ecosystem (e.g., number of hectares). If the valuation is deemed more accurate as a system-wide valuation (one that includes the interactions between ecosystem types but does not attribute a specific value contribution to each ecosystem), then the ecosystem type column can be described as “system-wide valuation”. If the valuations are deemed additive, these totals are summed following guidelines to avoid double counting, as set in Step 5 of “Steps to Conduct an ESV” below,<sup>18</sup> to provide a total value aggregated across all ecosystem services in the **Total Economic Value** cell. If the valuations are not additive (they represent non-additive values or were conducted for validation of the results), then the more

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<sup>18</sup> See Section “Conducting Ecosystem Service Valuations” below.

rigorous valuation should be used in the Total Economic Value cell.

If ecosystem services were identified or deemed to be present but could not be included or valued due to their incommensurability, lack of data, irrelevance, or license agreement limitations; these should be listed in the footnotes and an explanation for their exclusion should be provided in the methodological notes.

### **Statement of Natural Assets:**

The Statement of Natural Assets reports information on the potential production value of natural assets managed by a NAC, in monetary terms. This will be measured through the Net Present Value of ecosystem service value flows, using a 100-year time horizon, a 2% discount rate, and an assumption that the ESV remains the same as the current year for the whole temporal horizon.

### Components of a Statement of Natural Assets:

1. **Natural Assets** refers to the particular ecosystem types being managed by the NAC. Examples include forests, wetlands, agricultural areas, and coral reefs. If the valuation was done for the NAC as a whole, this can describe by noting it was a “system-wide” valuation.
2. **Extent** refers to the size of the ecosystem producing the ecosystem service being valued, which is a spatial area measurement (e.g., number of hectares). This is either reported by each ecosystem type, or if the valuation was done for the NAC as a whole, then by the number of hectares supplying the service (i.e., the total area that produces the ecosystem service valued).
3. **Ecosystem Services** refers to the list of the ecosystem services that were valued through the ESV, from the potential base list of 38 potential ecosystem services.

4. **Ecosystem Service Category** identifies each ecosystem service listed under the category that it belongs (i.e., Provisioning, Regulating and Maintenance, Cultural, or Non-use Values).
5. **Annual Value** refers to the annual value (in current dollars) of each ecosystem service, (by each ecosystem type, when applicable) as determined through the ESV.
6. **Net Present Value** refers to the value of the assets under management (in dollars), calculated using the Net Present Value (“NPV”) method, which aggregates the expected future benefits over 100 years, using a 2% discount rate. This represents the future flow of annual ecosystem services based on the current year’s valuation and assuming a constant value over time.
7. **Total Value** sums the values for all ecosystem services provided by all the natural assets managed by the NAC. Footnotes will be provided as necessary to provide further detailed information.

**Statement of the Quality of Underlying Assets:**

The Statement of the Quality of Underlying Assets reports quantitative and qualitative information on the health and condition of the ecosystems being managed by the NAC on an annual basis.

The information in this Statement is separate and complementary to the values captured in the other Statements and will focus on biodiversity metrics and report in non-monetary units. Biodiversity is integral in measuring ecosystem condition, as it contributes to the composition, structure, and function of ecosystems. Areas with higher biodiversity tend to have increased

ecosystem productivity, stability, and resilience – being able to withstand and recover from natural and anthropogenic stresses over time.<sup>19</sup>

NACs will report on the Key Performance Indicators (“KPIs”) for the underlying assets under management, in both quantitative and qualitative terms as outlined below.

Components of a Statement of the Quality of Underlying Assets:

1. Quantitative KPIs will measure the state of key components of biodiversity being managed by NACs, the extent of the NAC’s ecosystems, and progress towards management goals. In addition, for natural areas, ecological capacity-to-produce indicators will be required when the ESV focuses on direct use values. The Statement will outline KPIs, unit of measurement, method for measurement or data source, and notes (which provide further explanation of the KPI and how the data can be interpreted, including the rationale/justification for selection of a particular metric, and expected directional change over time). Quantitative KPIs for natural, working, and hybrid areas are included below and further guidance on how to measure several of these indicators is provided in the section “Steps to conduct an ESV.”
2. A Qualitative Description of the Underlying Assets provides a descriptive account of the state and condition of the assets under management highlighting key species and habitats. It will describe management objectives, management approach, and progress towards maintaining and improving the overall health and condition of the natural assets. It will consider aspects of ecological integrity, connectivity, or fragmentation, as well as how threats and pressures from the surrounding area are being managed.

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<sup>19</sup> Le Provost, G., Schenk, N.V., Penone, C. et al. 2002. The supply of multiple ecosystem services requires biodiversity across spatial scales. *Nat Ecol Evol*. <https://doi.org/10.1038/s41559-022-01918-5>.

For working and hybrid areas, a descriptive account of the state of the assets along with progress towards implementing regenerative practices will be included.

Quantitative KPIs for Natural Areas:

- For species level indicators, *either* a **Species Threat Abatement and Restoration** metric (“**STAR**”)<sup>20</sup> score *or* **Species Richness & Abundance** counts will be reported. The specific indicators chosen will be based on what is most appropriate and feasible.
  - STAR is a biodiversity metric that allows the quantification of the potential contributions that species threat abatement and restoration actions offer towards reducing global extinction risk. Drawing on the IUCN Red List of Threatened Species (the most comprehensive global assessment of the status of biodiversity), the metric combines data on species, the threats they face and their risk of extinction.
  - Species Richness refers to the number of species within a given area. Species richness counts that cover multiple taxa (e.g., mammals, birds, reptiles, amphibians, plants, insects, or fish) will be reported.
  - Species Abundance refers to the total number of individuals of a species in a given area. Abundance will be reported for target species. Where counts are not feasible, other measures such as biomass and/or percentage cover may be used.<sup>21</sup>

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<sup>20</sup> Mair et al. (2021). A metric for spatially explicit contributions to science-based species targets. *Nature Ecology & Evolution*. 5 (June 2021) 836-844.  
<https://doi.org/10.1038/s41559-021-01432-0>

<sup>21</sup> UN SEEA (2018) Biodiversity Accounting.  
[https://seea.un.org/files/seea\\_eea\\_biodiversity\\_accounting.pdf](https://seea.un.org/files/seea_eea_biodiversity_accounting.pdf).



- Ecosystem Capacity. KPIs related to the ecosystem's long-term capacity to produce ecosystem services will be required when there are direct use values within the ESV. For each direct use value (e.g., the value of current fish catch), a corresponding KPI will be required to reflect the capacity of the ecosystem to sustain that ecosystem service in the future (e.g., reproduction rate of fish or fish abundance). The direct use of some services, such as provisioning services (e.g., hunting wild animals or wild fish catch) and some cultural services (e.g., amenity value or recreational uses), if extracted unsustainably, can result in ecosystem degradation. To avoid this, this KPI will be developed to provide information on the ecological capacity to produce the ecosystem service being valued given current use levels.<sup>22</sup>
- Area of Ecosystems under Management refers to the size or extent of the ecosystems being managed by a NAC. Results will reflect total area under management, disaggregated into areas by ecosystem type.
- Where applicable, Total Area under Restoration will be reported, referring to either the spatial area where restoration has been successfully completed or where restoration is currently being implemented in accordance with a restoration plan.
- Percentage of Natural Asset Management Objectives Met. Each NAC will have a specific management plan that will seek to manage, grow, and/or restore its natural assets, based on the local context. Within the Management Plan, a set of targets will be prioritized and tracked through measurable indicators. This KPI will report the degree to which prioritized targets are met every year. Measurement will be based on

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<sup>22</sup> Hein L, Bagstad K, Edens B, Obst C, de Jong R, Lesschen JP (2016) Defining ecosystem Assets for Natural Capital Accounting. *PLoS ONE* 11(11): e0164460. Doi: 10.1371/journal.pone.0164460

the Management Plan objectives, targets and outcomes from the NAC's monitoring and evaluation system, for the given reporting period.

Quantitative KPIs for Working Areas:

- Rate of Water Infiltration is a measure of how fast water enters the soil.
- Insect Species Richness and Abundance where richness refers to the number of different insect species and abundance refers to the number of individuals of target insect species, in a given area.
- Bird Species Richness and Abundance where richness refers to the number of different bird species and abundance refers to the number of individuals of target bird species, in a given area.
- Plant Species Richness refers to the number of different plant species in a given area.
- Percentage of Regenerative Management Objectives Met. Each NAC will have a specific Regenerative Management Plan that will guide it through the transition towards a regenerative system, based on the local context. Within the Management Plan, a set of targets will be prioritized and tracked through measurable indicators. This KPI will report the degree to which prioritized targets are met every year. These will be based on the Regenerative Management Plan objectives, targets and outcomes from the NAC's monitoring and evaluation system, for the given reporting period.

KPIs for Hybrid Areas:

The Natural Areas KPIs above will be reported, as well as Working Area KPIs, if there is an agricultural component of the hybrid NAC.

### **Conducting Ecosystem Service Valuations**

Ecosystem service valuations (ESVs) are the foundation for determining the values of NACs. The ESV process consists of using well-established methods to calculate the monetary value of ecosystem services. These values are used in the Statements of Natural Production and Natural Assets.

The Framework includes the Steps to Conduct an ESV, outlined below, and the Components and Structure of the Ecological Performance Statements. The general approach for valuing ecosystem services to be used by NACs is grounded in the guidelines outlined in the SEEA EA framework<sup>23</sup> and builds on it to include a wider breadth of potential economic values and valuation approaches. The objective of the Framework is to estimate the Total Economic Value produced by the ecosystems managed within a NAC through the generation of ecosystem services.

The steps outlined below represent the required approach for conducting ESVs for NACs. These will be conducted every year (in line with the NAC's accounting period) and provide the necessary information to report on the NAC's ecosystem service production. The initial Year 1 valuation study is of particular importance because it will largely set the scope for the NAC, by specifying the ecosystem services to be valued and the general approach to be taken for their valuation. This initial valuation will set the expectations for future ESVs to ensure consistency and replicability. Every year, the analysis should use the most current data and aim to report on that year's values, which will require an annual measurement of change in the value of the assets.

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<sup>23</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>.

The ESV study will also derive many of the KPIs on ecosystem quality and condition, which will be complementary to the values obtained in the ESV and will be used in the Statement of the Quality of Underlying Assets.

It is important that experienced experts with knowledge of the subject matter (ecosystem service valuations) and of local ecosystems be involved (including local experts). Methods should also be transparently and clearly explained, be replicable, traceable, and lend themselves for meaningful reporting on an annual basis (i.e., to report annual changes). Once systems have been established, local capacity can be built for ongoing data collection and monitoring.

### **Steps to Conduct an ESV Study for a NAC**

To obtain an economic value for the natural asset and ecosystem services produced by a given NAC, an initial Year 1 ESV study will be conducted. This study will also include the steps necessary to derive several KPIs tied to the Statement of the Quality of Underlying Assets. The following steps are described in more detail in the sections that follow:

1. Define Spatial Boundary
2. Determine Ecosystems Present, their Extent, Quality and Attributes
3. Identify Ecosystem Services and Conduct a Preliminary Assessment of their Relative Value
4. Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units
5. Assign an Economic Value to Ecosystem Services
6. Calculate the Asset Value

#### **Step 1. Define Spatial Boundary**

The first step to conduct the ESV is to define the spatial boundary of the NAC. The initial boundary will represent the total area under NAC management. This step requires identifying

clearly defined geographical boundaries, based on what a NAC can legally manage and the areas that they can commit to the NAC's charter. If areas within the NAC are excluded due to limitations in the license agreements, this should be noted. Note that a NAC can include multiple ecosystem types, land uses, and multiple sites. Primary data, remotely sensed data<sup>24</sup> and/or authoritative secondary data can be used to determine the area for this boundary. The resolution of the data and method used to estimate this extent should be stated as well as any potential sources of error in the estimation of the extent.

OUTPUT:

- Map of the study area that will make up the NAC and its total spatial extent  
Step 2. Determine Ecosystems Present, their Extent, Quality, and Attributes

The entire spatial area of a NAC must be allocated to a relevant ecosystem type. This step identifies, characterizes, and determines the ecosystems within the NAC boundary and states their extent, quality, and other attributes of interest for ecosystem service production and ecosystem quality KPIs. This information should reflect current conditions (using the most recently available data) with the intention of giving a snapshot of the ecosystems present in the current accounting period (the most recent year that corresponds to the audited financial statements).

The spatial boundaries established in the previous step will cover one or more distinct ecosystems. In this step, the entire area is allocated to a discrete ecosystem type which can be treated as distinct spatial units for accounting purposes. To better understand the attributes of the NAC, its ecosystems, and to aid the valuation process, ecosystem types present, and their condition must be identified and described in this step.

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<sup>24</sup> Remote sensing refers to the use of satellite or aircraft-based sensor technologies to get information on the biophysical characteristics of areas on Earth.

First, ecosystems should be categorized using official ecosystem classification systems, aiming to be as granular, accurate, and precise as possible and to include local ecological knowledge on boundaries and functionality.<sup>25</sup> If local classification systems are not available, internationally recognized ecosystem typologies should be used. In addition, to aid comparisons and high-level evaluations, NACs should also use or map onto IUCN's Global Ecosystem Typology 2.0 (Ecosystem Functional Group)<sup>26</sup>, independent of the ecosystem classification used.

Geographical Information Systems (GIS) maps should be used to demonstrate the extent and configuration of each ecosystem type, such as forests, wetlands, agricultural land, and other land cover types (including water bodies). GIS maps compile information by analyzing satellite and aerial imagery as well as other remote sensed or manually acquired data. The resolution of land cover data will impact the composition of ecosystem types that is captured. A higher resolution (i.e., 100m<sup>2</sup> or more granular) should be used. For NACs with smaller areas, a resolution of at least 30m<sup>2</sup> should be used. The process of identifying ecosystem types and mapping GIS data to ecosystem types should be clearly stated, including the resolution of the data and the definitions for each ecosystem type.

In addition, ecosystems should be characterized with key descriptor attributes like their global uniqueness, proximity to populations, protected status, habitat suitability, and attributes related to ecological integrity, connectivity, or fragmentation, existing threats, and/or

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<sup>25</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

<sup>26</sup> Keith, D., Ferrer-Paris, J., Nicholson, E., & Kingsford, R. (2020). *IUCN Global Ecosystem Typology 2.0 Descriptive profiles for biomes and ecosystem functional groups*. International Union for Conservation of Nature and Natural Resources (IUCN). <https://portals.iucn.org/library/sites/library/files/documents/2020-037-En.pdf>

management regimes. This information will complement the classification and description of the ecosystems and help to structure the valuation.

The extent (or size) of each ecosystem type (e.g., forest, wetland, or cropland) should be measured. Extent is measured in terms of spatial area (e.g., hectares). If attributes of interest were identified, those should also be spatially measured and reported (e.g., hectares of protected forests). If developed lands, such as roads or residential areas, are included within the NAC's overall boundaries, their corresponding extent should also be provided.

The ecosystem quality KPIs outlined below should also be scoped within this step in order to determine how these will be measured and reported, according to the Components of the Statement of the Quality of Underlying Assets. These include the following indicators:

For Natural Areas:

For species level indicators, *either* a **Species Threat Abatement and Restoration metric ("STAR")**<sup>27</sup> score *or* **Species Richness & Abundance** counts should be scoped. The specific indicators chosen will be based on what is most appropriate and feasible.

- STAR scores can be calculated for an area being managed by a NAC in three phases. Initially, an estimated STAR score can be calculated to determine the potential to reduce species extinction risk, based on published data from the IUCN Red List.<sup>28</sup> This value can be revised to a calibrated STAR score with on-the-ground verification of threats and species presence, establishing a baseline against which conservation

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<sup>27</sup> Mair et al. (2021). A metric for spatially explicit contributions to science-based targets. *Nature Ecology & Evolution*. 5 (June 2021) 836-844. <https://doi.org/10.1038/s41559-021-01432-0>.

<sup>28</sup> Access to the STAR Estimated Heat-map layers is currently accessed through the Integrated Biodiversity Assessment Tool (IBAT) STAR portal (<https://www.ibat-alliance.org/star>)

- management can be planned and targets set. This will then enable NACs to demonstrate in time the delivery of a realized STAR score, which takes into account the measurable reduction of threats generated by the NAC's management activities.<sup>29</sup>
- Species Richness counts will be scoped covering multiple taxa (e.g., mammals, birds, reptiles, amphibians, plants, insects, or fish) and present a reliable representation of current local species richness.
    - Species will be selected based on abundance and the key role they play in the functioning of the local ecosystems.
    - The basis for selection of the species included in the richness count should be transparently presented. Species to include can be determined through a scientific assessment of what is relevant (based on local, regional, or global significance) and through local expert opinion. The methods employed for conducting species count will need to be justified and an explanation provided for how the data can be interpreted.
  - Species Abundance will be reported for target species. Where counts are not feasible, other measures, such as biomass and/or percentage cover, may be used.<sup>30</sup>
    - Selection of target species will be based on the key role they play in the functioning of the ecosystem and/or because they provide information on the overall condition of the ecosystem, like keystone species, indicator species,

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<sup>29</sup> The Biodiversity Consultancy (2022). Species Threat Abatement and Restoration (STAR) A Global Metric Supporting Nature-Positive Action. *IBAT*. <https://www.ibat-alliance.org/pdf/star-industry-briefing-note.pdf>

<sup>30</sup> UN SEEA (2018) Biodiversity Accounting. [https://seea.un.org/sites/seea.un.org/files/seea\\_eea\\_biodiversity\\_accounting.pdf](https://seea.un.org/sites/seea.un.org/files/seea_eea_biodiversity_accounting.pdf).



umbrella species, rare or locally endemic species, or globally threatened species.

- Target species will be determined through a scientific assessment, local expert opinion and should be coherent with the indicators of Species Richness. The basis for the selection of target species will need to be justified and an explanation provided for how the data can be interpreted, including the expected directional change over time. If some species are of greater importance, relative to others, in determining the overall condition of the ecosystem, this should also be noted.

Species Richness and Abundance should be measured across ecosystems using the most appropriate field sampling methods (e.g., transect counts, acoustic recording, environmental DNA) and/or authoritative secondary data (e.g., official government data, data used for published work, recognized global data sources used by subject matter experts). When authoritative secondary data is used, validated sources should be prioritized.

For Working Areas, the following indicators of ecosystem quality should be scoped:

- Rate of water infiltration
- Insect species richness and abundance of target species
- Bird species richness and abundance of target species
- Plant species richness

To determine how to estimate these ecosystem quality indicators for natural and working areas, the analyst conducting the assessment should define the boundaries of the study based on the NAC's boundaries. Next existing information for the area of study will be reviewed. Where existing information is sufficiently current, valid, granular, and comprehensive, this information

should be used to determine values for these indicators. When there is not sufficient information, the appropriate data collection methods should be used as part of Step 4 of this Framework (“Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units”). The initial Year 1 indicators may need to rely on existing authoritative data sources (e.g., IUCN’s Red List of Threatened Species) and identify gaps and potential errors (including a measurement of error, if possible). Subsequent year valuations can enrich the ecosystem characterization and ecosystem quality KPIs by filling information gaps through streamlined data collection and improved monitoring methods.

Where there is GIS spatial analysis, it should be complemented with field data collection, when necessary, in order to validate the characterization of ecosystems and fill in data gaps, including field measures, validation of species presence, and interviews with locals and experts. Both the spatial analysis and the field data collection should be led by experts using the best available practices. More in-depth data collection will be conducted in Step 4. The complexities and particularities of each local context should be considered in the approach that will be adopted.

Once ecosystem characterization and ecosystem quality KPI methods are established in the initial study, local capacity can be built to continuously collect data for future ecosystem service valuations.

#### OUTPUTS:

- A section for the Technical Report outlining:
  - Definition of each ecosystem type in the NAC
  - Extent of each ecosystem type that makes up the natural assets under management

- Key descriptive, geographical, and ecosystem quality-related attributes for the ecosystems identified
- Description of the approach to select and measure the ecosystem quality KPIs for the identified/categorized ecosystems within the NAC

Step 3. Identify Ecosystem Services and Conduct a Preliminary Assessment of their Relative Value

This step identifies the ecosystem services that are being produced in the study area. This step will involve consultation with local stakeholders and subject matter experts, as well as an initial review of the information available to determine ecosystem services that are present, those that can be valued based on data availability, and their rough scales of ecological, economic, and social importance.

The full potential scope of ecosystem services to be considered in the valuation includes 38 general categories. Although all ecosystem services being produced should be identified and an effort should be made to value all the ecosystem services identified, there may be cases when some ecosystem services are not measurable or do not have enough data available to conduct a meaningful valuation. It is also possible that a NAC's ownership or license agreement may be limited with respect to some ecosystem services, in which case these limitations must be transparently disclosed. It is expected that the ESV for a NAC includes at least six different ecosystem service categories of the 38, and that multiple regulating services are included. The intention in deriving the inventory of ecosystem services to include should be to provide a complete and diverse set of ecosystem service values and to include services that most directly reflect ecological integrity and local relevance. In particular, there should be a clear presentation of the ecosystem services that are identified, those that are quantifiable, and those that are

monetizable. To maintain consistency and comparability between ecosystem types and among NACs, the Framework includes a list, adapted from the SEEA EA framework,<sup>31</sup> which should be used in the ESV study.<sup>32</sup>

To identify ecosystem services that are present, the first task is to conduct a preliminary desktop value assessment of the ecosystem services commonly produced by the ecosystems within the NAC. A desktop assessment entails the use of existing data to identify the types of ecosystem services that could be produced by the ecosystems present and their relative value. A benefit transfer exercise can be used for this task to determine what ecosystem services may be present in the area and the economic values that other studies have assigned to these ecosystem services. Alternatively, or in addition, basic configurations for tools such as INVEST<sup>33</sup> and/or ARIES<sup>34</sup> can be used to determine which ecosystem services may be present and their relative importance.<sup>35</sup> Each ecosystem may produce a different bundle of ecosystem services. For example, wetlands will likely produce water purification services, provide nursery spaces for

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<sup>31</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Table 6.3, pg. 131.

<sup>32</sup> See Exhibit 3, Framework at Table 2.

<sup>33</sup> Natural Capital Project, 2022. *INVEST 3.12.0.post26+ug.g230fb3d User's Guide*. Stanford University, University of Minnesota, Chinese Academy of Sciences, The Nature Conservancy, World Wildlife Fund, and Stockholm Resilience Centre.

<sup>34</sup> Villa, F., K.J. Bagstad, B. Voigt, G.W. Johnson, R. Portela, M. Honzak, and D. Batker. 2014. A methodology for adaptable and robust ecosystem services assessment. *PLoS ONE* 9(3):e91001. ARIES FOR SEEA Available at <https://aries.integratedmodelling.org/aries-for-seea-user-guide/>

<sup>35</sup> A list of selected ecosystem service modeling tools can be found In United Nations (2022). *Guidelines on Biophysical Modelling for Ecosystem Accounting*. United Nations Department of Economic and Social Affairs, Statistics Division, New York. Available at: <https://seea.un.org/content/supplemental-materials-and-tables-guidelines-biophysical-modelling#Table%204>

fish, and flood regulation services (among others), while silvopastoral systems will likely produce biomass for livestock, habitat for bird species, and micro-climate regulation, among others. The suite or bundle of potential ecosystem services that will be included should be as extensive as possible and must include multiple regulating services. Expert opinion and judgement and local community consultation should also be used to identify ecosystem services produced in the NAC.

Subsequently, the desktop value assessment (benefit transfer valuation and/or rapid model-based ecosystem assessment) will estimate a first, rough approximation of the value of different ecosystem services. This should be used as a guide to prioritize a more in-depth analysis of ecosystem service provision. This preliminary assessment is particularly important for the initial valuation when ecosystem services present may not be known and when data gaps may limit the ability to value all ecosystem services.

The desktop assessment should be complemented with an on-the-ground, site-based assessment to identify the most current and locally relevant ecosystem services present. This assessment will be conducted through a combination of field observations, interviews, surveys and/or focus groups with local stakeholders and experts knowledgeable of the study area. What is considered most important will vary depending on the stakeholder group providing input as many viewpoints as possible should be included to inform the identification process. The information gathered at this stage will be recorded and used to validate and/or expand the list of ecosystem services to be valued.

If identified ecosystem services cannot be valued with primary valuation methods due to data gaps, time constraints, or analytical capacity; an expert-informed estimate, combined with a rigorous desktop analysis may be proposed to conduct the ecosystem service quantification and

valuation. This can include a more refined benefit transfer exercise that can be used to estimate conservative values while better, primary data is gathered (in subsequent years). Given that desktop analyses may result in more error and uncertainty, conservative values should be prioritized when adopting this approach. If a valuation is still not possible, the justification for their exclusion should be clearly stated and the ecosystem service should still be listed as present but not valued. This includes limitations due to license agreement constraints or due to risks of double-counting with information in the company's GAAP financial statements.

After the initial Year 1 valuation is conducted, subsequent valuations should include the list of ecosystem services valued the previous years and start by validating their relative values and continued importance and existence, at this step. If additional ecosystem services are identified (i.e., they were previously unknown or not legally available for inclusion at the time of the initial valuation) and these are deemed material and suitable for inclusion in the ESV, these must be added to the list of ecosystem services for valuation that year.

#### OUTPUTS:

- List of ecosystem services identified as present in the NAC
- An initial gap assessment that identifies ecosystem services that cannot be measured, included, and/or valued the current year, including the reason for their exclusion
- Subset of ecosystem services prioritized for valuation
- Subset of ecosystem services where a desktop-based study can be used to estimate an approximate value
- Expected value ranges or relative importance based on a desktop assessment and consultation with local stakeholders and experts used to guide the ESV study

#### Step 4. Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units

Once both the ecosystems and ecosystem services produced by the NAC have been identified and determined to be within the scope of the NAC's license agreement, a study will be conducted to quantify the biophysical amount of ecosystem services produced using measurable units relevant to each ecosystem service (e.g., amount of carbon sequestered and stored; tons of biomass produced; or rate of pollination). In addition, the ecosystem quality KPIs will be measured, refined, and/or analyzed, as needed, based on the data gaps and field measurement needs identified in Step 2.

For ecosystem services, measurement at this stage focuses on the supply of the ecosystem service being valued. In particular, this step requires a biophysical analysis of the production and flow of ecosystem services. A combination of existing data for the region, direct measurement, indirect measurements, and modelling using ecosystem assessment tools should be utilized for ecosystem service measurement. The following steps outline the expectations for biophysical measurement of ecosystem services:

1. Determine the method of measurement, metrics, and tools to be used

Measuring the biophysical quantity of the ecosystem service production requires understanding the dynamics and processes that produce ecosystem services, translating this understanding into mathematical functions or models, and collecting good quality data from the site being studied in order to populate the models. This is the core objective of this step.

When possible, both the actual flow valued in the ESV and the capacity of the ecosystem to produce the service should be measured. Information on the ecosystem service flow will be needed to derive the economic value of that service. Information on the capacity to produce may be used to refine the valuation or as a complementary indicator of sustainability when direct use

values of provisioning ecosystem services as well as certain cultural ones (e.g., recreation, amenity value) are included in the ESV.<sup>36</sup> For example, fish catch is a measure that may be used to report the use value of wild fish. However, the current reproductive rate of said fish species is a measure of the capacity to produce that service that complements this ESV and that can be reported as a KPI to better interpret the economic value of fish catch, as a provisioning service. Thus, when direct use values for ecosystem services are included, an indicator on the capacity to produce should be included as an indicator of ecosystem quality or as a description of the condition of the ecosystem, in relation to that service. In some cases, information on biophysical capacity can also be used to derive an option value in Step 5.

When measuring the physical flow of ecosystem services, one must determine what would be provided in the absence of the ecosystem in its current state. Therefore, the measurement should reflect the total amount of ecosystem service produced every year (e.g., the total amount of fish produced and/or caught every year). This is different from measuring the change in the flow associated with a particular action, or its marginal value.<sup>37</sup> For purposes of valuing natural assets, it is recommended that the valuation is established relative to a counterfactual baseline where there would be nothing provided (e.g., a value of zero). When a value of zero is difficult to establish, the baseline can be modeled as if the ecosystem was barren land. The baseline assumption should be clearly stated in each instance. Overall, the

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<sup>36</sup> Hein L, Bagstad K, Edens B, Obst C, de Jong R, Lesschen JP (2016). Defining Ecosystem Assets for Natural Capital Accounting. *PLoS ONE* 11(11): e0164460. <https://doi.org/10.1371/journal.pone.0164460>

<sup>37</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>.



measurement of the ecosystem flow will reflect the full amount of the ecosystem services provided every year (the accounting period).

To ensure that biophysical processes are well understood, it is recommended that a NAC engage subject matter experts on each service (e.g., hydrologists for water services, agro-ecologists for biomass production and pollination, fisheries experts) in order to set up appropriate measurement methods and identify indicators and data that best describes ecosystem service production. The table below entitled “Recommended Measurement Methods by Ecosystem Service Categories” provides general recommendations on measurement methods. Also, some tools have already developed systematized methods (functions or models) to measure the production of ecosystem services which can be used in this step. SEEA’s Guidance for Biophysical Modelling identifies models suitable for different ecosystem services.<sup>38</sup> For example, the INVEST<sup>39</sup> and ARIES<sup>40</sup> tools model several ecosystem services included in the list of IEG’s ecosystem services. These models identify critical biophysical parameters that determine ecosystem service provision, the expected relationship between these parameters, and outline data needs. Locally relevant models can also be built by the analyst conducting the valuation. The most reliable measurement methods should be chosen based on the data available,

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<sup>38</sup> United Nations (2022). *Guidelines on Biophysical Modelling for Ecosystem Accounting*. United Nations Department of Economic and Social Affairs, Statistics Division, New York.

<sup>39</sup> Natural Capital Project, 2022. *INVEST 3.12.0.post26+ug.g230fb3d User’s Guide*. Stanford University, University of Minnesota, Chinese Academy of Sciences, The Nature Conservancy, World Wildlife Fund, and Stockholm Resilience Centre.

<sup>40</sup> [Villa, F., K.J. Bagstad, B. Voigt, G.W. Johnson, R. Portela, M. Honzak, and D. Batker. 2014. A methodology for adaptable and robust ecosystem services assessment. \*PLoS ONE\* 9\(3\):e91001.](#) ARIES FOR SEEA Available at: <https://aries.integratedmodelling.org/aries-for-seea-user-guide/>

the need to conduct annual reports, and the objective of capturing as much of the ecosystem's Total Economic Value as possible.

Once tools and models have been identified and set up, measurement should become a more streamlined process for reporting in the years following the initial valuation. Since consistency with previous years' valuations should be maintained when measuring ecosystem services, subsequent analyses will be expected to adhere to previous methods and focus on updating data sources to reflect annual changes, as possible.

To ensure transparency in measurement approach and methods, it is required that a conceptual model is provided, outlining the main factors or components of the ecosystem considered, their modelled relationships, direction of flow (between ecosystem components and structures, external factors, and potential users), outputs and underlying assumptions for the derivation of ecosystem service values.

### **Recommended Measurement Methods by Ecosystem Service Categories**

<b>Ecosystem Service Category</b>	<b>Recommended Measurement Method(s)</b>
Provisioning services	Measurement should be done in terms of the physical flows or outputs that are produced by ecosystems (e.g., total weight of fish caught). These realized flows should be complemented with information on the capacity to produce the ecosystem service in order to verify the sustainability of ecosystem service use and any impact on the condition of the ecosystem supplying the service (e.g., fish stock or fish growth rates assessed for the species).
Regulating and Maintenance services	Regulating services are often measured through the functions or processes performed and therefore require careful characterization of the structural and dynamic factors that allow the ecosystem to function. A conceptual model that outlines the relationships, direction of flow, and underlying assumptions must be presented.  Soil, air, and water quality changes should be measured in terms of concentrations at a given site and enabled by the ecosystems being studied. These should be presented in units compatible with the

	<p>valuation method (e.g., yearly averages). Pollination can be measured as the rate of pollination and/or number of pollinators. Flood regulation may require data on expected storms and their intensity and a measure of the characteristics of the ecosystem providing the service (e.g., vegetation density).</p> <p>Most regulating services will require measurement at fine spatial scales and require some biophysical modelling (e.g., hydrological balances for water regulation or sediment transport for soil erosion and/or water quality parameters).</p> <p>Often measures may need to be translated into an index or indicator that can be used for valuation (e.g., pollutants in water quality may need to be mapped to a water quality ladder outlining measures as indicative of good, fair, or poor water quality).</p>
Cultural services	<p>The link between biophysical measurement and the realization of cultural ecosystem services is often hard to define and model. In some cases, the frequency of cultural service use directly measures the provision of the service, making the biophysical landscape implicit in the use patterns. For example, recreation services may start with directly measuring visitation to a given site as the core measurement variable of the ecosystem service. In this case, the biophysical unit may be the spatial area that provides the service.</p> <p>When possible, an attempt should be made to integrate a measure of the quality and condition of the ecosystem and/or its capacity to sustain these services, in order to enrich the valuation exercise. Information from the Statements of the Quality of Underlying Assets can be used to complement and enrich the characterization of the ecosystem's ecosystem service production potential.</p>
Non-use values	<p>Since non-use values, and sometimes option values, are not dependent on current uses, these values can emphasize the value of biophysical production without having to equate them to their use (e.g., hectares of the ecosystem).</p>

## 2. Collect the data for biophysical measurements

Once measurement methods have been selected and data needs have been identified, primary data (through field observations, surveys, or remote sensing) and secondary data from authoritative sources (e.g., official government data, data used for published work, recognized

global data sources used by subject matter experts) should be collected. Data collection at this stage focuses on the production of the service (e.g., kilograms of fish catch relative to fish stock, rate of pollination, tons of nutrients removed), which will be used to derive an ecosystem service value.

To determine what data should be included and assure its quality, the following criteria should be followed:

- Accuracy (is the data correct?)
- Completeness (what does it cover and not cover?)
- Reliability (does it contradict trusted data sources?)
- Relevance (is the data needed for the calculations that will be applied?)
- Timeliness (how recent is it? can it be used for real-time reporting?)

Once data is identified and collected, the analysis is conducted through the chosen method and/or model. The initial study will require more time to identify data and set up measurement processes. However, given that annual reporting on ecosystem service values is required, methods and data sources should be streamlined to ensure consistency, using key indicators and data proxies that can be updated on an annual basis.

Data gaps and underlying assumptions should be clearly outlined in the method description. If data gaps exist, preventing the measurement of identified ecosystem services, an expert informed desktop analysis combined with authoritative secondary data should be used to fill value gaps. If there are gaps that cannot be filled with this approach, a transparent and clear justification for the exclusion of identified ecosystem services should be provided. In addition, ecosystem services identified but not measured and/or valued should be listed in the Footnotes of

the Statement of Natural Production and the reason for their exclusion noted in the Methodological Notes column.

A measurement of error should be provided for every ecosystem service quantified and a sensitivity analysis should be conducted with a focus on the parameters of greatest uncertainty and largest influence on the results. This can also be done through the calculation of result ranges, given different assumptions or scenarios. In addition, a qualitative description of potential errors and known uncertainties should be provided.

### 3. Standardize measurement units

The temporal and spatial dimensions of the measurement analysis must be determined and stated. Often, the biophysical units of measurement of a given ecosystem service may not be compatible with valuation frameworks due to the use of different temporal and spatial dimensions (e.g., water flow may be in volume per second, yet economic valuation may require data on average consumption per year). For this reason, data should be translated into units suitable for valuation, such as annual estimates and two-dimensional spatial units (e.g., hectares, acres, square kilometers). The exact unit will depend on the ecosystem service, data availability, and the method used for measurement. As an example, water provision could be measured in cubic meters per year while carbon sequestration is measured in tons of carbon per acre. These units will have to be translated into a common unit (e.g., per hectare per year) in order to conduct the valuation.

### **Complete Measurement of KPIs**

Data for the ecosystem quality KPIs determined in Step 2 that will populate the Statement of the Quality of Underlying Assets should be collected to complement, expand, or validate the selected indicators and approach outlined and scoped.

Where field measurement is possible, it should follow appropriate sampling methods and robust statistical models to be able to present a result for each indicator. If secondary, authoritative data sources are used, these should be validated, and an analysis of potential error should be included.

Data quality assurance should follow the same criteria as those established for the ecosystem service valuation, checking for accuracy, completeness, reliability, relevance, and timeliness.

Similarly, the initial Year 1 study will set up the approach and measurement processes that will be used to track and monitor each KPI in subsequent years. Therefore, methods and data sources should be streamlined to ensure consistency, transparency, and replicability on an annual basis. Data gaps and underlying assumptions should be clearly outlined in the method description. If data gaps exist, preventing the measurement of key indicators or species, those may be proposed for inclusion in subsequent years.

If certain KPIs are deemed more critical to ensuring ecosystem functionality and/or continued resilience of the landscape, those should be identified as such. It is possible that not all KPIs are of equal importance, and some may deserve greater attention relative to others. In these cases, the study must provide this qualifying information regarding the relative importance of some KPIs versus others. Additionally, contextual information should be provided to help interpret the results and determine whether there is a desirable trend in the indicators, in terms of ensuring ecological functionality in the long run.

#### OUTPUTS:

- Contributions to the Technical Report that include the results of the biophysical quantification of ecosystem service production, methods used for measurement, error

estimates, and conceptual models outlining the scope and logic behind the analysis of ecosystem service provision.

- Contributions to the Technical Report with the measurement values for ecosystem quality KPIs. The write up will include the methods used for measurement, error estimates, data sources, and additional contextual information to support the interpretation of the values.
- A database with data collected for analysis, data sources, and workbook with measurement results standardized with clearly defined units that include spatial and temporal dimensions.

Step 5. Assign an Economic Value to the Ecosystem Services

The next step is to value ecosystem services based on accepted methods and best practices within the discipline. These values will then be used in the NAC's Ecological Performance Statements.

1. Determine valuation method for each ecosystem service

There are many methods for conducting ESVs as outlined in “Recommended Valuation Methods” below, some of which are adapted from the descriptions provided in the SEEA EA Framework.<sup>41</sup>

**Recommended Valuation Methods**

<b>Direct Market Methods: Observable markets with direct market prices.</b>
Where well-functioning markets exist for ecosystem services (there is competition and minimal price distortions), prices can be used to represent the ecosystem services value. For example, fees paid to landowners for hunting leases may reflect the value placed on the

<sup>41</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

ecosystem's production of habitat for recreation (hunting). Most ecosystem services are not currently provided in markets. In cases where markets exist, prices tend to underestimate the total economic value of the ecosystem service. Also, given that certain goods and services are often provided by public institutions or are highly regulated (e.g., water supply), the prices for these services will be heavily distorted and may need to be complemented or substituted with another valuation method that provides a better measure of the total economic value of the ecosystem service. If the price paid embodies other significant factors of production (e.g., inputs, labor, technology), an indirect market price method should be considered, such as residual value estimates.

**Indirect Market Methods: Prices in related markets are used as proxies.**

**Referential markets:** In the absence of a direct market for the unique good or service, a similar marketed good or service can be used to infer the value. The good or service should be sufficiently similar. For example, in subsistence economies, prices for the same products traded in markets (e.g., fish harvest sold at nearby ports) can be used to estimate the value of the good (e.g., fish) obtained for one's own consumption.

**Residual values and resource rent methods:** If the price of a final good embodies the ecosystem service but also includes other significant factors of production (e.g., labor and technology), then these should be subtracted from the price to isolate the contribution of nature. These methods estimate a value by taking the gross value of the final marketed good to which the ecosystem service provides an input (e.g., crops) and then deducting the cost of all other inputs, including labor, produced assets, and intermediate inputs.

**Productivity or production function methods:** In this method, the ecosystem service is considered an input in the production function of a marketed good. Thus, changes in the service will lead to changes in the output of the marketed good, holding other things equal. The value of the service is determined by first estimating the marginal product (contribution) of the ecosystem service as the change in the value of production as a result of a marginal change in the supply of the ecosystem service. Then, the marginal product is multiplied by the price of the marketed good to derive a marginal value product for the ecosystem services. Third, this marginal value product is multiplied by the physical quantity of the provided ecosystem service to obtain the value of the ecosystem service. It is often used to estimate the value of water supply or pollination to agriculture.<sup>42</sup>

**Revealed Preference Methods: Uses consumer purchasing decisions and/or observed behavior to infer values for ecosystem services.**

<sup>42</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>



**Hedonic price valuations:** This method estimates the differential premium on property values or rental values (or other composite goods) that arises from the effect of an ecosystem characteristic (e.g., clean air, local parks) on those values. This method is commonly used to measure the amenity services provided to residents in particular locations. In order to obtain a measure of this effect, all other characteristics of the property (including size, number of rooms, central heating, garage space, etc.) are standardized and need to be included in the analysis. Consideration should also be given to the geographical, neighborhood and ecosystem characteristics of the properties.

**Averting behavior:** This method uses expenditures or observed behavior to prevent or mitigate a negative effect of an environmental impact. These expenditures (including time spent) are used to represent the value of the ecosystem service. Examples of this include extra expenditures to improve water quality or air quality.

**Travel cost:** This method is commonly used to value the recreational value of a given site. The cost of travel and opportunity cost of visitors' time to a given recreational or cultural site is collected and used to build a demand curve to infer the implicit price of the ecosystem service (e.g., recreation). The area under the demand curve provides a measure of the willingness to pay (measured through the expenditures and time spent of different visitors) to visit the site. The method is similar to the estimation of a demand curve based on the quantity demanded at different prices.

**Cost-Based Methods: The cost of damages that would be incurred by communities in the absence of ecosystem services.**

**Replacement costs:** Estimates the cost of replacing the ecosystem service through something that provides the same contribution to benefits. It is also known as the substitute cost or alternative cost approach. The substitutes can be either a consumption item (e.g., an air filtration unit for a household substituting for air filtration services of trees) or an input factor (e.g., sorghum substituting for non-priced forage in the case of a rangeland grazing ecosystem services) or a capital factor (e.g., water treatment plant). In all cases, if the substitute provides an identical contribution, the price of the ecosystem service is the cost of using the substitute to provide the same benefits as provided by a single quantity unit of the ecosystem service (e.g., price for a ton of forage).

**Avoided costs:** The cost of damages that would be incurred by communities in the absence of ecosystem services. Often, expected damage functions are built based on historical data of damages associated with different levels of ecosystem service provision. This method is often used to estimate storm protection benefits provided by natural areas (such as wetlands). Historical data for storm damages can be regressed depending on wetland extent, controlling for factors such as storm intensity, population density, and exposure factors.

**Mitigation or restoration costs:** The costs of recovering from and preventing further damages due to ecosystem degradation. This valuation method is common in legal settings, and it is used for the purpose of making the public whole again following an environmental damage.

**Stated Preference Methods:** Often used in marketing studies, these methods are based on rigorous surveys asking respondents their willingness to pay or willingness to accept payment for the provision of different levels of ecosystem services. These are often used to estimate consumer surplus and non-use values.

**Contingent valuation:** Survey-based stated preference technique that elicits people's behavior in constructed markets. In a contingent valuation questionnaire, a hypothetical market is described where the good/service in question can be traded. This contingent market defines the good itself, the institutional context in which it would be provided, and the way it would be financed. Respondents are asked about their willingness to pay for, or willingness to accept, a hypothetical change in the level of provision of the good, usually by asking them if they would accept a particular scenario. Respondents are assumed to behave as though they were in a real market.

**Choice modelling or conjoint analysis:** Surveys that isolate levels of the environmental good or service in order to build a valuation function based on multiple data points collected in different contexts presented in the survey. An individual is offered a set of alternative levels of supply of goods or services, in which the characteristics vary according to defined dimensions of quality and cost. By analyzing preferences across these different bundles of characteristics, it is possible to obtain the value placed by the individuals on each of the characteristics, provided: (i) the bundles include a cost variable; and (ii) a baseline bundle is included that represents the status quo.

**Benefit Transfer Method:** The use of existing data from published valuation studies to infer the value of an ecosystem or service. This method draws on the valuation methods above and can be adopted when primary data is lacking.

**The benefit transfer method** uses secondary data (i.e., published data) to estimate the value of a service at a target site. Similar to a house appraisal valuation, where "comparable sales" are used to predict the house's current value, this method uses comparable sites to predict ecosystem service values that lack primary data. The value can be refined to adjust for specific variables that may influence its value, such as size of the asset or income effects, through a function transfer method.

The application of a given ESV method will be based on the ecosystem and ecosystem service type, the type of economic value that is believed to be most material, and the data

available. For example, travel cost methods are often used to estimate the recreational value of an ecosystem since the method looks at distance travelled to get to a unique site. Hedonic valuations are often used to estimate the value obtained by homeowners from visual amenity services related to proximity to an ecosystem. The chosen method for each ecosystem service should be well-justified, researched and explained, including the type of economic value that will be targeted, key assumptions, and limitations. See below "Recommended Ecosystem Service Valuation Approaches" for recommended valuation methods by ecosystem service type.

Different types of values can be estimated through different valuation methods and framings. For example, a direct market method will measure the exchange value of a good or service (the price point given current demand and supply). Stated preference methods can also measure the value obtained by consumers above the price point, or the consumer surplus obtained through the consumption of a good or service. Cost-based approaches can measure the value of producing the ecosystem service and do not necessarily integrate demand-based factors (e.g., the expected price or the consumer surplus). Value types can also be categorized according to the Total Economic Value concept. In this lens, ecosystems can also be valuable to society simply because of their existence (non-use values) or the value placed in having the option to benefit from it (option value). Values relevant to the estimation of Total Economic Value should be explored and the target values sought through the valuation should be clearly outlined as part of the method description for a NAC valuation. The objective of a NAC is to capture as much of the Total Economic Value of the natural asset as possible.

Above all, a NAC should prioritize rigor, consistency, and transparency in the methods used, value types included, and underlying assumptions to allow reviewers to interpret the values obtained and compare them through time and to other NACs. By noting whether a value is an

exchange or consumer surplus value, or a market or non-market value, or whether it is a direct use, indirect use, option, or non-use value, a more accurate interpretation of the results will be enabled. Given that the objective for the ESV is to capture the Total Economic Value, transparent information on value types will help reviewers understand the completeness of the valuation and the type of value being captured. Transparency and replicability will help to conduct subsequent valuations for future reporting.

Exchange values will often provide a conservative value in units that are comparable to market prices. These value types are recommended by SEEA's EA Framework.<sup>43</sup> More specifically, SEEA's EA Framework of method prioritization, as is stated in their guidelines, is as follows:

- i. Methods where the price for the ecosystem service is directly observable;
- ii. Methods where the price for the ecosystem service is obtained from markets for similar goods and services;
- iii. Methods where the price for the ecosystem service is embodied in a market transaction;
- iv. Methods where the price for the ecosystem services is based on revealed expenditures (costs) for related goods and services;
- v. Methods where the price for the ecosystem service is based on expected expenditures or markets.

For NACs, exchange values based on market prices can be prioritized and included when there are well-functioning markets for the ecosystem service. Well-functioning markets are ones

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<sup>43</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

where there is competition and minimal price distortions (e.g., subsidies or price manipulations). For example, timber may have mature markets, with healthy competition, and hence prices serve as an indicator of timber direct use values. Because most ecosystem services do not have markets, other methods are often needed to capture more of the ecosystem service's total economic value.

It is important to note that exchange values and/or market-based methods may result in lower value estimates by excluding some indirect benefits and/or consumer surplus values. Since the objective of a NAC is to capture Total Economic Value, including values outside markets, other methods are often needed. Particularly, when consumer surplus is believed to be high and/or there are few market interactions, a cost-based and/or willingness-to-pay approach should be considered to complement or conduct the valuation. Also, if option values are identified and measurable, these should be estimated and included. When these additional valuations are conducted, they should be done transparently and clearly, pointing out the types of values being captured. Most importantly, the practitioner will have to justify the decision to adopt a given valuation method based on what seems best suited given the data available, the beneficiaries of the service, the characteristics of the market, and the completeness of the estimate. This decision will have to be explained in a Methods section of the technical report that will describe the ESV study.

Although the most appropriate valuation methods will depend on the local context and data available, some general recommendations are provided in the table below.

#### **Recommended Ecosystem Service Valuation Approaches**

<b>Ecosystem Service Category</b>	<b>Recommended Valuation Method(s)</b>
<b>Provisioning services</b>	Valuation should be framed in terms of the physical flows that are harvested and/or consumed (e.g., number and weight of unprocessed

	<p>fish caught). Direct market prices or indirect market prices are often used for these services. These should reflect prices when the service first enters the supply chain (harvest price rather than retail price) to avoid inclusion of other factors of production.</p> <p>If the price of the good includes other significant inputs (e.g., labor and other costs of production), an indirect market price method, such as residual values or production function methods, should be considered.</p> <p>Methods that estimate consumer surplus should be considered when market prices leave significant value gaps and/or where the good may be significantly underpriced in the market setting.</p> <p>For example, water markets are often subsidized and heavily regulated, resulting in very low values. In these cases, other methods, such as referential markets, productivity methods or stated preference methods should be considered.</p> <p>In subsistence economies, similar goods or service sold in market settings (referential markets) can be used as proxies.</p>
<p><b>Regulating and maintenance services</b></p>	<p>Regulating services are often measured through indirect market methods or cost-based methods, since they often provide inputs into the production of other ecosystem services (e.g., pollinating services are inputs into crop production) and can either be estimated through a substitute factor of production and its associated cost or through the marginal profit or cost savings that the service generates.</p> <p>In some cases, these services can be valued based on observed market transactions, such as data from payments for ecosystem services schemes or emissions trading schemes. However, there will be limits as to where these methods can be used to estimate exchange values, depending on the institutional arrangements involved or the way in which services are quantified within the schemes (e.g., often management actions are used as a proxy for quantities).<sup>44</sup></p>

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United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

	<p>For carbon markets, year appropriate social cost of carbon estimates accepted by the IPCC should be used (i.e., the difference between social cost and market cost). These are often based on avoided costs.</p> <p>Soil, air, and water quality changes should be measured in terms of concentrations levels attributed to natural ecosystems and presented as a representative yearly value. A cost-based approach to mitigate can be considered or an indirect market or revealed preference method that captures the value placed on these improvements.</p>
<b>Cultural services</b>	<p>Appropriate valuation methods will differ greatly from one cultural service to another.</p> <p>Recreational services are often valued through either travel cost estimates or stated preference methods (yielding consumer surplus estimates). These methods require the estimation of recreational days.</p> <p>Visual amenities are often valued through hedonic price estimates.</p> <p>Educational and scientific services may be measured through indirect markets (replacement costs, observed markets, or as factors of production).</p> <p>Where appropriate, spiritual, artistic, and symbolic services can be qualified, noting that valuation will yield a small portion of the value that people place on them.</p>
<b>Non-use values</b>	<p>Non-use values (bequest and existence values) should be calculated at the level of the ecosystem (e.g., a unique forest or wetland and everything it embodies) and should be reported as a separate flow of value (i.e., an ecosystem service) obtained every year.</p> <p>Bequest and existence values are generally (and almost exclusively) valued through stated preference methods. Often option values can also be valued through stated preference methods.</p>

Once all ecosystem services that will be included have been matched to a potential valuation method, a technical report should be drafted to present the methods chosen, with a supporting literature review that outlines best practices on the method. The types of economic values that will be captured for each ecosystem service should be clearly indicated and be as

specific as possible. For example, wild fish may be valued at an ex-vessel price and identified as such. A consumer surplus value should be described as explicitly as possible (e.g., the average willingness to pay above current prices).

There should also be a thorough review to check for potential double counting before and while conducting the valuations. Valuation estimates that are additive and complementary should be adopted to avoid double counting. If valuations are additive, their addition should be presented in a transparent manner, accompanied with a conceptual model, noting how they are additive, while noting the types of values obtained (e.g., direct, indirect, or option values relevant to a given population). When there are multiple values for the same ecosystem service and type of value, these should be presented separately to illustrate their additionality or the range of values available (e.g., they may be valued differently by different beneficiaries). Finally, if there are values with large margins of error, there should be at least one other validation method conducted to validate results.

Adding across value types for a given ecosystem service may be possible, as long as the valuations are framed to be additive at the outset. Therefore, where multiple valuations are conducted for a given service, there should be clear indication of their complementarity or overlap with respect to the object of valuation. If the potential for double counting is identified and significant, the more complete and rigorous valuation type should be prioritized and used as the final value in the Ecological Performance Statements. When two valuations are conducted for the same flow of ecosystem service for the purpose of validation, they can be presented separately but they will not be added in the total ecosystem service value column. Only the valuation that is deemed most rigorous and defensible will be used to derive a total asset value.

## 2. Conduct the valuation



To conduct the valuation, the physical units of ecosystem services are given a dollar value. Once the measurement units are standardized in a unit suitable for valuation, the valuation method will seek to estimate the value obtained by a given set of beneficiaries. Depending on the method, additional data may be needed to reflect the beneficiaries, their willingness to pay for or accept the service, or to reflect other socio-economic, demographic, or market data that determines the value to people's wellbeing. In many cases, the biophysical measurement approach will be closely intertwined with the valuation approach (Step 4). For example, coastal flood regulation may be measured in terms of the vegetation present and its ability to reduce flood levels within exposed structures. The unit of measurement for valuation may be the cost of replacing these structures, and the model will likely integrate these parameters (costs) into the measurement method.

In general, a pilot study or test run should first be conducted to test and validate the model being used for the valuation of each ecosystem service. If a statistical model is being used, an adequate sample size should be used in order to make results representative of the target population. The statistical model should be reviewed for potential errors and tested and validated. Descriptive statistics should be provided as well as econometric results. If secondary data is being used, validation methods should be conducted.

It is important to note data gaps and the proportion of the total value that was captured in the ESV with the information available. If needed, a desktop valuation should be considered to fill data gaps. A desktop analysis is different from a desktop assessment (such as the one conducted in step 2) by being more thorough and in-depth than the initial "assessment". If a desktop analysis is included to complement or conduct the valuation, the values should be derived in a rigorous manner, accounting for potential errors and uncertainty and include other

quality assurance methods. If a benefit transfer method is adopted to fill in data gaps, it should be done in the most rigorous manner possible, and a degree of confidence should be stated. Also, a range of possible values should be stated for the benefit transfer value. It is expected that in subsequent years, benefit transfer estimates will be replaced by a primary valuation method.

Given that NACs will have to report on the value of their natural assets every year, the valuation process should be streamlined to produce consistent estimates every year. Above all, data sources should be consistent and regularly updated data should be prioritized. If some variables cannot be updated every year (e.g., replacement costs of using alternative technologies or survey-based valuations), the year when the data was collected should be noted for transparency and an informed assumption of how applicable these are for the current year should be used, with an explicit attempt to reflect current conditions. It may be that the biophysical data can be updated more frequently than the value per unit (e.g., water quality data may be more frequently measured than the willingness to pay for changes in water quality). In this case, the change in the biophysical measure can be updated and the value per unit change should be clearly noted with the date when the estimate was carried out.

### 3. Adding ecosystem service flows

The values derived for each ecosystem service will be presented as an annual flow of benefits. To calculate a value for the NAC as a total, the flow of ecosystem service values must be added. Often, valuations will first calculate a value per hectare across the landscape, which can be used to derive the value for the total extent of the natural assets. These aggregations should be transparent. Double counting can happen when adding across categories of ecosystem services that overlap in their object of valuation. Regulating (or intermediary) services are often valued as factors of production to other provisioning or cultural services (final services). For

example, soil quality improvements may be valued in terms of the contribution they provide to crop production. In such case, if crops are valued as a provisioning service in addition to soil quality's contribution to those crops, there would be double counting. In order to avoid double counting, regulating services (and/or intermediary services) should be reviewed for potential overlap with other final goods and services included in the valuation as well as those reported in the company's traditional financial accounting statements. If double counting risks are identified and found to be significant, only the more rigorous and complete valuation should be kept when adding services together.

#### OUTPUTS:

- Contributions to the Technical Report with annual values per ecosystem service, a measurement of error per ecosystem service value or a range of values possible with the methods employed, a level of confidence for the values obtained, a clear description of the method employed, data sources, best practices followed, type of value captured, and total economic value for the NAC provided as annual estimates.
- Models used and data used in their original format with the purpose of aiding replication of the analysis during the review process.

#### Step 6. Calculate the Value of the Assets

Once the annual values of the ecosystem services have been determined, these are used to calculate the underlying asset value of the NAC, as a producer of multiple ecosystem services. The Net Present Value ("NPV") of the natural assets should be calculated, using the future flow of ecosystem services generated by the assets. This is consistent with the US EPA and the SEEA EA approach, which describes NPV as follows:

“The net present value (NPV) is the value of an asset determined by estimating the stream of income expected to be earned in the future and then discounting the future income back to the present accounting period.<sup>45</sup> In ecosystem accounting, it is applied by aggregating the NPV of expected future returns for each ecosystem service supplied by an ecosystem asset.”<sup>46</sup>

The formula for calculating NPV is:

$$NPV = \sum_{t=1}^n \frac{R_t}{(1+i)^t}$$

Where:

$R_t$  = Net cash inflow or outflow in period  $t$

$i$  = Discount rate

$t$  = Number of time periods

Assets will be valued by taking the sum of the discounted future flows of values for all the ecosystems services provided and calculating their Net Present Value. Each unique ecosystem type may be presented separately as a natural asset with its corresponding value or they may be valued as a system of interacting ecosystems that produce an overall “system-wide” value. The system will correspond to the boundaries of the NAC and the set of ecosystems within it.

There are three important considerations when calculating an NPV for natural assets:

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<sup>45</sup> United Nations (2014). *System of Environmental-Economic Accounting 2012—Central Framework*. Page 151 para. 5.110.

<sup>46</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Page 184.

1. the amount and/or value of future streams of benefits in comparison to the present assessment,
2. the discount rate (representing the opportunity cost of money and time preferences of the beneficiaries); and
3. the life of the asset (the length of time expected for the flow of ecosystem services to be provided).

In the context of a NAC, future streams of benefits will be estimated to be the same as they are today. This approach is recommended to maintain a consistent and transparent approach across NACs and avoid the uncertainty introduced through forecasting. If foreseeable risks or changes in future ecosystem functioning are evident and have high certainty, the analyst should recognize these and note them in the NAC's public disclosure documents filed with the SEC. For example, there may be foreseeable land cover changes due to climate change, which will imply a shifting baseline for the ESV in the future. Also, these notes may be complemented with a description of how ecosystem quality is expected to improve, or ecosystem service quantity is expected to increase as a result of the proposed management objectives and how these changes may be expected to impact ecosystem service values in the future. The expected increase in value can be included as a growth rate or yearly percentage increase within those notes, and they may be provided as a range of scenarios. For healthy ecosystems, with high performing KPIs, an additional valuation exercise may be conducted to estimate the economic value of continued resilience. This may be done through informed projections and/or scenarios. Information on expected growth rates is not required in the Statements but NACs should consider whether it constitutes material disclosure, which should be included in their public disclosure documents filed with the SEC.

With respect to the discount rate and temporal horizon, IEG recommends the use of a 2% discount rate and that the NPV be estimated based on a 100-year lifetime for the asset. This will ensure consistency across the different valuations and NACs, and follows a standard approach often used by the SEEA EA framework to illustrate NPV calculations.<sup>47</sup>

The rationale for a low discount rate and long asset life relates to the distinct characteristics of natural assets when compared to other types of capital (like manufactured or produced capital). Natural assets are long term, productive assets. When managed effectively, natural assets can appreciate in value, by providing a consistent amount of valuable ecosystem services far into the future and through their self-regenerating capacities. Also, unlike other types of capital, natural assets often cannot be substituted and hence have a higher opportunity cost than other types of capital.

The results of the ESV NPV calculations must be recorded on the Statement of Natural Assets. These may be broken down by ecosystem type and/or presented as “system-wide” values. All calculations and variables used should be disclosed, including discount rate and asset life.

#### OUTPUTS:

Net Present Value Calculations for the value of the natural assets

- Contributions to the Technical Report outlining the method used to calculate asset values, the results of the calculations, and any other information considered in this section

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<sup>47</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Page. 345

- If applicable, notes on future threats, shifting baselines, and potential improvements in ecosystem service production and value given effective conservation management, including margins of error or ranges according to different scenarios

In summary, each of the Steps to Conduct an ESV will generate a set of outputs and reports which will be compiled into a single Technical Report that documents the final process, methods, and findings for all the required outputs of the ESV study. Although the ESV steps are iterative and complementary, the final outputs produced at each step provide the information needed to populate the Statements of Natural Production and Natural Assets, and most of the ecosystem quality KPIs for the Statement of the Quality of Underlying Assets. Additional information to complete the Statement of the Quality of the Underlying Assets will be derived from the evaluation of the management performance of the NAC.

## 2. Statutory Basis

The Exchange believes that the proposed rule change is consistent with Section 6(b)(5) of the Act,<sup>48</sup> in that it is designed to promote just and equitable principles of trade, to foster cooperation and coordination with persons engaged in regulating, clearing, settling, processing information with respect to, and facilitating transactions in securities, to remove impediments to and perfect the mechanism of a free and open market and a national market system, and, in general, to protect investors and the public interest, and is not designed to permit unfair discrimination between customers, issuers, brokers, or dealers.

The proposed listing standard for NACs is consistent with the protection of investors and the public interest because, among other things, it includes rigorous quantitative financial requirements and corporate governance requirements. Specifically, the proposed listing standard

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<sup>48</sup> 15 U.S.C. 78f(b)(5).

requires NACs to meet the same quantitative initial and continued listing standards as are applied to operating companies listed on the NYSE. In addition, NACs would be subject, without exception, to all of the other rules applicable to NYSE listed operating companies.<sup>49</sup>

The proposed rule change is designed to perfect the mechanism of a free and open market in that it will facilitate the listing and trading of an additional type of security and will therefore enhance competition among market participants, to the benefit of investors and the marketplace. There is significant and growing interest in investing in asset classes that are consistent with the objective of protecting and improving the environment. The Exchange believes that the listing of NACs will provide investors with an investment vehicle that meets this demand. The Exchange also believes that the development of NACs will provide a source of funding to maintain and restore natural assets.

The charter provisions each NAC would be required to adopt under the proposed rule are also consistent with the protection of investors and the public interest because they are designed to ensure that the NAC conducts its operations in a manner consistent with the ecological and socially equitable goals that would motivate investors when investing in the NAC. Specifically, these proposed charter requirements would include the following provisions:

- The purpose of the company is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services, with the objective of maximizing ecological performance. The NAC may also engage in other activities that do not cause any material adverse impact to the natural assets for

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<sup>49</sup> While NACs will be subject to all of the requirements of the Manual, the Exchange proposes some rule language specific to NACs to ensure that readers of those sections will clearly understand their applicability to NACs. Specifically, the Exchange proposes to amend Section 303A to specify that NACs will be subject to the same corporate governance requirements as operating companies and similarly proposes to amend Chapter Eight of the Manual to specify that NACs are subject to all of the continued listing requirements specified in that chapter for operating companies.



which it is responsible, including: (a) supporting community well-being; and (b) engaging in sustainable commercial activities.

- NAC funds (including any proceeds from the sale of the company's securities at any time) must be used primarily to meet the NAC's operational needs to meet its responsibilities with respect to the natural assets under its control and to provide for the long-term capital needs of the NAC in fulfilling that purpose. In addition, provided that any such uses do not cause any material adverse impact to the natural assets for which the NAC is responsible, funds may be used to support community well-being.
- The NAC will be prohibited from engaging directly in unsustainable extractive activities (including, but not limited to, traditional fossil fuel development, mining, unsustainable logging, or perpetuating industrial agriculture) or using its funds to finance such activities.

If any of the foregoing provisions of the NAC's charter are eliminated or materially amended in a manner that is inconsistent with their required form at any time, the NAC will be subject to delisting from the NYSE.

Similarly, the various policies that the NAC would be required to adopt and publicize (including an Environmental and Social Policy, a Biodiversity Policy, a Human Rights Policy, and an Equitable Benefits Sharing Policy) would protect investors by establishing clear standards that the NAC must abide by in seeking to address its stated ecological and social goals.

In addition, the Exchange believes that the review conducted by the Independent Reviewer with respect to the initial and periodic statements filed by each NAC are consistent with investor protection and the public interest because they are designed to ensure that such

statements are prepared in a manner that is consistent with the requirements of the Framework. Further, this thorough independent expert review of each NAC's Statements will protect investors by providing significant assurance as to the reliability of those Statements. The proposal would also amend Section 802.01E of the Manual to create non-compliance and delisting procedures for NACs that fail to timely publish their Statements. The proposed requirements for the audit committee of the NAC to oversee the preparation of the Statements and the performance of the Independent Reviewer are consistent with the protection of investors as they will help assure the accuracy and completeness of the Statements and the quality of the Independent Reviewer's review.

Similarly, as is the case with all listed companies, NACs would be required to immediately disclose pursuant to the Exchange's immediate release policy set forth in Sections 202.05 and 202.06 of the Manual any material event, including any event that is anticipated to have a material adverse effect with respect to any of the criteria included in the Statement of Ecological Performance (e.g., a forest fire). It is therefore in the interests of investors to have a rigorous rule to address delinquencies with respect to disclosures and to require immediate disclosure of material events.

B. Self-Regulatory Organization's Statement on Burden on Competition

The Exchange does not believe that the proposed rule change will impose any burden on competition not necessary or appropriate in furtherance of the purposes of the Act. A listing under the proposed rule would be available in a non-discriminatory way to any company satisfying its requirements, as well as all other applicable NYSE listing requirements. In addition, the Exchange faces competition for listings but the proposed rule change does not impose any burden on the competition with other exchanges; any competing exchange could

similarly adopt rules to allow the listing of NACs.

C. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants, or Others

No written comments were solicited or received with respect to the proposed rule change.

III. Date of Effectiveness of the Proposed Rule Change and Timing for Commission Action

Within 45 days of the date of publication of this notice in the Federal Register or within such longer period up to 90 days (i) as the Commission may designate if it finds such longer period to be appropriate and publishes its reasons for so finding or (ii) as to which the self-regulatory organization consents, the Commission will:

- (A) by order approve or disapprove the proposed rule change, or
- (B) institute proceedings to determine whether the proposed rule change should be disapproved.

IV. Solicitation of Comments

Interested persons are invited to submit written data, views, and arguments concerning the foregoing, including whether the proposed rule change is consistent with the Act. Comments may be submitted by any of the following methods:

Electronic comments:

- Use the Commission's Internet comment form (<http://www.sec.gov/rules/sro.shtml>); or
- Send an e-mail to [rule-comments@sec.gov](mailto:rule-comments@sec.gov). Please include File Number SR-NYSE-2023-09 on the subject line.

Paper comments:

- Send paper comments in triplicate to: Secretary, Securities and Exchange Commission, 100 F Street, NE, Washington, DC 20549-1090.

All submissions should refer to File Number SR-NYSE-2023-09. This file number should be included on the subject line if e-mail is used. To help the Commission process and review your comments more efficiently, please use only one method. The Commission will post all comments on the Commission's Internet website (<http://www.sec.gov/rules/sro.shtml>). Copies of the submission, all subsequent amendments, all written statements with respect to the proposed rule change that are filed with the Commission, and all written communications relating to the proposed rule change between the Commission and any person, other than those that may be withheld from the public in accordance with the provisions of 5 U.S.C. 552, will be available for website viewing and printing in the Commission's Public Reference Room, 100 F Street, NE, Washington, DC 20549 on official business days between the hours of 10:00 a.m. and 3:00 p.m. Copies of the filing also will be available for inspection and copying at the principal office of the Exchange. All comments received will be posted without change. Persons submitting comments are cautioned that we do not redact or edit personal identifying information from comment submissions. You should submit only information that you wish to make available publicly. All submissions should refer to File Number SR-NYSE-2023-09 and should be submitted on or before [insert date 21 days from publication in the Federal Register].

For the Commission, by the Division of Trading and Markets, pursuant to delegated authority.<sup>50</sup>

J. Matthew DeLesDernier,  
Deputy Secretary.

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<sup>50</sup> 17 CFR 200.30-3(a)(12).

JANUARY 2023

**INTRINSIC  
EXCHANGE  
GROUP**  
**ECOLOGICAL  
PERFORMANCE  
FRAMEWORK**



**INTRINSIC**  
EXCHANGE GROUP

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## KEY TERMS USED IN THE CONTEXT OF A NAC

**Biodiversity** – Defined as “the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”.<sup>1</sup>

**Consumer Surplus Value** – The value obtained by consumers of a good or service beyond what is actually paid for the good or service. This is the extra welfare or utility that people obtain for free from the consumption of ecosystem goods and services.

**Cost-based Value** – Values based on expenditures involved in preventing, avoiding, mitigating, restoring, or replacing the loss of ecosystems and/or ecosystem services.

**Ecological Performance** – The value of natural assets and the production of ecosystem services.

**Ecological Performance Rights** – The rights to the ecological performance (i.e., the value of natural assets and production of ecosystem services) of a designated area, including the authority to manage the area. These rights are granted to a NAC, from a natural asset owner, as provided through a license or other legal instrument.

**Ecosystem Services** – The benefits people derive from ecosystems, many of which are provided outside market settings. These include the direct and indirect contributions from nature to economies and people’s wellbeing. The term is used to include both goods and services. Examples of ecosystem services include air filtration, water supply, flood protection, soil quality regulation, climate stability, and habitat for wildlife.

**Ecosystems** – The specific entities (structures, functions, and components of the natural world) that produce ecosystem services. The term is used by ecologists to define units within the natural world based on the interactions of plants, animals, and micro-organisms with the non-living environment.

**Ecosystem Service Valuation or ESV** – The assignation of an economic value to an ecosystem service using one of many valuation methodologies accepted today.

**Exchange Value** – The market price or price point equivalent of an ecosystem service represented by where demand and supply curves meet. This value type represents a realized market price or its potential price.

**Extent** – Refers to a spatial area measure in hectares or acres. The extent of the NAC will refer to the total area of the NAC at its most aggregate level; in the Statements of Underlying Quality, extent will be reported by ecosystem type. In the Statements on Natural Assets, the extent will refer to the areas supplying the ecosystem services being measured and valued.

**Hybrid Areas** – Areas that integrate natural areas with working areas and/or built infrastructure in a single NAC to produce the most value within a diverse landscape.

**IEG Ecological Performance Framework** – IEG has developed a specific framework for NACs to derive and report on ecosystem service values and on the quality of the

<sup>1</sup> Convention on Biological Diversity (1992) Convention on Biological Diversity. Secretariat of the Convention on Biological Diversity, Montreal, Canada

natural assets being managed. In addition, the Framework defines the components and structure of the Statements of Ecological Performance to ensure the values are reported transparently and consistently.

**Natural Areas** – Areas managed by a NAC where the NAC’s focus is on creating new conservation areas (e.g., intact landscapes or seascapes), protecting existing conservation areas, or restoring degraded areas to protect and enhance biodiversity and ecosystem service production.

**Natural Assets** – A statistical representation of ecosystems for accounting purposes that defines them as productive units of ecosystem services. Natural assets can be monetized directly or indirectly. Like traditional assets, they have economic value and are expected to provide a future benefit. The term in the singular form refers to an ecosystem type (e.g., a delineated forest).

**Natural Asset Companies or NACs** – Corporations that hold the rights to the ecological performance of natural, hybrid, or working areas, and have the authority to manage the areas for conservation, restoration, or sustainable management.

**Natural Production** – The production and use of ecosystem goods and services by natural assets.

**Statement of Natural Assets** – A statement that provides information on the net present value of natural assets producing ecosystem services managed by a NAC.

**Statement of Natural Production** – A statement that provides information on the annual flows of ecosystem services managed by a NAC.

**Statement of the Quality of Underlying Assets** – A statement that provides both qualitative and quantitative information on the overall health and condition of the underlying natural assets being managed by the NAC.

**Statements of Ecological Performance** – A suite of statements with information on the ecological performance of a NAC, including a Statement of Natural Production, a Statement of Natural Assets, and a Statement of the Quality of Underlying Assets. These statements are unique to NACs and are reported in addition to traditional financial statements.

**Sustainable Activities** – From an ecological perspective, sustainable activities cannot extract resources at a faster rate than they are replenished. For an activity to be deemed sustainable there should be no directly induced degradation of the condition of the ecosystems (which can be measured through the indicators in the Statement of the Quality of Underlying Assets).

**Total Economic Value** – A concept of value that disaggregates the different types of economic values that people place on ecosystems and/or natural resources, including non-use values, option values, indirect use value and direct use values.

**Working Areas** – Areas primarily designated for agricultural production and managed by a NAC. With respect to a Working Area, a NAC’s focus is on converting existing production practices from conventional methods, which degrade ecosystems, to regenerative agriculture methods, which increase the health of the soil and the surrounding water, provide room for nature, improve the nutritional value of food, and increase farm income.



## EXECUTIVE SUMMARY

Intrinsic Exchange Group (“IEG”) is introducing a new type of company whose equity captures the value of natural assets and the ecosystem services they produce, termed a Natural Asset Company (“NAC”).

People often say nature is priceless, intending to indicate how valuable it is. But in today’s economic system the value of nature is simply not counted. Because of this market failure, there is little economic incentive to preserve nature, and the costs of depleting it are not captured in our economic system, resulting in things like pollution, climate change, and biodiversity loss. Efforts to address this market failure, like policy measures in the form of taxes and regulation or voluntary remedies via philanthropy, have made strides, but have been insufficient to address the challenges at the scale needed. The financing gap for biodiversity is estimated between US\$598-824 billion per year,<sup>2</sup> for climate change about US\$5 trillion dollars per year,<sup>3</sup> and for the transition to a more sustainable, resilient, and equitable economy, orders of magnitude larger.

For our society to adequately protect and preserve nature, and all the benefits it produces, our economy must measure, value, and integrate it into economic systems. That is why IEG is pioneering NACs, which value the goods and services that nature produces – like clean air, water, and productive soils – and create financial incentives to conserve and harness them. The concept of ecosystem services has been growing rapidly in the research and policy arenas and methods to measure their economic value are becoming increasingly common.

IEG has partnered with NYSE to create a special listing section for NAC equities. By taking a NAC public through an IPO, this market transaction will succeed in converting the long-understood – but to-date unpriced – value of nature into financial capital. This monetization event will generate the funding needed to manage, protect, and restore healthy ecosystems globally long-term, and bring us closer to achieving a truly sustainable, circular economy.

The purpose of this document is to describe the framework IEG has developed for how NACs are required to measure and report on the value of ecosystem service and natural assets they manage, in a manner that is transparent, robust, and consistent, in order to accurately and adequately inform potential investors of their unique value and characteristics.

<sup>2</sup> Deutz, A., Heal, G. M., Niu, R., Swanson, E., Townshend, T., Zhu, L., Delmar, A., Meghji, A., Sethi, S. A., and Tobinde la Puente, J. 2020. Financing Nature: Closing the global biodiversity financing gap. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability.

<sup>3</sup> Boehm, S., K. Lebling, K. Levin, H. Fekete, J. Jaeger, R. Waite, A. Nilsson, J. Thwaites, R. Wilson, A. Geiges, C. Schumer, M. Dennis, K. Ross, S. Castellanos, R. Shrestha, N. Singh, M. Weisse, L. Lazer, L. Jeffery, L. Freehafer, E. Gray, L. Zhou, M. Gidden, and M. Gavin. 2021. State of Climate Action 2021: Systems Transformations Required to Limit Global Warming to 1.5°C. Washington, DC: World Resources Institute: <https://doi.org/10.46830/wrirpt.21.00048>.

## NATURAL ASSET COMPANY

### CONTEXT

Intrinsic Exchange Group (“IEG”) is introducing a new type of company whose equity captures the value of natural assets and the ecosystem services they produce, termed a Natural Asset Company (“NAC”).

Natural assets like forests, groundwater, and soil, provide a wealth of goods and services to people, termed ecosystem services that make life on Earth possible. These services, which are underpinned by biodiversity, include such things as clean air, water, productive soils for agriculture, food, climate stability, habitat for wildlife, and a vast genetic store of information for foods, medicines, and technological innovation.

The Millennium Ecosystem Assessment,<sup>4</sup> a major UN-sponsored effort that examined the interactions between ecosystems and human well-being, identified four major categories of ecosystem services to demonstrate the ways in which people benefit from nature, as follows:

- **Provisioning** – products directly consumed and obtained from ecosystems;
- **Regulating** – benefits obtained from the ecosystem processes that maintain ecosystems;
- **Cultural** – nonmaterial benefits obtained from ecosystems; and
- **Supporting** – services necessary for the production of all other ecosystem services.

Despite how essential they are to the economy and life on the planet, natural assets, and the services they provide, have been largely excluded from the mainstream of the economy. This exclusion had been largely due to a lack of information about their existence and the contributions they make to economic activity and human well-being as well as a lack of consistent measurement and valuation frameworks. But this is no longer the case and economies must adapt as it becomes clear that their exclusion has led to inefficient investment decisions, and these assets are being degraded at alarming rates. Species extinction is proceeding at a pace never experienced in human history.<sup>5</sup> Fresh water resources are being depleted and polluted. Agriculture is contributing to the loss of natural habitat and soil degradation. These are significant threats to life on earth and the economy.

At the same time, the demand for sustainable investment is large and growing, to such a degree that demand far outstrips supply. However, capital flows directed to biodiversity conservation, renewable energy, regenerative agriculture, and other direct investments needed to transition to a sustainable economy are insufficient due in part to the inability to transparently present the economic case to access these investment

<sup>4</sup> Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-being: Synthesis. Washington, DC: Island Press.

<sup>5</sup> IPBES (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). Available at: <https://doi.org/10.5281/zenodo.3831673>

dollars based on traditional measures of financial performance. The financing gap for biodiversity is estimated between US\$598-824 billion per year,<sup>6</sup> for climate change about US\$5 trillion per year,<sup>7</sup> and for the transition to a more sustainable, resilient, and equitable economy, orders of magnitude larger.<sup>8</sup>

A scalable capital markets solution based on making the value of natural assets transparent and accessible can provide much of the capital required to bridge the gap. Natural assets have been valued at about US\$5,000 trillion<sup>9</sup> and nature's annual production of goods and services at US\$125 trillion per year.<sup>10</sup> IEG has partnered with NYSE to create a special listing section for NAC equities. By taking a NAC public through an IPO, this market transaction will succeed in converting the long-understood – but to-date unpriced – value of nature into financial capital. This monetization event will generate the funding needed to manage, protect, and restore healthy ecosystems globally long-term, and bring us closer to achieving a truly sustainable, circular economy.

## NATURAL ASSET COMPANY

Natural Asset Companies are corporations that hold the rights to the value of natural assets and ecosystem services produced by natural, working or hybrid areas. These rights, termed Ecological Performance Rights, are similar to air rights or timber rights, are granted to the NAC by the owners of the underlying natural assets. These assets can be areas that are publicly owned, such as a national park, or tracts of privately owned property held by individuals or corporations. By charter, each NAC will have a board and management team with a mandate to maintain, protect, restore, and grow the natural assets under management.

Once a company is formed, it will be taken public via IPO on NYSE with listing rules designed to govern the unique aspects of NACs. The capital generated from the public offering will be used to invest in the underlying ecosystems with the purpose of actively managing, maintaining, and restoring them. Additional capital beyond this core function can be utilized to support broader sustainable activities.

<sup>6</sup> Deutz, A., Heal, G. M., Niu, R., Swanson, E., Townshend, T., Zhu, L., Delmar, A., Meghji, A., Sethi, S. A., and Tobinde la Puente, J. 2020. Financing Nature: Closing the global biodiversity financing gap. The Paulson Institute, The Nature Conservancy, and the Cornell Atkinson Center for Sustainability.

<sup>7</sup> Boehm, S., K. Lebling, K. Levin, H. Fekete, J. Jaeger, R. Waite, A. Nilsson, J. Thwaites, R. Wilson, A. Geiges, C. Schumer, M. Dennis, K. Ross, S. Castellanos, R. Shrestha, N. Singh, M. Weisse, L. Lazer, L. Jeffery, L. Freehafer, E. Gray, L. Zhou, M. Gidden, and M. Gavin. 2021. State of Climate Action 2021: Systems Transformations Required to Limit Global Warming to 1.5°C. Washington, DC: World Resources Institute: <https://doi.org/10.46830/wrirpt.21.00048>.

<sup>8</sup> Force for Good (2021). *Capital as a Force for Good, 2021 Report*. Available at: [https://www.forcegood.org/frontend/img/2021\\_report/pdf/Funding\\_the\\_SDGs\\_and\\_a\\_Sustainable\\_Future.pdf#toolbar=0](https://www.forcegood.org/frontend/img/2021_report/pdf/Funding_the_SDGs_and_a_Sustainable_Future.pdf#toolbar=0) Chapter 2

<sup>9</sup> Based on Costanza et al (2014). Changes in the global value of ecosystem services, *Global Environmental Change*, 26, 152-158. Available at: <https://doi.org/10.1016/j.gloenvcha.2014.04.002>

<sup>10</sup> Costanza et al (2014). Changes in the global value of ecosystem services, *Global Environmental Change*, 26, 152-158. Available at: <https://doi.org/10.1016/j.gloenvcha.2014.04.002>

To further explain what a NAC is, it is helpful to explain what it is not:

- **A Green Bond** – A NAC is structured as an equity, not a debt instrument.
- **An ESG/SRI Fund or ETF** – Investment in a NAC is based on the value of nature as an asset rather than investment based on sustainability scores or negative screens.
- **Carbon Credits** – The NAC intends to capture the value of a wide breadth ecosystem services (drawing on a list of 38) rather than simply carbon sequestration.
- **Philanthropy** – A NAC is designed to create new financial capital, rather than rely on a transfer of funds from wealthy individuals or countries.
- **Government Intervention** – A NAC is not a tax or regulation, though the financial resources generated by NACs can support governments to address budget shortfalls in conservation and sustainable production.

## VALUES CAPTURED IN A NATURAL ASSET COMPANY

Natural Asset Companies are being designed to more fully capture the value of natural assets. This includes, but is not limited to, the following:

- **Traditional Production** – The use of natural resources, built assets, financial capital, and labor to produce goods and services that may be valued and included in the rights granted to the Natural Asset Company or obtained by investment, as reported under US Generally Accepted Accounting Principles (“GAAP”) or International Financial Reporting Standards (“IFRS”).
- **Production of Ecosystem Services** – The production of goods and services that nature produces. This includes those that are monetized today and are reported under GAAP/IFRS (e.g., ecotourism values), as well as the vast majority which are not monetized today but intend to be captured within the NAC’s ecological performance reporting.
- **Nature’s Non-Use Value** – The less tangible inherent value of nature, including people’s value for species and ecosystems in and of themselves (e.g., for their complexity, diversity, spiritual significance). This category includes:
  - Bequest value – potential future value of a resource
  - Existence value – the value people place to ensure the continued existence of ecosystems
  - Value for services not yet identified or quantified

Once the NAC is traded, these additional values and characteristics, among others, may also be realized:

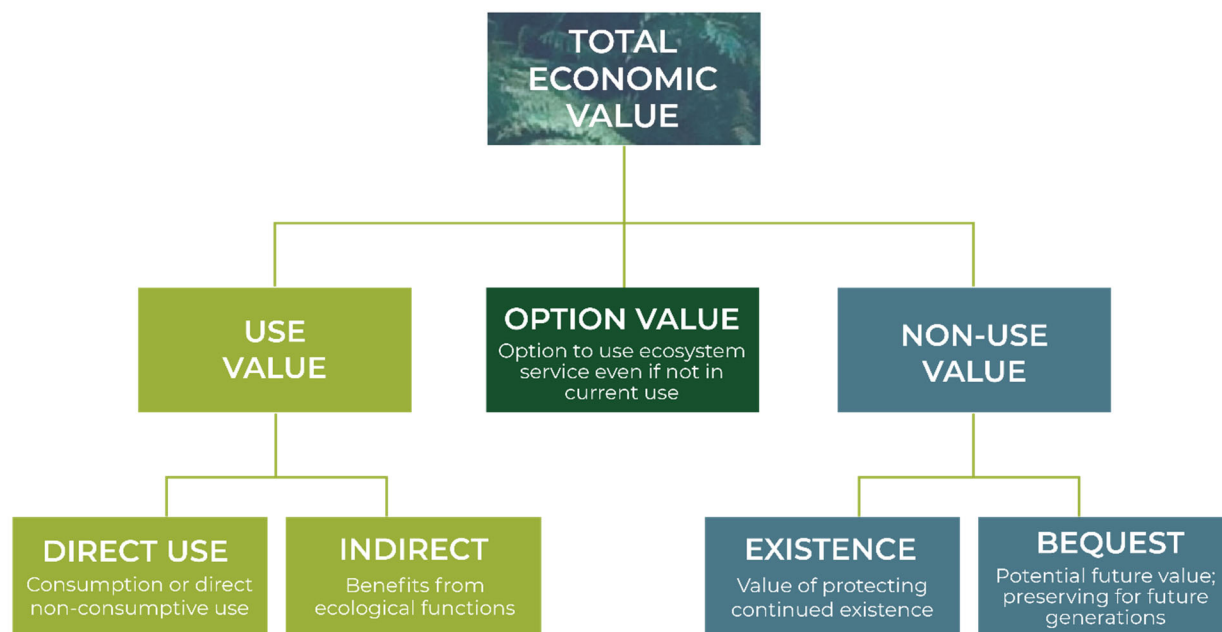
- **Store of Value** – A NAC’s equity is a store of value like any other security or asset. The stocks of water, timber, biodiversity, soil, carbon, fish, and other natural assets that make life on Earth possible are now protected under a NAC and are thus the ultimate store of value for investors.
- **Increased Quantity and Quality of Ecosystem Services** – A NAC creates an incentive and an enabling environment to increase both the quantity and quality of ecosystem services produced and consumed. Innovation, acquisitions, and growing demand for ecosystem services may all play a role in this dynamic.
- **Risk Mitigation** – By recognizing positive and negative externalities, and the full spectrum of ecosystem services, nature-based risks may be revealed, better mitigated, and in some cases, converted into an asset/income stream. Additionally, financial, operational, litigation, and reputational risks may be better managed through any resulting improvements in land management practices.
- **Uncorrelated Asset** – Nature works 24/7 regardless of market dynamics and may hedge against systemic economic downturns and business cycles. As biodiversity is protected, it can act like as a diversified asset to investors, providing new ways to adapt to a changing environment.
- **Increased Competitiveness** – As policy and regulatory environments evolve to manage climate change, biodiversity, and other natural resource pressures, NACs will be ahead of the market through clearly demonstrated nature-positive impacts. As new markets emerge around ecosystem services, NACs will be able to capitalize on the ecosystem services that translate into new markets.

A NAC’s equity is designed to capture the above elements of value and more, creating financial realization via a security, whereby the full value of natural assets is priced in a market transaction.

The value of the NAC will be based on the Total Economic Value of the ecosystems contained within the NAC’s boundaries. The concept of Total Economic Value (“TEV”) is often used to illustrate the different types of value of natural assets (see **Figure 1**). It is defined as the sum of the values of all services that natural assets generate both now and in the future.<sup>11</sup> At a broad level, a differentiation is made between ‘use value’ and ‘non-use value’. Use values can be direct and refer to goods or services that can be used or consumed directly by individuals, such as food or ecotourism. Use values can also be indirect and refer to the work that nature does to maintain ecosystem functioning and the life-supporting roles of ecosystems, which are ‘indirectly used’ (like coastal protection). Non-use values refer to indirect and/or intangible values that are not directly linked to realized uses. Examples of non-use values include the potential future value of a resource (bequest value) or the value of protecting the continued

<sup>11</sup> TEEB (2010). The Economics of Ecosystem and Biodiversity for National and International Policy makers. Earthscan, London.

existence of an ecosystem, including the value of having a functioning ecosystem for the sake of its own integrity (existence value). The value of having the option to access a natural resource or ecosystem service (option value), even if its use is never realized, can be classified as both a use and a non-use value.



**Figure 1: The Total Economic Value framework for valuation of ecosystem services**

Some direct use values are partially captured in markets and GAAP/IFRS financial statements. However, many others are not and the sustained capacity to continue obtaining these values in the long-term is not currently captured. Also, indirect uses, option values, and non-use values are often not captured within markets, yet these values represent functions and services that prevent ecological collapse and that are vital to sustaining and improving well-being now and in the future. Methods to measure and capture these types of value now exist and can be used to systematically include these other dimensions of value creation in a company's financial reporting.

## NATURAL ASSET COMPANY ACCOUNTING APPROACH

IEG has developed this Ecological Performance Framework (“Framework”) specifically to report on the value of NACs. NACs are designed with a fundamentally different purpose than traditional companies in that their primary business is to maximize ecological performance – the value of natural assets and the production of ecosystem services. A NAC’s activities are not well captured by traditional financial reporting frameworks like GAAP/IFRS, as most ecosystem services are not monetized today. In order to account for and capture the value of these non-monetized ecosystem services, IEG has developed materials termed Statements of Ecological Performance.

The value of a NAC will therefore be reflected in two sets of statements:

- **Traditional financial statements** to capture traditional cashflows where they exist (e.g., ecotourism revenue or carbon credit sales), and
- **Statements of Ecological Performance** – a suite of three statements unique to NACs, which will capture information on the flows of the annual ecosystem services being produced, the value of natural assets, and information on the quality of the underlying assets (see **Table 1** below).

**Table 1. Statements of Ecological Performance**

STATEMENT	DETAILS
<b>STATEMENT OF NATURAL PRODUCTION</b>	Provides information on the annual flows of ecosystem services provided by the natural assets under management by a NAC, in biophysical and monetary terms. Values for ecosystem services are calculated based on Ecosystem Service Valuations.
<b>STATEMENT OF NATURAL ASSETS</b>	Provides information on the net present value of the natural assets managed by a NAC, in monetary terms, as measured through the flows of ecosystem services.
<b>STATEMENT OF THE QUALITY OF UNDERLYING ASSETS</b>	Reports quantitative and qualitative information on the health and condition of the ecosystems being managed by the NAC and will focus on biodiversity metrics reported in non-monetary terms.

Ecosystem service valuations (“ESVs”) are the foundation for determining the monetary values of NACs which will be captured in the Statements of Ecological Performance. The Framework includes the requirements for the steps to conduct an ESV, building upon widely utilized ESV methodologies, approaches, and standards. In addition, the Framework defines the components and structure of the Statements of Ecological

Performance and provides guidance to produce them, to ensure transparency, robustness, and consistency in the reporting of values and information in the Statements.

The Framework is grounded on the measurement, valuation approaches, and ecosystem service categories in the United Nations System of Environmental and Economic Accounting – Ecosystem Accounting Framework (“SEEA EA Framework”). Most of the ecosystem service categories used in the Framework directly reflect the categories (names and definitions) used in the SEEA EA Framework as well as the SEEA EA Framework’s guidelines for the biophysical measurement of ecosystem services and their related valuation. The Framework differs from the SEEA EA Framework by including additional ecosystem service values and valuation approaches that are designed to provide transparent information on the TEV of natural assets and the underlying productive capacity of nature. Specifically, the Framework builds on the SEEA EA Framework by also including a larger set of ecosystem services (38 in total) that must be considered for potential inclusion when conducting an ESV. These ecosystem services are classified into three categories - including provisioning, regulating and maintenance, and cultural services. In addition, non-use values are presented as a separate category of value attributed to the ecosystem(s). These categories are used to classify the different ways in which people benefit from ecosystem service production.

The Framework builds upon SEEA EA and other frameworks by:

1. focusing on the monetary valuation of the natural assets managed by the NAC;
2. focusing on the positive externalities from conservation and restoration rather than the negative impacts or risks from ecosystem degradation;
3. building on the SEEA EA Framework standards to value a comprehensive suite of ecosystem services and their Total Economic Value;
4. proposing a financial reporting framework that buttresses GAAP/IFRS financial reporting with the unique values in the Statements; and
5. directly tying the value of nature to a financial instrument (the NAC) and market mechanism (through the listing of the NAC on the NYSE) to enable the transformation of the natural asset value to financial capital.

## **COMPONENTS AND FORM OF THE STATEMENTS OF ECOLOGICAL PERFORMANCE**

The following three Statements constitute the Statements of Ecological Performance that must be created and publicly filed by NYSE-listed NACs: (i) Statement of Natural Production, (ii) Statement of Natural Assets, and (iii) Statement of the Quality of Underlying Assets. These statements must be published annually, representing the same accounting period as the NAC’s audited financial statements.



## Statement of Natural Production

The Statement of Natural Production provides information on the annual flows of ecosystem services provided by the natural assets under management by a NAC in biophysical and monetary terms. This Statement presents the annual total economic value captured for each ecosystem service, and annual values aggregated across all ecosystem types within the NAC. See **Appendix A** for a template of the Statement of Natural Production and Footnotes.

### Components of a Statement of Natural Production:

1. **Flows of Ecosystem Services** – The Statement of Natural Production will itemize all the ecosystem services that were valued through the ESV, from a base list of 38 potential ecosystem services.
2. **Biophysical Measure** – Refers to the amount of ecosystem service provided, measured in biophysical units. The appropriate measurement unit will depend on the ecosystem service type. The amount or quantity of ecosystem services will reflect the total amount valued and provided by all the ecosystems found within the NAC. In cases where the amount provided is greater than the amount valued, only the amount valued should be noted in this cell, specifying the unit of measurement (e.g., tons of carbon or number of hectares providing the service). When total units are not relevant indicators, then an average value can be provided here (e.g., average temperature reduction across the landscape). The intent is to provide transparent information on the quantification and measurement of the ecosystem service.
3. **Total Economic Value Captured** – Refers to the total monetary value derived for each ecosystem service through the ESV conducted by the NAC. This total value can include multiple types of economic values, such as direct, indirect, and/or option values. More information about the types of value captured and scope of the values reported will be provided in the Footnotes, including confidence intervals for each estimate and/or ranges derived through different valuation methods. This value will be presented in current dollars.

**Footnotes** will be included, in tabular form, to provide further details on the information noted above (The Statement of Natural Production). They will provide transparency by including more disaggregated information about the scope of the valuations, the types of economic values estimated, and their precision. Footnotes will list the ecosystem services identified but not included and the reason for their exclusion. For the ecosystem service valued, the footnotes will provide detailed information on the biophysical quantities of ecosystem service production and the method of measurement. If there is a discrepancy between the amount produced and the amount valued, this will also be noted here.

As there can be more than one valuation conducted per ecosystem service, the Statement allows for multiple valuations to be conducted and presented under **Valuation 1** and **Valuation 2** headings. It will include sub columns to present the different **Types of Values** that were derived for a given ecosystem service. These columns should report the type of TEV captured and if relevant the valuation method

(e.g., direct use value from market prices). This information presents the scope of the valuation and is particularly valuable in cases where complementary valuations may have been deemed necessary and/or possible. The **Value per Unit** will refer to the dollar value used for the singular unit of ecosystem service, corresponding to the biophysical measurement unit (e.g., value of a ton of carbon). In some cases, an average value may be provided to reflect different unit values used in the valuation (e.g., the Visual Amenity value of a landscape may be presented as an average value per hectare). The **Value** column reflects the economic value derived for the ecosystem service listed using the unit price and quantities noted in the previous columns. The **Range or Confidence Interval** column summarizes the upper and lower bounds of the value presented, as estimated through the methodologies employed. For example, the valuation may be sensitive to key assumptions or variables, which can be presented in this column for transparency of the range of results that can be obtained. Errors may also be disaggregated by the step of the methodology, including those from the derivation of the biophysical unit and those from the valuation method employed. **Methodological Notes** will describe the measurement and valuation methodologies, including key assumptions, beneficiaries, and other key information to better interpret the results. The details of each method will be explained in more detail in the Technical Report of the ESV study.

If the original valuation was conducted by ecosystem type (e.g., forest, wetland, and cropland) and results were presented as such, these disaggregated results will be included here, through separate lines for each ecosystem service within each ecosystem type. The extent of each ecosystem type will outline the size of each ecosystem (e.g., number of hectares). If the valuation is deemed more accurate as a system-wide valuation (one that includes the interactions between ecosystem types but does not attribute a specific value contribution to each ecosystem), then the ecosystem type column can be described as "system-wide valuation". If the valuations are deemed additive, these totals are summed following guidelines to avoid double counting in Step 5 of the "Steps to Conduct an ESV" section below, to provide a total value aggregated across all ecosystem services in the **Total Economic Value** cell. If the valuations are not additive (they represent non-additive values or were conducted for validation of the results), then the more rigorous valuation should be used in the Total Economic Value cell.

If ecosystem services were identified or deemed to be present but could not be included or valued due to their incommensurability, lack of data, irrelevance, or license agreement limitations; these should be listed in the footnotes and an explanation for their exclusion should be provided in the methodological notes.

### **Statement of Natural Assets**

The Statement of Natural Assets reports information on the potential production value of natural assets managed by a NAC, in monetary terms. This will be measured through the Net Present Value of ecosystem service value flows, using a 100-year time horizon, a 2% discount rate, and an assumption that the ESV remains the same as the current year for the whole temporal horizon. See **Appendix B** for a template of the Statement of Natural Assets.

Components of a Statement of Natural Assets:

1. **Natural Assets** refers to the particular ecosystem types being managed by the NAC. Examples include forests, wetlands, agricultural areas, and coral reefs. If the valuation was done for the NAC as a whole, this can describe by noting it was a “system-wide” valuation.
2. **Extent** refers to the size of the ecosystem producing the ecosystem service being valued, which is a spatial area measurement (e.g., number of hectares). This is either reported by each ecosystem type, or if the valuation was done for the NAC as a whole, then by the number of hectares supplying the service (i.e., the total area that produces the ecosystem service valued).
3. **Ecosystem Services** refers to the list of the ecosystem services that were valued through the ESV, from the potential base list of 38 potential ecosystem services.
4. **Ecosystem Service Category** identifies each ecosystem service listed under the category that it belongs (i.e., Provisioning, Regulating and Maintenance, Cultural, or Non-use Values).
5. **Annual Value** refers to the annual value (in current dollars) of each ecosystem service, (by each ecosystem type, when applicable) as determined through the ESV.
6. **Net Present Value** refers to the value of the assets under management (in dollars), calculated using the Net Present Value (“NPV”) method, which aggregates the expected future benefits over 100 years, using a 2% discount rate. This represents the future flow of annual ecosystem services based on the current year’s valuation and assuming a constant value over time.
7. **Total Value** sums the values for all ecosystem services provided by all the natural assets managed by the NAC. Footnotes will be provided as necessary to provide further detailed information.

### **Statement of the Quality of Underlying Assets**

The Statement of the Quality of Underlying Assets reports quantitative and qualitative information on the health and condition of the ecosystems being managed by the NAC on an annual basis. See **Appendix C** for a template of the Statement of the Quality of Underlying Assets.

The information in this Statement is separate and complementary to the values captured in the other Statements and will focus on biodiversity metrics and report in non-monetary units. Biodiversity is integral in measuring ecosystem condition, as it contributes to the composition, structure, and function of ecosystems. Areas with higher biodiversity tend to have increased ecosystem productivity, stability, and

resilience – being able to withstand and recover from natural and anthropogenic stresses over time.<sup>12</sup>

NACs will report on the Key Performance Indicators (“KPIs”) for the underlying assets under management, in both quantitative and qualitative terms as outlined below.

Components of a Statement of the Quality of Underlying Assets include:

1. **Quantitative KPIs** will measure the state of key components of biodiversity being managed by NACs, the extent of the NAC’s ecosystems, and progress towards management goals. In addition, for natural areas, ecological capacity-to-produce indicators will be required when the ESV focuses on direct use values. The Statement will outline KPIs, unit of measurement, method for measurement or data source, and notes (which provide further explanation of the KPI and how the data can be interpreted, including the rationale/justification for selection of a particular metric and expected directional change over time). Quantitative KPIs for natural, working, and hybrid areas are included below. Further guidance on how to measure several of these indicators is provided in the section “Steps to conduct an ESV.”
2. **A Qualitative Description of the Underlying Assets** provides a descriptive account of the state and condition of the assets under management highlighting key species and habitats. It will describe management objectives, management approach, and progress towards maintaining and improving the overall health and condition of the natural assets. It will consider aspects of ecological integrity, connectivity, or fragmentation, as well as how threats and pressures from the surrounding area are being managed. For working and hybrid areas, a descriptive account of the state of the assets along with progress towards implementing regenerative practices will be included.

Quantitative KPIs for Natural Areas:

- For species level indicators, *either* a **Species Threat Abatement and Restoration metric (“STAR”)**<sup>13</sup> score *or* **Species Richness & Abundance** counts will be reported. The specific indicators chosen will be based on what is most appropriate and feasible.
  - **STAR** is a biodiversity metric that allows the quantification of the potential contributions that species threat abatement and restoration actions offer towards reducing global extinction risk. Drawing on the IUCN Red List of Threatened Species (the most comprehensive global

<sup>12</sup> Le Provost, G., Schenk, N.V., Penone, C. et al. 2002. The supply of multiple ecosystem services requires biodiversity across spatial scales. *Nat Ecol Evol*. <https://doi.org/10.1038/s41559-022-01918-5>

<sup>13</sup> Mair et al. (2021). A metric for spatially explicit contributions to science-based species targets. *Nature Ecology & Evolution*. 5 (June 2021) 836-844. <https://doi.org/10.1038/s41559-021-01432-0>

assessment of the status of biodiversity), the metric combines data on species, the threats they face and their risk of extinction.

- **Species Richness** refers to the number of species within a given area. Species richness counts that cover multiple taxa (e.g., mammals, birds, reptiles, amphibians, plants, insects, or fish) will be reported.
  - **Species Abundance** refers to the total number of individuals of a given species in a given area. Abundance will be reported for target species. Where counts are not feasible, other measures, such as biomass and/or percentage cover, may be used.<sup>14</sup>
- **Ecosystem Capacity** – KPIs related to the ecosystem’s long-term capacity to produce ecosystem services will be required when there are direct use values within the ESV. For each direct use value (e.g., the value of current fish catch), a corresponding KPI will be required to reflect the capacity of the ecosystem to sustain that ecosystem service in the future (e.g., reproduction rate of fish or fish abundance). The direct use of some services, such as provisioning services (e.g., hunting wild animals or wild fish catch) and some cultural services (e.g., amenity value or recreational uses), if extracted unsustainably, can result in ecosystem degradation. To avoid this, this KPI will be developed to provide information on the ecological capacity to produce the ecosystem service being valued given current use levels.<sup>15</sup>
  - **Area of Ecosystems under Management** refers to the size or extent of the ecosystems being managed by a NAC. Results will reflect total area under management, disaggregated into areas by ecosystem type.
  - Where applicable, **Total Area Under Restoration** will be reported, referring to either the spatial area where restoration has been successfully completed or where restoration is currently being implemented in accordance with a restoration plan.
  - **Percentage of Natural Asset Management Objectives Met.** Each NAC will have a specific management plan that will seek to manage, grow, and/or restore its natural assets, based on the local context. Within the Management Plan, a set of targets will be prioritized and tracked through measurable indicators. This KPI will report the degree to which prioritized targets are met every year. Measurement will be based on the Management Plan objectives, targets and outcomes from the NAC’s monitoring and evaluation system, for the given reporting period.

<sup>14</sup> UN SEEA (2018) Biodiversity Accounting.  
[https://seea.un.org/sites/seea.un.org/files/seea\\_eea\\_biodiversity\\_accounting.pdf](https://seea.un.org/sites/seea.un.org/files/seea_eea_biodiversity_accounting.pdf)

<sup>15</sup> Hein L, Bagstad K, Edens B, Obst C, de Jong R, Lesschen JP (2016) Defining Ecosystem Assets for Natural Capital Accounting. *PLoS ONE* 11(11): e0164460. doi:10.1371/journal.pone.0164460

Quantitative KPIs for Working Areas:

- **Rate of Water Infiltration** is a measure of how fast water enters the soil.
- **Insect Species Richness and Abundance** where richness refers to the number of different insect species and abundance refers to the number of individuals of target insect species, in a given area.
- **Bird Species Richness and Abundance** where richness refers to the number of different bird species and abundance refers to the number of individuals of target bird species, in a given area.
- **Plant Species Richness** refers to the number of different plant species in a given area.
- **Percentage of Regenerative Management Objectives Met** – Each NAC will have a specific Regenerative Management Plan that will guide it through the transition towards a regenerative system, based on the local context. Within the Management Plan, a set of targets will be prioritized and tracked through measurable indicators. This KPI will report the degree to which prioritized targets are met every year. These will be based on the Regenerative Management Plan objectives, targets and outcomes from the NAC’s monitoring and evaluation system, for the given reporting period.

KPIs for Hybrid Areas:

The Natural Areas’ KPIs above will be reported, as well as Working Areas KPIs, if there is an agricultural component of the hybrid NAC.

## CONDUCTING ECOSYSTEM SERVICE VALUATIONS

Ecosystem service valuations (ESVs) are the foundation for determining the values of NACs. The ESV process consists of using well-established methods to calculate the monetary value of ecosystem services. These values are used in the Statements of Natural Production and Natural Assets.

The general approach for valuing ecosystem services to be used by NACs is grounded in the guidelines outlined in the SEEA EA framework<sup>16</sup> and builds on it to include a wider breadth of potential economic values and valuation approaches. The objective of the Framework is to estimate the Total Economic Value produced by the ecosystems managed within a NAC through the generation of ecosystem services.

The steps outlined below represent the required approach for conducting ESVs for NACs. These will be conducted every year (in line with the NAC’s accounting period) and provide the necessary information to report on the NAC’s ecosystem service production. The initial Year 1 valuation study is of particular importance because it will largely set the scope for the NAC, by specifying the ecosystem services to be valued

<sup>16</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting— Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>.

and general approach to be taken for their valuation. This initial valuation will set the expectations for future ESVs to ensure consistency and replicability. Every year, the analysis should use the most current data and aim to report on that year's values, which will require an annual measurement of change in the value of the assets.

The ESV study will also derive many of the KPIs on ecosystem quality and condition, which will be complementary to the values obtained in the ESV and will be used in the Statement of the Quality of Underlying Assets.

It is important that experienced experts with knowledge of the subject matter (ecosystem service valuations) and of local ecosystems be involved (including local experts). Methods should also be transparently and clearly explained, be replicable, traceable, and lend themselves for meaningful reporting on an annual basis (i.e., to report annual changes). Once systems have been established, local capacity can be built for ongoing data collection and monitoring.

### **Steps to Conduct an ESV Study for a NAC**

To obtain an economic value for the natural asset and ecosystem services produced by a given NAC, an initial Year 1 ESV study will be conducted. This study will also include the steps necessary to derive several KPIs tied to the Statement of the Quality of Underlying Assets. The following steps are described in more detail in the sections that follow:

1. Define Spatial Boundary
2. Determine Ecosystems Present, their Extent, Quality and Attributes
3. Identify Ecosystem Services and Conduct a Preliminary Assessment of their Relative Value
4. Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units
5. Assign an Economic Value to Ecosystem Services
6. Calculate the Asset Value

## Step 1. Define Spatial Boundary

The first step to conduct the ESV is to define the spatial boundary of the NAC. The initial boundary will represent the total area under NAC management. This step requires identifying clearly defined geographical boundaries, based on what a NAC can legally manage and the areas that they can commit to the NAC's charter. If areas within the NAC are excluded due to limitations in the license agreements, this should be noted. Note that a NAC can include multiple ecosystem types, land uses, and multiple sites. Primary data, remotely sensed data<sup>17</sup> and/or authoritative secondary data can be used to determine the area for this boundary. The resolution of the data and method used to estimate this extent should be stated as well as any potential sources of error in the estimation of the extent.

### OUTPUT:

- Map of the study area that will make up the NAC and its total spatial extent

## Step 2. Determine Ecosystems Present, their Extent, Quality, and Attributes

The entire spatial area of a NAC must be allocated to a relevant ecosystem type. This step identifies, characterizes, and determines the ecosystems within the NAC boundary and states their extent, quality, and other attributes of interest for ecosystem service production and ecosystem quality KPIs . This information should reflect current conditions (using the most recently available data) with the intention of giving a snapshot of the ecosystems present in the current accounting period (the most recent year that corresponds to the audited financial statements).

The spatial boundaries established in the previous step will cover one or more distinct ecosystems. In this step, the entire area is allocated to a discrete ecosystem type which can be treated as distinct spatial units for accounting purposes. To better understand the attributes of the NAC, of its ecosystems, and to aid the valuation process; ecosystem types present and their condition must be identified and described in this step.

First, ecosystems should be categorized using official ecosystem classification systems, aiming to be as granular, accurate, and precise as possible and to include local ecological knowledge on boundaries and functionality.<sup>18</sup> If local classification systems are not available, internationally recognized ecosystem typologies should be used. In addition, to aid comparisons and high-level evaluations, NACs should also use or map

<sup>17</sup> Remote sensing refers to the use of satellite or aircraft-based sensor technologies to get information on the biophysical characteristics of areas on Earth.

<sup>18</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting— Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>



onto IUCN's Global Ecosystem Typology 2.0 (Ecosystem Functional Group),<sup>19</sup> independent of the ecosystem classification used.

Geographical Information Systems (GIS) maps should be used to demonstrate the extent and configuration of each ecosystem type, such as forests, wetlands, agricultural land, and other land cover types (including water bodies). GIS maps compile information by analyzing satellite and aerial imagery as well as other remote sensed or manually acquired data. The resolution of land cover data will impact the composition of ecosystem types that is captured. A higher resolution (i.e., 100m<sup>2</sup> or more granular) should be used. For NACs with smaller areas, a resolution of at least 30m<sup>2</sup> should be used. The process of identifying ecosystem types and mapping GIS data to ecosystem types should be clearly stated, including the resolution of the data and the definitions for each ecosystem type.

In addition, ecosystems should be characterized with key descriptor attributes like their global uniqueness, proximity to populations, protected status, habitat suitability, and attributes related to ecological integrity, connectivity, or fragmentation, existing threats, and/or management regimes. This information will complement the classification and description of the ecosystems and help to structure the valuation.

The extent (or size) of each ecosystem type (e.g., forest, wetland, or cropland) should be measured. Extent is measured in terms of spatial area (e.g., hectares). If attributes of interest were identified, those should also be spatially measured and reported (e.g., hectares of protected forests). If developed lands, such as roads or residential areas, are included within the NAC's overall boundaries, their corresponding extent should also be provided. The ecosystem quality KPIs outlined below should also be scoped within this step in order to determine how these will be measured and reported, according to the Components of the Statement of the Quality of Underlying Assets.

For Natural Areas:

- For species-level biodiversity indicators, either a Species Threat Abatement and Restoration metric or Species Richness & Abundance will be scoped. The specific indicators chosen will be based on what is most appropriate and feasible.
  - STAR scores can be calculated for an area being managed by a NAC in three phases. Initially, an estimated STAR score can be calculated to determine the potential to reduce species extinction risk, based on published data from the IUCN Red List.<sup>20</sup> This value can be revised to a calibrated STAR score with on-the-ground verification of threats and species presence, establishing a baseline against which conservation management can be planned and targets set. This will then enable NACs to demonstrate in time the delivery of a realized STAR score, which takes

<sup>19</sup> Keith, D., Ferrer-Paris, J., Nicholson, E., & Kingsford, R. (2020). *IUCN Global Ecosystem Typology 2.0 Descriptive profiles for biomes and ecosystem functional groups*. International Union for Conservation of Nature and Natural Resources (IUCN). <https://portals.iucn.org/library/sites/library/files/documents/2020-037-En.pdf>

<sup>20</sup> Access to the STAR Estimated Heat-map layers is currently accessed through the Integrated Biodiversity Assessment Tool (IBAT) STAR portal (<https://www.ibat-alliance.org/star>)

into account the measurable reduction of threats generated by the NAC's management activities.<sup>21</sup>

- Species richness counts will be scoped covering multiple taxa (e.g., mammals, birds, reptiles, amphibians, plants, insects, or fish) and present a reliable and relevant representation of current local species richness.
  - Species will be selected based on abundance and the key role they play in the functioning of the local ecosystems.
  - The basis for selection of the species included in the richness count should be transparently presented. Species to include can be determined through a scientific assessment of what is relevant (based on local, regional, or global significance) and through local expert opinion. The methods employed for conducting species counts will need to be justified and an explanation provided for how the data can be interpreted.
- Species Abundance will be reported for target species. Where counts are not feasible, other measures, such as biomass and/or percentage cover, may be used.<sup>22</sup>
  - Selection of target species will be based on the key role they play in the functioning of the ecosystem and/or because they provide information on the overall condition of the ecosystem, like keystone species, indicator species, umbrella species, rare or locally endemic species, or globally threatened species.
  - Target species will be determined through a scientific assessment, local expert opinion and should be coherent with the indicators of Species Richness. The basis for the selection of target species will need to be justified and an explanation provided for how the data can be interpreted including the expected directional change over time. If some species are of greater importance, relative to others, in determining the overall condition of the ecosystem, this should be noted.

Species Richness and Abundance should be measured across ecosystems using the most appropriate field sampling methods (e.g., transect counts, acoustic recording, environmental DNA) and/or authoritative secondary data (e.g., official government data, data used for published work, recognized global data sources used by subject matter experts). When authoritative secondary data is used, validated sources should be prioritized.

<sup>21</sup> The Biodiversity Consultancy (2022). Species Threat Abatement and Restoration (STAR) A Global Metric Supporting Nature-Positive Action. IBAT. <https://www.ibat-alliance.org/pdf/star-industry-briefing-note.pdf>

<sup>22</sup> UN SEEA (2018) Biodiversity Accounting. [https://seea.un.org/sites/seea.un.org/files/seea\\_eea\\_biodiversity\\_accounting.pdf](https://seea.un.org/sites/seea.un.org/files/seea_eea_biodiversity_accounting.pdf)

For Working Areas:

- The following indicators of ecosystem quality should be scoped:
- Rate of water infiltration
- Insect species richness and abundance of target species
- Bird species richness and abundance of target species
- Plant species richness

To determine how to estimate these ecosystem quality KPIs for natural and working areas, the analyst conducting the assessment should define the boundaries of the study based on the NAC's boundaries. Next, existing information for the area of study will be reviewed. Where existing information is sufficiently current, valid, granular, and comprehensive, this information should be used to determine values for these indicators. When there is not sufficient information, the appropriate data collection methods should be used as part of Step 4 of this Framework ("Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units"). The initial Year 1 indicators may need to rely on existing authoritative data sources (e.g., IUCN's Red List of Threatened Species) and identify gaps and potential errors (including a measurement of error, if possible). Subsequent year valuations can enrich the ecosystem characterization and ecosystem quality KPIs by filling information gaps through streamlined data collection and improved monitoring methods.

Where there is GIS spatial analysis, it should be complemented with field data collection, when necessary, in order to validate the characterization of ecosystems and fill in data gaps, including field measures, validation of species presence, and interviews with locals and experts. Both the spatial analysis and the field data collection should be led by experts using the best available practices. More in-depth data collection will be conducted in Step 4. The complexities and particularities of each local context should be considered in the approach that will be adopted.

Once ecosystem characterization and ecosystem quality KPI methods are established in the initial study, local capacity can be built to continuously collect data for future ecosystem service valuations.

**OUTPUTS:**

- A section for the Technical Report outlining:
  - Definition of each ecosystem type in the NAC
  - Extent of each ecosystem type that makes up the natural assets under management
  - A report with key descriptive, geographical, and ecosystem quality-related attributes for the ecosystems identified

- Description of the approach to select and measure the ecosystem quality KPIs for the identified/categorized ecosystems within the NAC

### **Step 3. Identify Ecosystem Services and Conduct a Preliminary Assessment of Their Relative Value**

This step identifies the ecosystem services that are being produced in the study area. This step will involve consultation with local stakeholders and subject matter experts, as well as an initial review of the information available to determine ecosystem services that are present, those that can be valued based on data availability, and their rough scales of ecological, economic, and social importance.

The full potential scope of ecosystem services to be considered in the valuation includes 38 general categories (see **Table 2**). Although all ecosystem services being produced should be identified and an effort should be made to value all the ecosystem services identified, there may be cases when some ecosystem services are not measurable or do not have enough data available to conduct a meaningful valuation. It is also possible that a NAC's ownership or license agreement may be limited with respect to some ecosystem services, in which case these limitations must be transparently disclosed. It is expected that the ESV for a NAC includes at least six different ecosystem services categories of the 38, and that multiple regulating services are included. The intention in deriving the inventory of ecosystem services to include should be to provide a complete and diverse set of ecosystem service values and to include services that most directly reflect ecological integrity and local relevance. In particular, there should be a clear presentation of the ecosystem services that are identified, those that are quantifiable, and those that are monetizable. To maintain consistency and comparability between ecosystem types and among NACs, the Framework includes a list, adapted from the SEEA EA framework,<sup>23</sup> which should be used in the ESV study.

<sup>23</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Table 6.3, pg. 131.

**Table 2. List of Ecosystem Service Categories**

<b>ECOSYSTEM SERVICE</b>		<b>DESCRIPTION</b>
<b>PROVISIONING SERVICES</b>		
<b>1</b>	<b>CROP PROVISIONING SERVICES</b>	The ecosystem's contributions to the growth of cultivated plants that are harvested for various uses including food and fiber production, fodder, and energy.
<b>2</b>	<b>GRAZED BIOMASS PROVISIONING SERVICES</b>	The ecosystem's contributions to the growth of grazed biomass that is an input to the growth of cultivated livestock. This service excludes the ecosystem contributions to the growth of crops used to produce fodder for livestock (e.g., hay, soybean meal) as these contributions are included under crop provisioning services.
<b>3</b>	<b>LIVESTOCK PROVISIONING SERVICES</b>	The ecosystem's contributions to the growth of cultivated livestock and livestock products (e.g., meat, milk, eggs, wool, leather), that are used for various uses, primarily food production.
<b>4</b>	<b>AQUACULTURE PROVISIONING SERVICES</b>	The ecosystem's contributions to the growth of animals and plants (e.g., fish, shellfish, seaweed) in aquaculture facilities that are harvested by economic units for various uses.
<b>5</b>	<b>WOOD PROVISIONING SERVICES</b>	The ecosystem's contributions to the growth of trees and other woody biomass in both cultivated (plantation) and uncultivated production contexts that are harvested for various uses including timber production and energy. This service excludes contributions to non-wood forest products.

<b>6</b>	<b>WILD FISH AND OTHER NATURAL AQUATIC PRODUCTS</b>	The ecosystem's contributions to the growth of fish and other aquatic biomass that are captured in uncultivated production contexts by economic units for various uses, primarily food production.
<b>7</b>	<b>WILD ANIMALS, PLANTS AND OTHER BIOMASS</b>	The ecosystem's contributions to the growth of wild animals, plants and other biomass that are captured and harvested in uncultivated production contexts for various uses. The scope includes non-wood forest products (NWFP) and services related to hunting, trapping and bio-prospecting activities; but excludes wild fish and other natural aquatic biomass (included in previous class).
<b>8</b>	<b>GENETIC MATERIAL SERVICES</b>	The ecosystem's contributions from all biota (including seed, spore, or gamete production) that are used by economic units, for example (i) to develop new animal and plant breeds; (ii) in gene synthesis; or (iii) in product development directly using genetic material.
<b>9</b>	<b>WATER SUPPLY</b>	Water supply services reflect the combined ecosystem contributions of water flow regulation, water purification, and other ecosystem services to the supply of water of appropriate quality to users for various uses including household consumption.
<b>10</b>	<b>ORNAMENTAL RESOURCES</b>	The ecosystem's contribution to the provisioning of resources for clothing, jewelry, handicraft, worship, and decoration.
<b>11</b>	<b>MEDICINAL RESOURCES</b>	The ecosystem's contribution to the provisioning of traditional medicines, pharmaceuticals, and assay organisms.
<b>REGULATING AND MAINTENANCE SERVICES</b>		
<b>12</b>	<b>GLOBAL CLIMATE REGULATION SERVICES</b>	The ecosystem's contributions to the regulation of the chemical composition of the atmosphere and oceans that affect global climate through the accumulation and retention of carbon and other GHG (e.g., methane) in ecosystems and the ability of ecosystems to remove (sequester) carbon from the atmosphere and retain (store) carbon in ecosystems. Carbon storage and sequestration should be reported separately, clearly indicating the temporal horizon over which they are measured.

<b>13 RAINFALL PATTERN REGULATION SERVICES (AT SUB-CONTINENTAL SCALE)</b>	The ecosystem contributions of vegetation, in particular forests, in maintaining rainfall patterns through evapotranspiration at the sub-continental scale. Forests and other vegetation recycle moisture back to the atmosphere where it is available for the generation of rainfall. Rainfall in interior parts of continents fully depends upon this recycling.
<b>14 LOCAL (MICRO AND MESO) CLIMATE REGULATION SERVICES</b>	The ecosystem's contributions to the regulation of ambient atmospheric conditions (including micro and mesoscale climates) through the presence of vegetation that improves the living conditions for people and supports economic production. Examples include the evaporative cooling provided by urban trees ('green space'), the role of urban water bodies ('blue space') and the contribution of trees in providing shade for humans and livestock.
<b>15 AIR FILTRATION SERVICES</b>	The ecosystem's contributions to the filtering of airborne pollutants through the deposition, uptake, fixing and storage of pollutants by ecosystem components, particularly plants, that mitigates the harmful effects of the pollutants.
<b>16 SOIL QUALITY REGULATION SERVICES</b>	The ecosystem's contributions to the decomposition of organic and inorganic materials and to the fertility and characteristics of soils, e.g., for input to biomass production.
<b>17 SOIL EROSION CONTROL SERVICES</b>	Soil erosion control services are the ecosystem contributions, particularly the stabilizing effects of vegetation, that reduce the loss of soil (and sediment) and support use of the environment (e.g., agricultural activity, water supply).
<b>18 LANDSLIDE MITIGATION</b>	Landslide mitigation services are the ecosystem contributions, particularly the stabilizing effects of vegetation, that mitigates or prevents potential damage to human health and safety and damaging effects to buildings and infrastructure that arise from the mass movement (wasting) of soil, rock, and snow.

<b>19 SOLID WASTE REMEDIATION</b>	Solid waste remediation services are the ecosystem contributions to the transformation of organic or inorganic substances, through the action of microorganisms, algae, plants, and animals that mitigates their harmful effects.
<b>20 WATER PURIFICATION SERVICES (WATER QUALITY AMELIORATION)</b>	Water purification services are the ecosystem contributions to the restoration and maintenance of the chemical condition of surface water and groundwater bodies through the breakdown or removal of nutrients and other pollutants by ecosystem components that mitigate the harmful effects of the pollutants on human use or health.
<b>21 BASELINE WATER FLOW MAINTENANCE SERVICES</b>	Water regulation services are the ecosystem contributions to the regulation of river flows and groundwater and lake water tables. They are derived from the ability of ecosystems to absorb and store water, and gradually release water during dry seasons or periods through evapotranspiration and hence secure a regular flow of water.
<b>22 PEAK WATER FLOW MITIGATION SERVICES</b>	Water regulation services are the ecosystem contributions to the regulation of river flows and groundwater and lake water tables. They are derived from the ability of ecosystems to absorb and store water, and hence mitigate the effects of flood and other extreme water-related events. Peak flow mitigation services will be supplied together with river flood mitigation services in providing the benefit of flood protection.
<b>23 COASTAL PROTECTION SERVICES</b>	Coastal protection services are the ecosystem contributions of linear elements in the seascape, for instance coral reefs, sandbanks, dunes, or mangrove ecosystems along the shore, in protecting the shore and thus mitigating the impacts of tidal surges or storms on local communities.
<b>24 RIVER FLOOD MITIGATION SERVICES</b>	River flood mitigation services are the ecosystem contributions of riparian vegetation which provides structure and a physical barrier to high water levels and thus mitigates the impacts of floods on local communities. River flood mitigation services will be supplied together with peak flow mitigation services in providing the benefit of flood protection.



<b>25</b>	<b>STORM MITIGATION SERVICES</b>	Storm mitigation services are the ecosystem contributions of vegetation including linear elements, in mitigating the impacts of wind, sand and other storms (other than water related events) on local communities.
<b>26</b>	<b>NOISE ATTENUATION SERVICES</b>	Noise attenuation services are the ecosystem contributions to the reduction in the impact of noise on people that mitigates its harmful or stressful effects.
<b>27</b>	<b>POLLINATION SERVICES</b>	Pollination services are the ecosystem contributions by wild pollinators to the fertilization of crops that maintains or increases the abundance and/or diversity of other species that economic units use or enjoy.
<b>28</b>	<b>SEED DISPERSAL SERVICES</b>	The ecosystem's contribution by seed dispersal species that maintains or increases the abundance and/or diversity of plant species that economic units use or enjoy.
<b>29</b>	<b>PEST CONTROL SERVICES</b>	Biological control services are the ecosystem contributions to the reduction in the incidence of species that may prevent or reduce the effects of pests on biomass production processes or other economic and human activity.
<b>30</b>	<b>DISEASE CONTROL SERVICES</b>	Disease control services are the ecosystem contributions to the reduction in the incidence of species that may prevent or reduce the effects of species on human health.
<b>31</b>	<b>NURSERY POPULATION MAINTENANCE SERVICES</b>	The ecosystem contributions necessary for sustaining populations of species that economic units ultimately use or enjoy either through the maintenance of habitats (e.g., for nurseries or migration) or the protection of natural gene pools.
<b>32</b>	<b>SOIL FORMATION SERVICES</b>	The ecosystem's contribution to the creation of soils for agricultural and ecosystems structural integrity.
<b>33</b>	<b>HABITAT SUPPORT SERVICES</b>	The ecosystem's contribution to the formation and maintenance of ecosystem health, genetic and biological diversity; promoting growth of valued species.

## CULTURAL SERVICES

- |           |   |  |
|-----------|---|--|
| <b>34</b> | <b>RECREATION-RELATED SERVICES</b>                  | The ecosystem contributions through the biophysical characteristics and qualities of ecosystems that enable people to use and enjoy the environment through direct, in-situ, physical and experiential interactions with the environment. This includes services to both locals and non-locals (i.e., visitors, including tourists). Recreation-related services may also be supplied to those undertaking recreational fishing and hunting. |
| <b>35</b> | <b>VISUAL AMENITY SERVICES</b>                      | The ecosystem contributions to local living conditions through the biophysical characteristics and qualities of ecosystems that provide sensory benefits, especially visual. This service is often valued through the added value to real estate property and/or combines with other ecosystem services, including recreation-related services and noise attenuation services to underpin amenity values.                                    |
| <b>36</b> | <b>EDUCATION, SCIENTIFIC, AND RESEARCH SERVICES</b> | The ecosystem contributions through the biophysical characteristics and qualities of ecosystems, that enable people to use the environment through intellectual interactions with the environment.   |
| <b>37</b> | <b>SPIRITUAL, ARTISTIC, AND SYMBOLIC SERVICES</b>   | The ecosystem contributions through the biophysical characteristics and qualities of ecosystems, that are recognized by people for their cultural, historical, aesthetic, sacred or religious significance. These services may underpin people's cultural identity and may inspire people to express themselves through various artistic media.  |

## FLOW OF NON-USE VALUES

- |           |   |   |
|-----------|---|---|
| <b>38</b> | <b>ECOSYSTEM AND SPECIES APPRECIATION/EXISTENCE/BEQUEST</b> | Ecosystem and species appreciation concerns the wellbeing that people derive from the existence and preservation of the environment for current and future generations, irrespective of any direct or indirect use. |
|-----------|---|---|

To identify ecosystem services that are present, the first task is to conduct a preliminary desktop value assessment of the ecosystem services commonly produced by the ecosystems within the NAC. A desktop assessment entails the use of existing data to identify the types of ecosystem services that could be produced by the ecosystems present and their relative value. A benefit transfer exercise can be used for this task to determine what ecosystem services may be present in the area and the economic values that other studies have assigned to these ecosystem services. Alternatively, or in addition, basic configurations for tools such as INVEST<sup>24</sup> and/or ARIES<sup>25</sup> can be used to determine which ecosystem services may be present and their relative importance.<sup>26</sup> Each ecosystem may produce a different bundle of ecosystem services. For example, wetlands will likely produce water purification services, provide nursery spaces for fish, and flood regulation services (among others), while silvopastoral systems will likely produce biomass for livestock, habitat for bird species, and micro-climate regulation, among others. The suite or bundle of potential ecosystem services that will be included should be as extensive as possible and must include multiple regulating services. Expert opinion and judgement and local community consultation should also be used to identify ecosystem services produced in the NAC.

Subsequently, the desktop value assessment (benefit transfer valuation and/or rapid model-based ecosystem assessment) will estimate a first, rough approximation of the value of different ecosystem services. This should be used as a guide to prioritize a more in-depth analysis of ecosystem service provision. This preliminary assessment is particularly important for the initial valuation when ecosystem services present may not be known and when data gaps may limit the ability to value all ecosystem services.

The desktop assessment should be complemented with an on-the-ground, site-based assessment to identify the most current and locally relevant ecosystem services present. This assessment will be conducted through a combination of field observations, interviews, surveys and/or focus groups with local stakeholders and experts knowledgeable of the study area. What is considered most important will vary depending on the stakeholder group providing input - as many viewpoints as possible should be included to inform the identification process. The information gathered at this stage will be recorded and used to validate and/or expand the list of ecosystem services to be valued.

If identified ecosystem services cannot be valued with primary valuation methods due to data gaps, time constraints, or analytical capacity; an expert-informed estimate, combined with a rigorous desktop analysis may be proposed to conduct the ecosystem service quantification and valuation. This can include a more refined benefit transfer exercise that can be used to estimate conservative values while better, primary data is

<sup>24</sup> Natural Capital Project, 2022. *INVEST 3.12.0.post26+ug.g230fb3d User's Guide*. Stanford University, University of Minnesota, Chinese Academy of Sciences, The Nature Conservancy, World Wildlife Fund, and Stockholm Resilience Centre.

<sup>25</sup> Villa, F., K.J. Bagstad, B. Voigt, G.W. Johnson, R. Portela, M. Honzak, and D. Batker. 2014. A methodology for adaptable and robust ecosystem services assessment. *PLoS ONE* 9(3):e91001. ARIES FOR SEEA Available at <https://aries.integratedmodelling.org/aries-for-seea-user-guide/>

<sup>26</sup> A list of selected ecosystem service modeling tools can be found In United Nations (2022). *Guidelines on Biophysical Modelling for Ecosystem Accounting*. United Nations Department of Economic and Social Affairs, Statistics Division, New York. Available at: <https://seea.un.org/content/supplemental-materials-and-tables-guidelines-biophysical-modelling#Table%204>

gathered (in subsequent years). Given that desktop analyses may result in more error and uncertainty, conservative values should be prioritized when adopting this approach. If a valuation is still not possible, the justification for their exclusion should be clearly stated and the ecosystem service should still be listed as present but not valued. This includes limitations due to license agreement constraints or due to risks of double counting with information captured in the company's GAAP/IFRS financial statements.

After the initial Year 1 valuation is conducted, subsequent valuations should include the list of ecosystem services valued the previous years and start by validating their relative values and continued importance and existence, at this step. If additional ecosystem services are identified (i.e., they were previously unknown or not legally available for inclusion at the time of the initial valuation) and these are deemed material and suitable for inclusion in the ESV, these must be added to the list of ecosystem services for valuation that year.

#### **OUTPUTS:**

- List of ecosystem services identified as present in the NAC
- An initial gap assessment that identifies ecosystem services that cannot be measured, included, and/or valued the current year, including the reason for their exclusion
- Subset of ecosystem services prioritized for valuation
- Subset of ecosystem services where a desktop-based study can be used to estimate an approximate value
- Expected value ranges or relative importance based on a desktop assessment and consultation with local stakeholders and experts used to guide the ESV study

#### **Step 4. Measure Ecosystem Services and Ecosystem Quality KPIs in Biophysical Units**

Once both the ecosystems and ecosystem services produced by the NAC have been identified and determined to be within the scope of the NAC's license agreement, a study will be conducted to quantify the biophysical amount of ecosystem services produced using measurable units relevant to each ecosystem service (e.g., amount of carbon sequestered and stored; tons of biomass produced; or rate of pollination). In addition, the ecosystem quality KPIs will be measured, refined, and/or analyzed, as needed, based on the data gaps and field measurement needs identified in Step 2.

For ecosystem services, measurement at this stage focuses on the supply of the ecosystem service being valued. In particular, this step requires a biophysical analysis of the production and flow of ecosystem services. A combination of existing data for the region, direct measurement, indirect measurements, and modelling using ecosystem assessment tools should be utilized for ecosystem service measurement. The following steps outline the expectations for biophysical measurement of ecosystem services:

### 1. Determine the method of measurement, metrics, and tools to be used

Measuring the biophysical quantity of the ecosystem service production requires understanding the dynamics and processes that produce ecosystem services, translating this understanding into mathematical functions or models, and collecting good quality data from the site being studied in order to populate the models. This is the core objective of this step.

When possible, both the actual flow valued in the ESV and the capacity of the ecosystem to produce the service should be measured. Information on the ecosystem service flow will be needed to derive the economic value of that service. Information on the capacity to produce may be used to refine the valuation or as a complementary indicator of sustainability when direct use values of provisioning ecosystem services as well as certain cultural ones (e.g., recreation, amenity value) are included in the ESV.<sup>27</sup> For example, fish catch is a measure that may be used to report the use value of wild fish. However, the current reproductive rate of said fish species is a measure of the capacity to produce that service that complements this ESV and that can be reported as a KPI to better interpret the economic value of fish catch, as a provisioning service. Thus, when direct use values for ecosystem services are included, an indicator on the capacity to produce should be included as an indicator of ecosystem quality or as a description of the condition of the ecosystem, in relation to that service. In some cases, information on biophysical capacity can also be used to derive an option value in Step 5.

When measuring the physical flow of ecosystem services, one must determine what would be provided in the absence of the ecosystem in its current state. Therefore, the measurement should reflect the total amount of ecosystem service produced every year (e.g., the total amount of fish produced and/or caught every year). This is different from measuring the change in the flow associated with a particular action, or its marginal value.<sup>28</sup> For purposes of valuing natural assets, it is recommended that the valuation is established relative to a counterfactual baseline where there would be nothing provided (e.g., a value of zero). When a value of zero is difficult to establish, the baseline can be modeled as if the ecosystem was barren land. The baseline assumption should be clearly stated in each instance. Overall, the measurement of the ecosystem flow will reflect the full amount of the ecosystem services provided every year (the accounting period).

To ensure that biophysical processes are well understood, it is recommended that a NAC engage subject matter experts on each service (e.g., hydrologists for water services, agro-ecologists for biomass production and pollination, fisheries experts) in order to set up appropriate measurement methods and identify indicators and data that best describes ecosystem service production. **Table 3** below provides general recommendations on measurement methods. Also, some tools have already developed systematized methods (functions or models) to measure the production of ecosystem services which can be used in this step. SEEA's Guidance for Biophysical Modelling

<sup>27</sup> Hein L, Bagstad K, Edens B, Obst C, de Jong R, Lesschen JP (2016). Defining Ecosystem Assets for Natural Capital Accounting. *PLoS ONE* 11(11): e0164460. <https://doi.org/10.1371/journal.pone.0164460>

<sup>28</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting— Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

identifies models suitable for different ecosystem services.<sup>29</sup> For example, the INVEST<sup>30</sup> and ARIES<sup>31</sup> tools model several ecosystem services included in the list of IEG's ecosystem services. These models identify critical biophysical parameters that determine ecosystem service provision, the expected relationship between these parameters, and outline data needs. Locally relevant models can also be built by the analyst conducting the valuation. The most reliable measurement methods should be chosen based on the data available, the need to conduct annual reports, and the objective of capturing as much of the ecosystem's Total Economic Value as possible.

Once tools and models have been identified and set up, measurement should become a more streamlined process for reporting in the years following the initial valuation. Since consistency with previous years' valuations should be maintained when measuring ecosystem services, subsequent analyses will be expected to adhere to previous methods and focus on updating data sources to reflect annual changes, as possible.

To ensure transparency in measurement approach and methods, it is required that a conceptual model is provided, outlining the main factors or components of the ecosystem considered, their modelled relationships, direction of flow (between ecosystem components and structures, external factors, and potential users), outputs and underlying assumptions for the derivation of ecosystem service values.

<sup>29</sup> United Nations (2022). *Guidelines on Biophysical Modelling for Ecosystem Accounting*. United Nations Department of Economic and Social Affairs, Statistics Division, New York.

<sup>30</sup> Natural Capital Project, 2022. *InVEST 3.12.0.post26+ug.g230fb3d User's Guide*. Stanford University, University of Minnesota, Chinese Academy of Sciences, The Nature Conservancy, World Wildlife Fund, and Stockholm Resilience Centre.

<sup>31</sup> Villa, F., K.J. Bagstad, B. Voigt, G.W. Johnson, R. Portela, M. Honzak, and D. Batker. 2014. A methodology for adaptable and robust ecosystem services assessment. *PLoS ONE* 9(3):e91001. ARIES FOR SEEA Available at: <https://aries.integratedmodelling.org/aries-for-seea-user-guide/>

**Table 3. Recommended Measurement Methods by Ecosystem Service Categories**

<b>ECOSYSTEM SERVICE CATEGORY</b>	<b>RECOMMENDED MEASUREMENT METHOD(S)</b>
<b>PROVISIONING SERVICES</b>	<p>Measurement should be done in terms of the physical flows or outputs that are produced by ecosystems (e.g., total weight of fish caught). These realized flows should be complemented with information on the capacity to produce the ecosystem service in order to verify the sustainability of ecosystem service use and any impact on the condition of the ecosystem supplying the service (e.g., fish stock or fish growth rates assessed for the species).</p>
<b>REGULATING AND MAINTENANCE SERVICES</b>	<p>Regulating services are often measured through the functions or processes performed and therefore require careful characterization of the structural and dynamic factors that allow the ecosystem to function. A conceptual model that outlines the relationships, direction of flow, and underlying assumptions must be presented.</p> <p>Soil, air, and water quality changes should be measured in terms of concentrations at a given site and enabled by the ecosystems being studied. These should be presented in units compatible with the valuation method (e.g., yearly averages). Pollination can be measured as the rate of pollination and/or number of pollinators. Flood regulation may require data on expected storms and their intensity and a measure of the characteristics of the ecosystem providing the service (e.g., vegetation density).</p> <p>Most regulating services will require measurement at fine spatial scales and require some biophysical modelling (e.g., hydrological balances for water regulation or sediment transport for soil erosion and/or water quality parameters).</p> <p>Often measures may need to be translated into an index or indicator that can be used for valuation (e.g., pollutants in water quality may need to be mapped to a water quality ladder outlining measures as indicative of good, fair, or poor water quality).</p>
<b>CULTURAL SERVICES</b>	<p>The link between biophysical measurement and the realization of cultural ecosystem services is often hard to define and model. In some cases, the frequency of cultural service use directly measures the provision of the service, making the biophysical landscape implicit in the use patterns. For example, recreation</p>

services may start with directly measuring visitation to a given site as the core measurement variable of the ecosystem service. In this case, the biophysical unit may be the spatial area that provides the service.

When possible, an attempt should be made to integrate a measure of the quality and condition of the ecosystem and/or its capacity to sustain these services, in order to enrich the valuation exercise. Information from the Statements of Quality of Underlying Assets can be used to complement and enrich the characterization of the ecosystem's ecosystem service production potential.

**NON-USE VALUES** Since non-use values, and sometimes option values, are not dependent on current uses, these values can emphasize the value of biophysical production without having to equate them to their use (e.g., hectares of the ecosystem).

## 2. Collect the data for biophysical measurements

Once measurement methods have been selected and data needs have been identified, primary data (through field observations, surveys, or remote sensing) and secondary data from authoritative sources (e.g., official government data, data used for published work, recognized global data sources used by subject matter experts) should be collected. Data collection at this stage focuses on the production of the service (e.g., kilograms of fish catch relative to fish stock, rate of pollination, tons of nutrients removed), which will be used to derive an ecosystem service value.

To determine what data should be included and assure its quality, the following criteria should be followed:

- Accuracy (is the data correct?)
- Completeness (what does it cover and not cover?)
- Reliability (does it contradict trusted data sources?)
- Relevance (is the data needed for the calculations that will be applied?)
- Timeliness (how recent is it? can it be used for real-time reporting?)

Once data is identified and collected, the analysis is conducted through the chosen method and/or model. The initial study will require more time to identify data and set up measurement processes. However, given that annual reporting on ecosystem service values is required, methods and data sources should be streamlined to ensure consistency, using key indicators and data proxies that can be updated on an annual basis.



Data gaps and underlying assumptions should be clearly outlined in the method description. If data gaps exist, preventing the measurement of identified ecosystem services, an expert informed desktop analysis combined with authoritative secondary data should be used to fill value gaps. If there are gaps that cannot be filled with this approach, a transparent and clear justification for the exclusion of identified ecosystem services should be provided. In addition, ecosystem services identified but not measured and/or valued should be listed in the Footnotes of the Statement of Natural Production and the reason for their exclusion noted in the Methodological Notes column.

A measurement of error should be provided for every ecosystem service quantified and a sensitivity analysis should be conducted with a focus on the parameters of greatest uncertainty and largest influence on the results. This can also be done through the calculation of result ranges, given different assumptions or scenarios. In addition, a qualitative description of potential errors and known uncertainties should be provided.

### *3. Standardize measurement units*

The temporal and spatial dimensions of the measurement analysis must be determined and stated. Often, the biophysical units of measurement of a given ecosystem service may not be compatible with valuation frameworks due to the use of different temporal and spatial dimensions (e.g., water flow may be in volume per second, yet economic valuation may require data on average consumption per year). For this reason, data should be translated into units suitable for valuation, such as annual estimates and two-dimensional spatial units (e.g., hectares, acres, square kilometers). The exact unit will depend on the ecosystem service, data availability, and the method used for measurement. As an example, water provision could be measured in cubic meters per year while carbon sequestration is measured in tons of carbon per acre. These units will have to be translated into a common unit (e.g., per hectare per year) in order to conduct the valuation.

### Complete Measurement of KPIs

Data for the ecosystem quality KPIs determined in Step 2 that will populate the Statement of the Quality of Underlying Assets should be collected to complement, expand, or validate the selected indicators and approach outlined and scoped.

Where field measurement is possible, it should follow appropriate sampling methods and robust statistical models to be able to present a result for each indicator. If secondary, authoritative data sources are used, these should be validated, and an analysis of potential error should be included.

Data quality assurance should follow the same criteria as those established for the ecosystem service valuation, checking for accuracy, completeness, reliability, relevance, and timeliness.

Similarly, the initial Year 1 study will set up the approach and measurement processes that will be used to track and monitor each KPI in subsequent years. Therefore, methods and data sources should be streamlined to ensure consistency, transparency, and replicability on an annual basis. Data gaps and underlying assumptions should be clearly outlined in the method description. If data gaps exist, preventing the

measurement of key indicators or species, those may be proposed for inclusion in subsequent years.

If certain KPIs are deemed more critical to ensuring ecosystem functionality and/or continued resilience of the landscape, those should be identified as such. It is possible that not all KPIs are of equal importance, and some may deserve greater attention relative to others. In these cases, the study must provide this qualifying information regarding the relative importance of some KPIs versus others. Additionally, contextual information should be provided to help interpret the results and determine whether there is a desirable trend in the indicators, in terms of ensuring ecological functionality in the long run.

## **OUTPUTS:**

- Contributions to the Technical Report that include the results of the biophysical quantification of ecosystem service production, the methods used for measurement, error estimates, and conceptual models outlining the scope and logic behind the analysis of ecosystem service provision.
- Contributions to the Technical Report with the measurement values for ecosystem quality KPIs, the methods used for measurement, error estimates, data sources, and additional contextual information to support the interpretation of the values.
- A database with data collected for analysis, data sources, and workbook with measurement results standardized with clearly defined units that include spatial and temporal dimensions.

## **Step 5. Assign an Economic Value to the Ecosystem Services**

The next step is to value ecosystem services based on accepted methods and best practices within the discipline. These values will then be used in the NAC's Ecological Performance Statements.

### *1. Determine valuation method for each ecosystem service*

There are many methods for conducting ESVs as outlined in **Table 4** below, some of which are adapted from the descriptions provided in the SEEA EA Framework.<sup>32</sup>

<sup>32</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting— Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

**Table 4. Recommended Valuation Methods****DIRECT MARKET METHODS: Observable markets with direct market prices.**

Where well-functioning markets exist for ecosystem services (there is competition and minimal price distortions), prices can be used to represent the ecosystem services value. For example, fees paid to landowners for hunting leases may reflect the value placed on the ecosystem's production of habitat for recreation (hunting). Most ecosystem services are not currently provided in markets. In cases where markets exist, prices tend to underestimate the total economic value of the ecosystem service. Also, given that certain goods and services are often provided by public institutions or are highly regulated (e.g., water supply), the prices for these services will be heavily distorted and may need to be complemented or substituted with another valuation method that provides a better measure of the total economic value of the ecosystem service. If the price paid embodies other significant factors of production (e.g., inputs, labor, technology), an indirect market price method should be considered, such as residual value estimates.

**INDIRECT MARKET METHODS: Prices in related markets are used as proxies.**

**Referential markets:** In the absence of a direct market for the unique good or service, a similar marketed good or service can be used to infer the value. The good or service should be sufficiently similar. For example, in subsistence economies, prices for the same products traded in markets (e.g., fish harvest sold at nearby ports) can be used to estimate the value of the good (e.g., fish) obtained for one's own consumption.

**Residual values and resource rent methods:** If the price of a final good embodies the ecosystem service but also includes other significant factors of production (e.g., labor and technology), then these should be subtracted from the price to isolate the contribution of nature. These methods estimate a value by taking the gross value of the final marketed good to which the ecosystem service provides an input (e.g., crops) and then deducting the cost of all other inputs, including labor, produced assets, and intermediate inputs.

**Productivity or production function methods:** In this method, the ecosystem service is considered an input in the production function of a marketed good. Thus, changes in the service will lead to changes in the output of the marketed good, holding other things equal. The value of the service is determined by first estimating the marginal product (contribution) of the ecosystem service as the change in the value of production as a result of a marginal change in the supply of the ecosystem service.

Then, the marginal product is multiplied by the price of the marketed good to derive a marginal value product for the ecosystem services. Third, this marginal value product is multiplied by the physical quantity of the provided ecosystem service to

obtain the value of the ecosystem service. It is often used to estimate the value of water supply or pollination to agriculture.<sup>33</sup>

**REVEALED PREFERENCE METHODS: Uses consumer purchasing decisions and/or observed behavior to infer values for ecosystem services.**

**Hedonic price valuations:** This method estimates the differential premium on property values or rental values (or other composite goods) that arises from the effect of an ecosystem characteristic (e.g., clean air, local parks) on those values. This method is commonly used to measure the amenity services provided to residents in particular locations. In order to obtain a measure of this effect, all other characteristics of the property (including size, number of rooms, central heating, garage space, etc.) are standardized and need to be included in the analysis. Consideration should also be given to the geographical, neighborhood and ecosystem characteristics of the properties.

**Averting behavior:** This method uses expenditures or observed behavior to prevent or mitigate a negative effect of an environmental impact. These expenditures (including time spent) are used to represent the value of the ecosystem service. Examples of this include extra expenditures to improve water quality or air quality.

**Travel cost:** This method is commonly used to value the recreational value of a given site. The cost of travel and opportunity cost of visitors' time to a given recreational or cultural site is collected and used to build a demand curve to infer the implicit price of the ecosystem service (e.g., recreation). The area under the demand curve provides a measure of the willingness to pay (measured through the expenditures and time spent of different visitors) to visit the site. The method is similar to the estimation of a demand curve based on the quantity demanded at different prices.

**COST-BASED METHODS: The cost of damages that would be incurred by communities in the absence of ecosystem services.**

**Replacement costs:** Estimates the cost of replacing the ecosystem service through something that provides the same contribution to benefits. It is also known as the substitute cost or alternative cost approach. The substitutes can be either a consumption item (e.g., an air filtration unit for a household substituting for air filtration services of trees) or an input factor (e.g., sorghum substituting for non-priced forage in the case of a rangeland grazing ecosystem services) or a capital factor (e.g., water treatment plant). In all cases, if the substitute provides an identical contribution, the price of the ecosystem service is the cost of using the

<sup>33</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

substitute to provide the same benefits as provided by a single quantity unit of the ecosystem service (e.g., price for a ton of forage).

**Avoided costs:** The cost of damages that would be incurred by communities in the absence of ecosystem services. Often, expected damage functions are built based on historical data of damages associated with different levels of ecosystem service provision. This method is often used to estimate storm protection benefits provided by natural areas (such as wetlands). Historical data for storm damages can be regressed depending on wetland extent, controlling for factors such as storm intensity, population density, and exposure factors.

**Mitigation or restoration costs:** The costs of recovering from and preventing further damages due to ecosystem degradation. This valuation method is common in legal settings, and it is used for the purpose of making the public whole again following an environmental damage.

**STATED PREFERENCE METHODS:** Often used in marketing studies, these methods are based on rigorous surveys asking respondents their willingness to pay or willingness to accept payment for the provision of different levels of ecosystem services. These are often used to estimate consumer surplus and non-use values.

**Contingent valuation:** Survey-based stated preference technique that elicits people's behavior in constructed markets. In a contingent valuation questionnaire, a hypothetical market is described where the good/service in question can be traded.

This contingent market defines the good itself, the institutional context in which it would be provided, and the way it would be financed. Respondents are asked about their willingness to pay for, or willingness to accept, a hypothetical change in the level of provision of the good, usually by asking them if they would accept a particular scenario. Respondents are assumed to behave as though they were in a real market.

**Choice modelling or conjoint analysis:** Surveys that isolate levels of the environmental good or service in order to build a valuation function based on multiple data points collected in different contexts presented in the survey. An individual is offered a set of alternative levels of supply of goods or services, in which the characteristics vary according to defined dimensions of quality and cost. By analyzing preferences across these different bundles of characteristics, it is possible to obtain the value placed by the individuals on each of the characteristics, provided: (i) the bundles include a cost variable; and (ii) a baseline bundle is included that represents the status quo.

**BENEFIT TRANSFER METHOD: The use of existing data from published valuation studies to infer the value of an ecosystem or service. This method draws on the valuation methods above and can be adopted when primary data is lacking.**

The benefit transfer method uses secondary data (i.e., published data) to estimate the value of a service at a target site. Similar to a house appraisal valuation, where “comparable sales” are used to predict the house’s current value, this method uses comparable sites to predict ecosystem service values that lack primary data. The value can be refined to adjust for specific variables that may influence its value, such as size of the asset or income effects, through a function transfer method.

The application of a given ESV method will be based on the ecosystem and ecosystem service type, the type of economic value that is believed to be most material, and the data available. For example, travel cost methods are often used to estimate the recreational value of an ecosystem since the method looks at distance travelled to get to a unique site. Hedonic valuations are often used to estimate the value obtained by homeowners from visual amenity services related to proximity to an ecosystem. The chosen method for each ecosystem service should be well-justified, researched and explained, including the type of economic value that will be targeted, key assumptions, and limitations. See **Table 5** for recommended valuation methods by ecosystem service type.

Different types of values can be estimated through different valuation methods and framings. For example, a direct market method will measure the exchange value of a good or service (the price point given current demand and supply). Stated preference methods can also measure the value obtained by consumers above the price point, or the consumer surplus obtained through the consumption of a good or service. Cost-based approaches can measure the value of producing the ecosystem service and do not necessarily integrate demand-based factors (e.g., the expected price or the consumer surplus). Value types can also be categorized according to the Total Economic Value concept. In this lens, ecosystems can also be valuable to society simply because of their existence (non-use values) or the value placed in having the option to benefit from it (option value). Values relevant to the estimation of Total Economic Value should be explored and the target values sought through the valuation should be clearly outlined as part of the method description for a NAC valuation. The objective of a NAC is to capture as much of the Total Economic Value of the natural asset as possible.

Above all, a NAC should prioritize rigor, consistency, and transparency in the methods used, value types included, and underlying assumptions to allow reviewers to interpret the values obtained and compare them through time and to other NACs. By noting whether a value is an exchange or consumer surplus value, or a market or non-market value, or whether it is a direct use, indirect use, option, or non-use value, a more accurate interpretation of the results will be enabled. Given that the objective for the ESV is to capture the Total Economic Value, transparent information on value types will help reviewers understand the completeness of the valuation and the type of value

being captured. Transparency and replicability will help to conduct subsequent valuations for future reporting.

Exchange values will often provide a conservative value in units that are comparable to market prices. These value types are recommended by SEEA's EA Framework.<sup>35</sup> More specifically, SEEA's EA Framework of method prioritization, as is stated in their guidelines, is as follows:

- Methods where the price for the ecosystem service is directly observable;
- Methods where the price for the ecosystem service is obtained from markets for similar goods and services;
- Methods where the price for the ecosystem service is embodied in a market transaction;
- Methods where the price for the ecosystem services is based on revealed expenditures (costs) for related goods and services;
- Methods where the price for the ecosystem service is based on expected expenditures or markets.

For NACs, exchange values based on market prices can be prioritized and included when there are well-functioning markets for the ecosystem service. Well-functioning markets are ones where there is competition and minimal price distortions (e.g., subsidies or price manipulations). For example, timber may have mature markets, with healthy competition, and hence prices serve as an indicator of timber direct use values. Because most ecosystem services do not have markets, other methods are often needed to capture more of the ecosystem service's Total Economic Value.

It is important to note that exchange values and/or market-based methods may result in lower value estimates by excluding some indirect benefits and/or consumer surplus values. Since the objective of a NAC is to capture Total Economic Value, including values outside markets, other methods are often needed. Particularly, when consumer surplus is believed to be high and/or there are few market interactions, a cost-based and/or willingness-to-pay approach should be considered to complement or conduct the valuation. Also, if option values are identified and measurable, these should be estimated and included. When these additional valuations are conducted, they should be done transparently and clearly, pointing out the types of values being captured. Most importantly, the practitioner will have to justify the decision to adopt a given valuation method based on what seems best suited given the data available, the beneficiaries of the service, the characteristics of the market, and the completeness of the estimate. This decision will have to be explained in a Methods section of the Technical Report that will describe the ESV study.

Although the most appropriate valuation methods will depend on the local context and data available, some general recommendations are provided in **Table 5** below.

**Table 5. Recommended Ecosystem Service Valuation Approaches**

<b>ECOSYSTEM SERVICE CATEGORY</b>	<b>RECOMMENDED VALUATION METHOD(S)</b>
<b>PROVISIONING SERVICES</b>	<p>Valuation should be framed in terms of the physical flows that are harvested and/or consumed (e.g., number and weight of unprocessed fish caught). Direct market prices or indirect market prices are often used for these services. These should reflect prices when the service first enters the supply chain (harvest price rather than retail price) to avoid inclusion of other factors of production.</p> <p>If the price of the good includes other significant inputs (e.g., labor and other costs of production), an indirect market price method, such as residual values or production function methods, should be considered.</p> <p>Methods that estimate consumer surplus should be considered when market prices leave significant value gaps and/or where the good may be significantly underpriced in the market setting.</p> <p>For example, water markets are often subsidized and heavily regulated, resulting in very low values. In these cases, other methods, such as referential markets, productivity methods, or stated preference methods should be considered.</p> <p>In subsistence economies, similar goods or service sold in market settings (referential markets) can be used as proxies.</p>
<b>REGULATING AND MAINTENANCE SERVICES</b>	<p>Regulating services are often measured through indirect market methods or cost-based methods, since they often provide inputs into the production of other ecosystem services (e.g., pollinating services are inputs into crop production) and can either be estimated through a substitute factor of production and its associated cost or through the marginal profit or cost savings that the service generates.</p> <p>In some cases, these services can be valued based on observed market transactions, such as data from payments for ecosystem services schemes or emissions trading schemes. However, there will be limits as to where these methods can be used to estimate exchange values, depending on the institutional arrangements involved or the way in which services are quantified within the</p>



schemes (e.g., often management actions are used as a proxy for quantities).<sup>34</sup>

For carbon markets, year appropriate social cost of carbon estimates accepted by the IPCC should be used (i.e., the difference between social cost and market cost). These are often based on avoided costs.

Soil, air, and water quality changes should be measured in terms of concentration levels attributed to natural ecosystems and presented as a representative yearly value. A cost-based approach to mitigate can be considered or an indirect market or revealed preference method that captures the value placed on these improvements.

### **CULTURAL SERVICES**

Appropriate valuation methods will differ greatly from one cultural service to another.

Recreational services are often valued through either travel cost estimates or stated preference methods (yielding consumer surplus estimates). These methods require the estimation of recreational days.

Visual amenities are often valued through hedonic price estimates.

Educational and scientific services may be measured through indirect markets (replacement costs, observed markets, or as factors of production).

Where appropriate, spiritual, artistic, and symbolic services can be qualified, noting that valuation will yield a small portion of the value that people place on them.

### **NON-USE VALUES**

Non-use values (bequest and existence values) should be calculated at the level of the ecosystem (e.g., a unique forest or wetland and everything it embodies) and should be reported as a separate flow of value (i.e., an ecosystem service) obtained every year.

Bequest and existence values are generally (and almost exclusively) valued through stated preference methods. Often option values can also be valued through stated preference methods.

<sup>34</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting— Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>

Once all ecosystem services that will be included have been matched to a potential valuation method, a Technical Report should be drafted to present the methods chosen, with a supporting literature review that outlines best practices on the method. The types of economic values that will be captured for each ecosystem service should be clearly indicated and be as specific as possible. For example, wild fish may be valued at an ex-vessel price and identified as such. A consumer surplus value should be described as explicitly as possible (e.g., the average willingness to pay above current prices).

There should also be a thorough review to check for potential double counting before and while conducting the valuations. Valuation estimates that are additive and complementary should be adopted to avoid double counting. If valuations are additive, their addition should be presented in a transparent manner, accompanied with a conceptual model, noting how they are additive, while noting the types of values obtained (e.g., direct, indirect, or option values relevant to a given population). When there are multiple values for the same ecosystem service and type of value, these should be presented separately to illustrate their additionality or the range of values available (e.g., they may be valued differently by different beneficiaries). Finally, if there are values with large margins of error, there should be at least one other validation method conducted to validate results.

Adding across value types for a given ecosystem service may be possible, as long as the valuations are framed to be additive at the outset. Therefore, where multiple valuations are conducted for a given service, there should be clear indication of their complementarity or overlap with respect to the object of valuation. If the potential for double counting is identified and significant, the more complete and rigorous valuation type should be prioritized and used as the final value in the Ecological Performance Statements. When two valuations are conducted for the same flow of ecosystem service for the purpose of validation, they can be presented separately but they will not be added in the total ecosystem service value column. Only the valuation that is deemed most rigorous and defensible will be used to derive a total asset value.

## 2. Conduct the Valuation

To conduct the valuation, the physical units of ecosystem services are given a dollar value. Once the measurement units are standardized in a unit suitable for valuation, the valuation method will seek to estimate the value obtained by a given set of beneficiaries. Depending on the method, additional data may be needed to reflect the beneficiaries, their willingness to pay for or accept the service, or to reflect other socio-economic, demographic, or market data that determines the value to people's wellbeing. In many cases, the biophysical measurement approach will be closely intertwined with the valuation approach (Step 4). For example, coastal flood regulation may be measured in terms of the vegetation present and its ability to reduce flood levels within exposed structures. The unit of measurement for valuation may be the cost of replacing these structures, and the model will likely integrate these parameters (costs) into the measurement method.

In general, a pilot study or test run should first be conducted to test and validate the model being used for the valuation of each ecosystem service. If a statistical model is being used, an adequate sample size should be used in order to make results representative of the target population. The statistical model should be reviewed for potential errors and tested and validated. Descriptive statistics should be provided as well as econometric results. If secondary data is being used, validation methods should be conducted.

It is important to note data gaps and the proportion of the total value that was captured in the ESV with the information available. If needed, a desktop valuation should be considered to fill data gaps. A desktop analysis is different from a desktop assessment (such as the one conducted in Step 2) by being more thorough and in-depth than the initial "assessment". If a desktop analysis is included to complement or conduct the valuation, the values should be derived in a rigorous manner, accounting for potential errors and uncertainty and include other quality assurance methods. If a benefit transfer method is adopted to fill in data gaps, it should be done in the most rigorous manner possible, and a degree of confidence should be stated. Also, a range of possible values should be stated for the benefit transfer value. It is expected that in subsequent years, benefit transfer estimates will be replaced by a primary valuation method.

Given that NACs will have to report on the value of their natural assets every year, the valuation process should be streamlined to produce consistent estimates every year. Above all, data sources should be consistent and regularly updated data should be prioritized. If some variables cannot be updated every year (e.g., replacement costs of using alternative technologies or survey-based valuations), the year when the data was collected should be noted for transparency and an informed assumption of how applicable these are for the current year should be used, with an explicit attempt to reflect current conditions. It may be that the biophysical data can be updated more frequently than the value per unit (e.g., water quality data may be more frequently measured than the willingness to pay for changes in water quality). In this case, the change in the biophysical measure can be updated and the value per unit change should be clearly noted with the date when the estimate was carried out.

### *3. Adding Ecosystem Service Flows*

The values derived for each ecosystem service will be presented as an annual flow of benefits. To calculate a value for the NAC as a total, the flow of ecosystem service values must be added. Often, valuations will first calculate a value per hectare across the landscape, which can be used to derive the value for the total extent of the natural assets. These aggregations should be transparent.

Double counting can happen when adding across categories of ecosystem services that overlap in their object of valuation. Regulating (or intermediary) services are often valued as factors of production to other provisioning or cultural services (final services). For example, soil quality improvements may be valued in terms of the contribution they provide to crop production. In such case, if crops are valued as a provisioning service in

addition to soil quality's contribution to those crops, there would be double counting. In order to avoid double counting, regulating services (and/or intermediary services) should be reviewed for potential overlap with other final goods and services included in the valuation as well as those reported in the company's GAAP/IFRS financial statements. If double counting risks are identified and found to be significant, only the more rigorous and complete valuation should be kept when adding services together.

## **OUTPUTS:**

- Contributions to the Technical Report with annual values per ecosystem service, a measurement of error per ecosystem service value or a range of values possible with the methods employed, a level of confidence for the values obtained, a clear description of the method employed, data sources, best practices followed, type of value captured, and total natural economic value for the NAC provided as annual estimates.
- Models used and data used in their original format with the purpose of aiding replication of the analysis during the review process.

## **Step 6. Calculate the Value of the Assets**

Once the annual values of the ecosystem services have been determined, these are used to calculate the underlying asset value of the NAC, as a producer of multiple ecosystem services. The Net Present Value ("NPV") of the natural assets should be calculated, using the future flow of ecosystem services generated by the assets. This is consistent with the US EPA and the SEEA EA approach, which describes NPV as follows:

"The net present value (NPV) is the value of an asset determined by estimating the stream of income expected to be earned in the future and then discounting the future income back to the present accounting period.<sup>35</sup> In ecosystem accounting, it is applied by aggregating the NPV of expected future returns for each ecosystem service supplied by an ecosystem asset."<sup>36</sup>

<sup>35</sup> United Nations (2014). *System of Environmental-Economic Accounting 2012—Central Framework*. Page 151 para. 5.110.

<sup>36</sup> United Nations et al. (2021). *System of Environmental-Economic Accounting— Ecosystem Accounting (SEEA EA)*. White cover publication, pre-edited text subject to official editing. Available at: <https://seea.un.org/ecosystem-accounting>, Page 184.

The formula for calculating NPV is:

$$NPV = \sum_{t=1}^n \frac{R_t}{(1+i)^t}$$

Where:

$R_t$  = Net cash inflow or outflow in period  $t$

$i$  = Discount rate

$t$  = Number of time periods

Assets will be valued by taking the sum of the discounted future flows of values for all the ecosystems services provided and calculating their Net Present Value. Each unique ecosystem type may be presented separately as a natural asset with its corresponding value or they may be valued as a system of interacting ecosystems that produce an overall "system-wide" value. The system will correspond to the boundaries of the NAC and the set of ecosystems within it.

There are three important considerations when calculating an NPV for natural assets:

1. the amount and/or value of future streams of benefits in comparison to the present assessment,
2. the discount rate (representing the opportunity cost of money and time preferences of the beneficiaries); and
3. the life of the asset (the length of time expected for the flow of ecosystem services to be provided).

In the context of a NAC, future streams of benefits will be estimated to be the same as they are today. This approach is recommended to maintain a consistent and transparent approach across NACs and avoid the uncertainty introduced through forecasting. If foreseeable risks or changes in future ecosystem functioning are evident and have high certainty, the analyst should recognize these and note them in the NAC's public disclosure documents filed with the SEC. For example, there may be foreseeable land cover changes due to climate change, which will imply a shifting baseline for the ESV in the future. Also, these notes may be complemented with a description of how ecosystem quality is expected to improve or ecosystem service quantity is expected to increase as a result of the proposed management objectives, and how these changes may be expected to impact ecosystem service values in the future. The expected increase in value can be included as a growth rate or yearly percentage increase within those notes, and they may be provided as a range of scenarios. For healthy

ecosystems, with high performing KPIs, an additional valuation exercise may be conducted to estimate the economic value of continued resilience. This may be done through informed projections and/or scenarios. Information on expected growth rates is not required in the Statements but NACs should consider whether it constitutes material disclosure, which should be included in their public disclosure documents filed with the SEC.

With respect to the discount rate and temporal horizon, IEG recommends the use of a 2% discount rate and that the NPV be estimated based on a 100-year lifetime for the asset. This will ensure consistency across the different valuations and NACs, and follows a standard approach often used by the SEEA EA framework to illustrate NPV calculations.<sup>39</sup>

The rationale for a low discount rate and long asset life relates to the distinct characteristics of natural assets when compared to other types of capital (like manufactured or produced capital). Natural assets are long term, productive assets. When managed effectively, natural assets can appreciate in value, by providing a consistent amount of valuable ecosystem services far into the future and through their self-regenerating capacities. Also, unlike other types of capital, natural assets often cannot be substituted and hence have a higher opportunity cost than other types of capital.

The results of the ESV NPV calculations must be recorded on the Statement of Natural Assets. These may be broken down by ecosystem type and/or presented as “system-wide” values. All calculations and variables used should be disclosed, including discount rate and asset life.

#### **OUTPUTS:**

- Net Present Value calculations for the value of the natural assets
- Contributions to the Technical Report outlining the method used to calculate asset values, the results of the calculations, and any other information considered in this section
- If applicable, notes on future threats, shifting baselines, and potential improvements in ecosystem service production and value given effective conservation management, including margins of error or ranges according to different scenarios

In summary, each of the steps to conduct an ESV will generate a set of outputs and reports which will be compiled into a single Technical Report that documents the final process, methods, and findings for all the required outputs of the ESV study. Although the ESV steps are iterative and complementary, the final outputs produced at each step provide the information needed to populate the Statements of Natural Production and Natural Assets, and most of the ecosystem quality KPIs for the Statement of the Quality of Underlying Assets. Additional information to complete the Statement of the Quality of the Underlying Assets will be derived from the evaluation of the management performance of the NAC.

## APPENDIX A: TEMPLATE FOR THE STATEMENT OF NATURAL PRODUCTION (WITH FOOTNOTES)

[YEAR X] STATEMENT OF NATURAL PRODUCTION			
FLOWS OF ECOSYSTEM SERVICES	BIOPHYSICAL MEASURE		TOTAL ECONOMIC VALUE CAPTURED (\$)*
	QUANTITY	UNIT	
<b>REGULATING</b>			
Storm mitigation			
Global climate regulation			
Local (micro and meso) climate regulation			
Air filtration			
Soil quality regulation			
Soil erosion control			
Landslide mitigation			
Solid waste remediation			
Water purification (water quality amelioration)			
Baseline water flow maintenance			
Peak flow water mitigation			
Coastal protection			
River flood mitigation			
Rainfall pattern regulation (at sub-continental scale)			
Noise attenuation			
Pollination			
Seed dispersal			
Pest control			
Disease control			
Nursery population and habitat maintenance			
Soil formation services			
Habitat services			
<b>PROVISIONING</b>			
Crop			
Grazed biomass			
Livestock			
Aquaculture			
Wood			
Wild fish and other natural aquatic products			
Wild animals, plants, and other biomass (animals)			
Genetic material services			
Water supply			
Medicinal resources			
Ornamental resources			
<b>CULTURAL</b>			
Recreation-related services			
Visual amenity services			
Education, scientific, and research			
Spiritual, artistic, and symbiotic services			
<b>FLOW OF NON-USE VALUES</b>			
Ecosystem and species appreciation / existence / bequest			
<b>TOTAL VALUE</b>			

\*Ranges provided in the Footnotes SNP.



[YEAR X] FOOTNOTES TO THE STATEMENT OF NATURAL PRODUCTION																
FLOWS OF ECOSYSTEM SERVICES	ECOSYSTEM TYPE*	ECOSYSTEM EXTENT (HA)**	BIOPHYSICAL MEASURE			VALUATION 1					VALUATION 2					TOTAL ECONOMIC VALUE (\$)
			QUANTITY	UNIT	METHODOLOGICAL NOTES	TYPE OF VALUE 1	VALUE PER UNIT (\$/UNIT)	VALUE 1 (\$)	RANGE OR CONFIDENCE INTERVAL	METHODOLOGICAL NOTES	TYPE OF VALUE 2	VALUE PER UNIT (\$/UNIT)	VALUE 2 (\$)	RANGE OR CONFIDENCE INTERVAL	METHODOLOGICAL NOTES	
<b>REGULATING</b>																
Storm mitigation																
Global climate regulation																
Local (micro and meso) climate regulation																
Air filtration																
Soil quality regulation																
Soil erosion control																
Landslide mitigation																
Solid waste remediation																
Water purification (water quality amelioration)																
Baseline water flow maintenance																
Peak flow water mitigation																
Coastal protection																
River flood mitigation																
Rainfall pattern regulation (at sub-continental scale)																
Noise attenuation																
Pollination																
Seed dispersal																
Pest control																
Disease control																
Soil formation services																
Nursery population and habitat maintenance																
<b>PROVISIONING</b>																
Crop																
Grazed biomass																
Livestock																
Aquaculture																
Wood																
Wild fish and other natural aquatic products																
Wild animals, plants, and other biomass																
Genetic material services																
Water supply																
Medicinal resources																
Ornamental resources																
<b>CULTURAL</b>																
Recreation-related services																
Visual amenity services																
Education, scientific and research																
Spiritual, artistic, and symbiotic services																
<b>FLOW OF NON-USE VALUES</b>																
Ecosystem and species appreciation / existence / bequest																
<b>TOTAL VALUE</b>																

\*When applicable.  
 \*\*If not differentiated by ecosystem type, then include the size of the provisioning area.

## APPENDIX B: TEMPLATE FOR THE STATEMENT OF NATURAL ASSETS

[YEAR X] STATEMENT OF NATURAL ASSETS					
NATURAL ASSET(S)	EXTENT	ECOSYSTEM SERVICE CATEGORY	ECOSYSTEM SERVICES	ANNUAL VALUE (\$)	NET PRESENT VALUE (\$)
Ecosystem Type A					
		<b>SUBTOTAL</b>			
Ecosystem Type B					
		<b>SUBTOTAL</b>			
System-wide					
		<b>SUBTOTAL</b>			
<b>TOTAL VALUE</b>					

# APPENDIX C: TEMPLATE FOR THE STATEMENT OF THE QUALITY OF UNDERLYING ASSETS

[YEAR X] STATEMENT OF THE QUALITY OF UNDERLYING ASSETS			
KPI	MEASUREMENT (UNITS)	METHODS/SOURCES	NOTES
<b>NATURAL AREAS</b>			
<i>Species Threat Abatement and Restoration Metric (STAR)</i>			
STAR Score			
<i>Species Richness</i>			
Total species richness for X groups			
Group A			
Group B			
Group C			
<i>Abundance of Target Species</i>			
Species A			
Species B			
Species C			
<i>Ecosystem Capacity to produce ecosystem services</i>			
Ecosystem Service A			
Ecosystem Service B			
Ecosystem Service C			
<i>Area of Ecosystems under Management</i>			
Total			
Ecosystem A			
Ecosystem B			
Ecosystem C			
<i>Total Area Under Restoration</i>			
<i>% of Natural Asset Management Objectives Met</i>			
<b>WORKING AREAS</b>			
<i>Rate of Water Infiltration</i>			
<i>Insect Species Richness</i>			
<i>Insect Species Abundance</i>			
<i>Bird Species Richness</i>			
<i>Bird Species Abundance</i>			
<i>Plant Species Richness</i>			
<i>% of Regenerative Management Objectives Met</i>			
<b>QUALITATIVE DESCRIPTION OF THE UNDERLYING ASSETS</b>			

Added text underlined;  
Deleted text in [brackets]

NYSE Listed Company Manual

\* \* \* \* \*

#### SECTION 102.09 Natural Asset Companies

For purposes of this Section 102.09, a Natural Asset Company (“NAC”) is a corporation whose purpose is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services,\* and whose value is based on those natural assets and ecosystem services. Additionally, a NAC may use its funds to support community well-being, provided that such uses do not cause any material adverse impact to the natural assets under its control.

A NAC operates by obtaining a license or other legal right that grants it ecological performance rights\*\* for a designated geographic area or by owning such ecological performance rights. To the extent not owned by the NAC itself, these rights are granted to a NAC from a natural asset owner as provided through a license or other legal instrument.

\* The term “ecosystem services” refers to the benefits people derive from ecosystems, many of which are provided outside market settings. These include the direct and indirect contributions from nature to economies and people’s wellbeing. Examples of ecosystem services include clean air, water supply, flood protection, productive soils for agriculture, climate stability, and habitat for wildlife.

\*\* “Ecological Performance Rights” means the rights to the ecological performance (the value of natural assets and production of ecosystem services) of a designated area and includes the authority to manage the area. These rights are granted to a NAC, from a natural asset owner, as provided through a license or other legal instrument.

To qualify for listing as a NAC, an applicant issuer must meet the following requirements:

#### **(A) Quantitative Requirements**

The issuer must meet the quantitative requirements for initial listing equity listings set forth in Sections 102.01(A), (B) and (C).

#### **(B) Required Charter Provisions**

As a condition to initial listing, the NYSE proposes to require a NAC’s organizational documents to state the following:

(i) The purpose of the company is to actively manage, maintain, restore (as applicable), and grow the value of natural assets and their production of ecosystem services, with the objective of maximizing ecological performance. The NAC may also engage in other activities that do not cause any material adverse impact to the natural assets for which it is responsible, including: (a) supporting community well-being; and (b) engaging in sustainable commercial activities.

(ii) NAC funds (including any proceeds from the sale of the company's securities at any time) must be used primarily to meet the NAC's operational needs to meet its responsibilities with respect to the natural assets under its control and to provide for the long-term capital needs of the NAC in fulfilling that purpose. In addition, provided that any such uses do not cause any material adverse impact to the natural assets for which the NAC is responsible, funds may be used to support community well-being.

(iii) The NAC will be prohibited from engaging directly in unsustainable extractive activities (including, but not limited to, traditional fossil fuel development, mining, unsustainable logging, or perpetuating industrial agriculture) or using its funds to finance such activities.

If any of the foregoing provisions of the NAC's organizational documents are eliminated or materially amended in a manner that is inconsistent with their required form at any time, the NAC will be subject to delisting from the NYSE.

### **(C) NAC Policies**

A NAC seeking to list on the NYSE must adopt the following written policies and post them on its website by the earlier of the date that the NAC's initial public offering closes or five business days following the NAC's initial listing date:

(i) An Environmental and Social Policy that articulates the objectives and principles that will guide the NAC to achieve sound environmental and social performance. Such policy must include requirements to conduct a process of environmental and social assessment, and establish, as soon as practicable after listing, an Environmental and Social Management System ("ESMS"). The ESMS should be designed to:

- (a) identify and assess environmental and social risks and impacts,
- (b) identify measures to avoid, minimize and mitigate the negative risks and impacts, and
- (c) promote improved environmental and social performance.

(ii) A Biodiversity Policy that articulates a commitment to achieving no net loss, and where possible a net positive impact on biodiversity. The Biodiversity Policy should be based on the mitigation hierarchy, a planning and management approach for addressing impacts to biodiversity and ecosystem services through avoidance, minimization, restoration, and offsetting.

(iii) A Human Rights Policy that articulates a commitment to human rights, consistent with the United Nations Guiding Principles on Business and Human Rights, including a commitment to recognize and respect people's rights in accordance with customary, national, and international human rights laws, in particular those of indigenous peoples.

(iv) An Equitable Benefit Sharing Policy (as described in detail below) that articulates the NAC's commitment for sharing benefits with local communities. In any case where a NAC enters into a license agreement with a natural asset owner (e.g., a governmental entity or private landowner, rather than direct ownership by the NAC) with respect to the ecological performance rights of a designated area, such licensor must also be subject to the applicable provisions of the Equitable Benefit Sharing Policy.

**(D) Equitable Benefit Sharing**

(i) A NAC must adopt prior to listing an Equitable Benefit Sharing Policy that articulates the NAC's commitment to sharing benefits with local communities. The NAC must post the Equitable Benefit Sharing policy on its website by the earlier of the date that the NAC's initial public offering closes or five business days following the NAC's initial listing date.

(ii) In any case where a NAC enters into a license agreement with a natural asset owner (e.g., a governmental entity or private landowner, rather than direct ownership by the NAC) with respect to the ecological performance rights of a designated area, such licensor must also be subject to the applicable provisions of the Equitable Benefit Sharing Policy and the NAC must include in its license agreement with the licensor a provision requiring the licensor to comply with the applicable terms of the Equitable Benefit Sharing Policy.

(iii) The Equitable Benefit Sharing Policy must require an equitable benefit sharing arrangement for the distribution of shares of the NAC's common stock to local communities (i.e., those who have direct ties to and derive livelihood or cultural values from the applicable area). The NAC common stock distribution must be completed no later than the time of closing of the NAC's initial public offering. The Equitable Benefit Sharing Policy must set forth the following share distribution requirements at a minimum:

- If the NAC has entered into a license agreement with respect to public lands, shares representing at least 50% of the shares of the NAC's outstanding shares as of the closing of the IPO must be distributed to local communities.
- If the NAC owns the land or has entered into a license agreement with respect to private lands, shares representing at least 5% of the shares of the NAC outstanding as of the closing of the IPO must be distributed to local communities.

The foregoing distributions of shares of common stock may be placed in a trust or equivalent structure, for the benefit of the intended beneficiaries. Any trust (or equivalent) holding shares of the NAC for this purpose must be under the majority control of trustees that are fully independent of both the NAC and, where applicable, the licensor, and/or be representative of the intended beneficiaries.

(iv) The Equitable Benefit Sharing Policy must provide that the NAC will (a) deposit its cash and other financial assets in accounts with a bank custodian regulated by the U.S. Office of the Comptroller of the Currency (an "Authorized Bank"); and (b) where the NAC has entered into a

license agreement with a natural asset owner, include in its license agreement a provision requiring the licensor to place any shares of the NAC it owns in the custody of an Authorized Bank and deposit the proceeds from any NAC share sales by the licensor and any distributions received from the NAC in accounts with an Authorized Bank, pending the distribution of such assets in a manner consistent with the NAC's Equitable Benefit Sharing Policy.

(v) The NAC must review the adequacy of the Equitable Benefit Sharing Policy at least annually and publish on its website a detailed description of its activities under the Equitable Benefits Sharing Policy during each fiscal year no later than 90 days after the end of the first part fiscal year of the NAC's listing and each subsequent fiscal year (the "Annual EBS Report"). The Annual EBS Report must include an attestation by a public accounting firm that is registered with the Public Company Accounting Oversight Board ("PCAOB") ("EBS Independent Reviewer") regarding compliance by the NAC and, if applicable, the licensor, with the Equitable Benefits Sharing Policy during the applicable fiscal period, including a review of the accounts maintained by the NAC and the licensor at Authorized Banks.

(vi) The NAC's compliance with the requirements of its Equitable Benefits Sharing Policy must be reviewed periodically either by: (a) a committee consisting solely of directors who meet the independence requirements of Section 303A of the Manual or (b) the NAC's independent directors acting as a group. Such committee or the independent directors, as the case may be, must meet for this purpose at least annually and such meeting must include an executive session in which management does not participate and a discussion with the EBS Independent Reviewer at which management must not be present.

#### **(E) Statements of Ecological Performance**

Prior to its initial listing, the NAC must publish on its public web site and file or furnish with the SEC as part of a Form 8-K or Form 6-K, as applicable, Statements of Ecological Performance (the "Statements") covering the same fiscal period as the NAC's most recent audited financial statements filed with the SEC as of the date of listing. Instructions for the preparation of the Statements of Ecological Performance can be found at [link to nyse.com]. The Statements as published by the NAC must be reviewed by a public accounting firm that is registered with the PCAOB and is independent from the NAC and NAC licensor, if applicable, under the independence standard set forth in Rule 2-01 of Regulation S-X ("Independent Reviewer") and be accompanied by an examination report prepared by such Independent Reviewer in compliance with the PCAOB's attestation standards.

(F) Where a NAC's rights to the ecological performance of natural assets are created by a license agreement, the term of such license at the time of initial listing must be a minimum of ten years from the date of closing of the NAC's initial public offering. Any NAC whose license is terminated or materially breached by either party is subject to delisting.

#### **(G) Continued Listing Requirements**

Listed NACs are subject to all of the continued listing requirements that are applicable to operating companies listed under Chapter One hereof, unless there is a specific exception applicable to NACs included in a rule.

### 103.00 Foreign Private Issuers

The Exchange welcomes listing inquiries from foreign private issuers.

\* \* \* \* \*

### 202.06 Procedure for Public Release of Information; Trading Halts

#### (A) Immediate Release Policy

\* \* \* \* \*

Annual and quarterly earnings, dividend announcements, mergers, acquisitions, tender offers, stock splits, major management changes, and any substantive items of unusual or non-recurrent nature are examples of news items that should be handled on an immediate release basis. News of major new products, contract awards, expansion plans, and discoveries very often fall into the same category. Unfavorable news should be reported as promptly and candidly as favorable news. Reluctance or unwillingness to release a negative story or an attempt to disguise unfavorable news endangers management's reputation for integrity. Changes in accounting methods to mask such occurrences can have a similar impact.

A Natural Asset Company ("NAC") listed under Section 102.09 should handle on an immediate release basis any event (e.g., a forest fire) that is anticipated to have a material adverse effect with respect to any of the criteria included in the NAC's Statements of Ecological Performance. As soon thereafter as possible, the NAC must disclose in a Form 8-K or Form 6-K filing, as applicable, its estimates of the changes to the previously presented Statements of Ecological Performance of such event.

\* \* \* \* \*

### 303A.00 Introduction

#### **General Application**

Companies listed on the Exchange must comply with certain standards regarding corporate governance as codified in this Section 303A. Consistent with the NYSE's traditional approach, as well as the requirements of the Sarbanes-Oxley Act of 2002, certain provisions of Section 303A are applicable to some listed companies but not to others. Section 303A in its entirety applies to Natural Asset Companies listed under Section 102.09 unless an exception is explicitly available.



\* \* \* \* \*

### 303A.07 Audit Committee Additional Requirements

\* \* \* \* \*

(c) Each listed company must have an internal audit function.

*Commentary:* Listed companies must maintain an internal audit function to provide management and the audit committee with ongoing assessments of the listed company's risk management processes and system of internal control. A listed company may choose to outsource this function to a third party service provider other than its independent auditor. While Section 303A.00 permits certain categories of newly-listed companies to avail themselves of a transition period to comply with the internal audit function requirement, all listed companies must have an internal audit function in place no later than the first anniversary of the company's listing date.

*General Commentary to Section 303A.07:* To avoid any confusion, note that the audit committee functions specified in Section 303A.07 are the sole responsibility of the audit committee and may not be allocated to a different committee.

#### **(d) Additional Requirements for Natural Asset Companies**

The following are additional provisions that must be included in the audit committee charter of any Natural Asset Company ("NAC") listed under Section 102.09 hereof:

(A) That the audit committee's purpose includes assisting board oversight of (1) the integrity of the NAC's Statements, (2) the qualifications and independence of the Independent Reviewer and (3) the performance of the Independent Reviewer (as defined in Section 102.09(E)).

(B) The audit committee of the NAC must:

(i) At least annually, obtain and review a report by the Independent Reviewer describing: the Independent Reviewer's internal quality-control procedures; any material issues raised by the most recent internal quality-control review, or peer review, of the Independent Reviewer, or by any inquiry or investigation by governmental or professional authorities, within the preceding five years, respecting one or more independent audits carried out by the Independent Reviewer, and any steps taken to deal with any such issues; and (to assess the Independent Reviewer's independence) all relationships between the Independent Reviewer and the NAC. After reviewing the foregoing report and the Independent Reviewer's work throughout the year, the audit committee will be in a position to evaluate the Independent Reviewer's qualifications, performance and independence. This evaluation should include the review and evaluation of the lead partner of the Independent Reviewer. In making its evaluation, the audit committee should take into account the opinions of management and the NAC's internal auditors (or other personnel responsible for the internal audit function). In addition to assuring the

regular rotation of the lead partner responsible for the Statements Review, the audit committee should further consider whether, in order to assure continuing independence of the Independent Reviewer, there should be regular rotation of the firm undertaking the Statements Review itself. The audit committee should present its conclusions with respect to the Independent Reviewer to the full board. meet to review and discuss the NAC's annual Statements; Meetings may be telephonic if permitted under applicable corporate law; polling of audit committee members, however, is not permitted in lieu of meetings.

(ii) Meet separately, periodically, with management and the Independent Reviewer to discuss the Statements and the conduct of the Statements Review. To perform its oversight functions most effectively, the audit committee must have the benefit of separate sessions with management and the Independent Reviewer. These separate sessions may be more productive than joint sessions in surfacing issues warranting committee attention.

(iii) Review with the Independent Reviewer any problems in the conduct of their review or difficulties and management's response. The audit committee must regularly review with the Independent Reviewer any difficulties the Independent Reviewer encountered in the course of its review, including any restrictions on the scope of the Independent Reviewer's activities or on access to requested information, and any significant disagreements with management.

(iv) Set clear hiring policies for employees or former employees of the Independent Reviewer. Employees or former employees of the Independent Reviewer may be valuable additions to the NAC's management. Such individuals' familiarity with the business, and personal rapport with the employees, may be attractive qualities when filling a key opening. However, the audit committee should set hiring policies taking into account the pressures that may exist for personnel of the Independent Reviewer consciously or subconsciously seeking a job with the NAC they review.

(v) Report regularly to the board of directors with respect to the preparation of the Statements and the performance of the Independent Reviewer. The audit committee should review with the full board any issues that arise with respect to the quality or integrity of the Statements or the performance and independence

\* \* \* \* \*

The Exchange would normally give consideration to the prompt initiation of suspension and delisting procedures with respect to a security of either a domestic or non-U.S. issuer (including a Natural Asset Company) when:

802.01A. Distribution Criteria for Capital or Common Stock (including Equity Investment Tracking Stock and Natural Asset Companies).—

•Number of total stockholders (A) is less than \_\_\_\_\_400

**OR**

•Number of total stockholders (A) is less than \_\_\_\_\_1,200 and

•Average monthly trading volume is less than \_\_\_\_\_100,000 shares (for most recent 12 months)

**OR**

•Number of publicly-held shares (B) is less than \_\_\_\_\_600,000(C)

(A) The number of beneficial holders of stock held in the name of Exchange member organizations will be considered in addition to holders of record.

(B) Shares held by directors, officers, or their immediate families and other concentrated holdings of 10% or more are excluded in calculating the number of publicly-held shares.

(C) If the unit of trading is less than 100 shares, the requirement relating to the number of shares publicly held shall be reduced proportionately.

This Section 802.01A is applicable to listed Equity Investment Tracking Stocks and Natural Asset Companies.

802.01B Numerical Criteria for Capital or Common Stock (including Equity Investment Tracking Stock and Natural Asset Companies)

A company (including the issuer of an Equity Investment Tracking Stock or a Natural Asset Company) will be considered to be below compliance if its average global market capitalization over a consecutive 30 trading-day period is less than \$50,000,000 and, at the same time stockholders' equity is less than \$50,000,000.

\* \* \* \* \*

### 802.01C Price Criteria for Capital or Common Stock

A company (including a Natural Asset Company) will be considered to be below compliance standards if the average closing price of a security as reported on the consolidated tape is less than \$1.00 over a consecutive 30 trading-day period.

\* \* \* \* \*

### 802.01E SEC Annual and Quarterly Report Timely Filing Criteria; Natural Asset Company Timely Filing Criteria

#### **(A) Annual and Quarterly Report Timely Filing Criteria**

\* \* \* \* \*

#### **Notification and Cure Periods**

\* \* \* \* \*

In determining whether an Additional Cure Period after the expiration of the Initial Cure Period is appropriate, the Exchange will consider the likelihood that the Delinquent Report and all Subsequent Reports can be filed or refiled, as applicable, during the Additional Cure Period, as well as the company's general financial status, based on information provided by a variety of sources, including the company, its audit committee, its outside auditors, the staff of the SEC and any other regulatory body. The Exchange strongly encourages companies to provide ongoing disclosure on the status of the Delinquent Report and any Subsequent Reports to the market through press releases, and will also take the frequency and detail of such information into account in determining whether an Additional Cure Period is appropriate. If the Exchange determines that an Additional Cure Period is appropriate and the company fails to file the Delinquent Report and all Subsequent Reports by the end of such Additional Cure Period, suspension and delisting procedures will commence immediately in accordance with the procedures set out in Section 804.00. In no event will the Exchange continue to trade a company's securities if that company (i) has failed to cure its Filing Delinquency or (ii) is not current with all Subsequent Reports, on the date that is twelve months after the company's initial Filing Delinquency.

#### **(B) Natural Asset Company Timely Filing Criteria**

#### **Occurrence of a NAC Late Statement Delinquency**

A Natural Asset Company ("NAC") listed under Section 102.09 must publish on its public web site and file or furnish with the SEC as part of a Form 8-K or Form 6-K, as applicable, annual

Statements of Ecological Performance (“Statements”) that have been prepared consistent with the Ecological Performance Framework (the “Framework”) developed by Intrinsic Exchange Group. These Statements must be reviewed by the Independent Reviewer (as defined in Section 102.09(E)) and must be accompanied by an examination report prepared by such Independent Reviewer in compliance with the PCAOB’s attestation standards. The Statements must cover the same fiscal periods as the audited financial statements included in the NAC’s annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable. The NAC should utilize its best efforts to publish its annual Statements no later than the filing of its annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable. In the event that the annual Statements are not completed by the filing due date of the NAC’s annual report on Form 10-K, Form 20-F, or Form 40-F, as applicable, such annual Statements are required to be published no later than 180 days after the end of the fiscal year to which such annual Statements relate (the “NAC Statement Due Date” and the failure of a listed NAC to timely publish its annual Statements, a “NAC Late Statement Delinquency”). In the event that the company is unable to file its Form 10-K, Form 20-F, or Form 40-F, as applicable, by the NAC Statement Due Date, the company should not delay the publication of its Statements, but rather should publish its Statements of Ecological Performance on or before that date.

### **Notification of Delinquency**

Upon the occurrence of a NAC Late Statement Delinquency, the Exchange will promptly send written notification (the “NAC Late Statement Delinquency Notification”) to an affected NAC of the procedures set forth below. Within five days of the date of the NAC Late Statement Delinquency Notification, the company will be required to (a) contact the Exchange to discuss the status of the delinquent annual Statements (the “Delinquent NAC Statement”) and (b) issue a press release disclosing the occurrence of the NAC Late Statement Delinquency, the reason for the NAC Late Statement Delinquency, and, if known, the anticipated date such NAC Late Statement Delinquency will be cured via the publication of the Delinquent NAC Statement. If the company has not issued the required press release within five days of the date of the NAC Late Statement Delinquency Notification, the Exchange will issue a press release stating that the company has incurred a NAC Late Statement Delinquency and providing a description thereof.

### **NAC Non-Reliance Event**

In the event that a NAC concludes that its previously issued Statements should no longer be relied upon because of an error in such Statements (a “NAC Non-Reliance Event,” and the disclosure of such NAC Non-Reliance Event, a “NAC Non-Reliance Disclosure”), it will be required to comply with the NAC Late Statement Delinquency Notification procedures set forth above. If the NAC does not publish amended Statements within 60 days of the issuance of the NAC Non-Reliance Disclosure (an “Extended NAC Non-Reliance Disclosure Event” and, together with a NAC Late Statement Delinquency, a “NAC Reporting Delinquency”) for purposes of the cure periods described below a NAC Reporting Delinquency will be deemed to have occurred on the date of original issuance of the NAC Non-Reliance Disclosure. If the Exchange believes that a NAC is unlikely to publish the amended Statements within 60 days after a NAC Non-Reliance Disclosure or that the errors giving rise to such NAC Non-Reliance

Disclosure are particularly severe in nature, the Exchange may, in its sole discretion, determine earlier than 60 days that the applicable NAC has incurred a NAC Publication Delinquency as a result of such NAC Non-Reliance Disclosure.

### **Cure Periods**

In the event that a NAC concludes that its previously issued Statements should no longer be relied upon because of an error in such Statements (a “NAC Non-Reliance Event,” and the disclosure of such NAC Non-Reliance Event, a “NAC Non-Reliance Disclosure”), it will be required to comply with the NAC Late Statement Delinquency Notification procedures set forth above. If the NAC does not publish amended Statements within 60 days of the issuance of the NAC Non-Reliance Disclosure (an “Extended NAC Non-Reliance Disclosure Event” and, together with a NAC Late Statement Delinquency, a “NAC Reporting Delinquency”) for purposes of the cure periods described below a NAC Reporting Delinquency will be deemed to have occurred on the date of original issuance of the NAC Non-Reliance Disclosure. If the Exchange believes that a NAC is unlikely to publish the amended Statements within 60 days after a NAC Non-Reliance Disclosure or that the errors giving rise to such NAC Non-Reliance Disclosure are particularly severe in nature, the Exchange may, in its sole discretion, determine earlier than 60 days that the applicable NAC has incurred a NAC Publication Delinquency as a result of such NAC Non-Reliance Disclosure.

In determining whether an Additional NAC Statement Cure Period after the expiration of the Initial NAC Statement Cure Period is appropriate, the Exchange will consider the likelihood that the Delinquent NAC Statement can be filed during the Additional NAC Statement Cure Period. The Exchange strongly encourages companies to provide ongoing disclosure on the status of the Delinquent NAC Statement to the market through press releases and will also take the frequency and detail of such information into account in determining whether an Additional NAC Statement Cure Period is appropriate. If the Exchange determines that an Additional NAC Statement Cure Period is appropriate, and the company fails to publish the Delinquent NAC Statement by the end of such Additional NAC Statement Cure Period, suspension and delisting procedures will commence immediately in accordance with the procedures set out in Section 804.00. In no event will the Exchange continue to trade a NAC’s securities if that company has failed to cure its NAC Statement Delinquency on the date that is twelve months after the applicable NAC Statement Due Date.

### **(C) Filing Delinquencies and NAC Statement Delinquencies are Treated Separately**

For purposes of this Section 802.01E, NACs are also subject to the provisions with respect to Filing Delinquencies set forth in Section 802.01E(A) above. A Filing Delinquency is a separate event of noncompliance from a NAC Statement Delinquency. Consequently, a company can be deemed to have cured a Filing Delinquency while remaining noncompliant due to an ongoing NAC Statement Delinquency or vice versa.

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