Roadmap to Institutionalize Natural Capital Accounting in the Philippines

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List of Abbreviations

ADB	Asian Development Bank
ANNI	Adjusted Net National Income
ANNS	Adjusted Net National Savings
ANRES	Agriculture, Natural Resources, and Environment Staff
BFAR	Bureau of Fisheries and Aquatic Resources
BFP	Bureau of Fire Protection
BMB	Biodiversity Management Bureau
BSP	Bangko Sentral ng Pilipinas
BSWM	Bureau of Soils and Water Management
CAR	Cordillera Administrative Region
CBMS	Community-Based Management System
CCC	Climate Change Commission
CCRESS	Capturing Coral Reef and Related Ecosystem Services
CDP	Comprehensive Development Plan
CENRO	Community Environment and Natural Resources Office
CHED	Commission on Higher Education
CLUP	Comprehensive Land Use Plan
CNCH	Cleopatra's Needle Critical Habitat
COA	Commission on Audit
CPAs	Conservation Priority Areas
CPES	Compendium of Philippine Environment Statistics
CPUE	Catch Per Unit Effort
CSO	Civil Society Organization
CW	Comprehensive wealth
DA	Department of Agriculture
DAP	Development Academy of the Philippines
DAR	Department of Agrarian Reform
DBM	Department of Budget and Management
DENR	Department of Environment and Natural Resources
DHSUD	Department of Human Settlements and Urban Development

DILG	Department of the Interior and Local Government
DOE	Department of Energy
DOF	Department of Finance
DOST	Department of Science and Technology
DOT	Department of Tourism
DOTr	Department of Transportation
DPWH	Department of Public Works and Highways
DTI	Department of Trade and Industry
EAA	Ecosystem Accounting Areas
EEPSEA	Economy and Environment Program for Southeast Asia
EIA	Environmental Impact Assessment
EMB	Environmental Management Bureau
ENR	Environment and Natural Resources
ENRAD	Environment and Natural Resources Accounts Division
ENRAP	Environmental and Natural Resources Project
ENSO	El Niño–Southern Oscillation
EO	Executive Order
ERC	Energy Regulatory Commission
ERDB	Ecosystems Research and Development Bureau
FASPS	Foreign-Assisted and Special Projects Service
FLUP	Forest Land Use Plans
FMB	Forest Management Bureau
GAA	General Appropriations Act
GDP	Gross Domestic Product
GHG	greenhouse gas
GIS	Geographic Information System
GNI	Gross National Income
IACENRS	Interagency Committee on Environment and Natural Resources Statistics
IBA	Important Bird Area
ICC	Investment Coordination Committee
ICSC	Institute for Climate and Sustainable Cities
ICT	Information and Communications Technology
IFC	The International Finance Corporation
IPG	Investment Programming Group
ISO	International Organization for Standardization

KBA	Key Biodiversity Area
KISS	Knowledge and Information Systems Service
LCCAP	Local Climate Change Action Plan
LDRRMP	Local Disaster Risk Reduction and Management Plan
LGUs	Local Government Units
LLDA	Laguna Lake Development Authority
LMB	Land Management Bureau
LWUA	Local Water Utilities Administration
MEY	Maximum Economic Yield
MGB	Mines and Geosciences Bureau
MHRWS	Mount Hamiguitan Range Wildlife Sanctuary
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPSA	Mineral Production Sharing Agreement
MTPDP	Medium-Term Philippine Development Plan
MWSS	Metropolitan Waterworks and Sewerage System
NACRE	National Assessment of Coral Reef Environment
NAMRIA	National Mapping and Resource Information Authority
NAPC	National Anti-Poverty Commission
NCA	Natural Capital Accounting
NCIP	National Commission on Indigenous Peoples
NCP	Natural Capital Program
NDC	Nationally Determined Contribution
NDRRMC	National Disaster Risk Reduction and Management Council
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
NFRDI	National Fisheries Research and Development Institute
NGA	National Government Agency
NGCP	National Grid Corporation of the Philippines
NGO	Non-Governmental Organization
NIA	National Irrigation Authority
NPC	National Privacy Commission
NPPS	National Policy and Planning Staff
NSCB	National Statistical Coordination Board
NSMNP	Northern Sierra Madre Natural Park

NSO	National Statistics Office
NTC	National Telecommunications Commission
NWRB	National Water Resources Board
OCD	Office of Civil Defense
ODIN	Open Data Initiative
OECD	Organisation for Economic Co-operation and Development
PAGASA	Philippine Atmospheric, Geophysical, and Astronomical Services Administration
PAMs	policies and measures
PAP4SCP	Philippine Action Plan for Sustainable Consumption and Production
PBSAP	Philippine Biodiversity Strategy and Action Plan
PC	Produced Capital
PCAARRD	Philippine Council for Agriculture, Aquatic, and Natural Resources and Development
PCSD	Palawan Council for Sustainable Development
PCSDS	Palawan Council for Sustainable Development Staff
PDP	Philippine Development Plan
PDPFP	Provincial Development and Physical Framework Plan
PEENRA	Philippine Economic-Environmental and Natural Resources Accounting
PEISS	Philippine Environmental Impact Statement System
PENCAS	Philippine Ecosystem and Natural Capital Accounting
PENRO	Provincial Environment and Natural Resources Office
PES	Payments for Ecosystem Services
PIDS	Philippine Institute for Development Studies
PO	People's Organization
PPG	Policy and Planning Group
PPS	Policy and Planning Service
PPSO	Policy and Planning Studies Office
PPUR	Puerto Princesa Underground River
PSA	Philippine Statistics Authority
PSALM	Power Sector Assets and Liabilities Management
PSDP	Philippine Statistical Development Program
RCES	Regional Compendium of Environment Statistics
RDG	Regional Development Group
REECS	Resources, Environment, and Economics Center for Studies
RRP	Risk Resiliency Program

SDGs	Sustainable Development Goals
SEEA	System of Environmental-Economic Accounting
SEEA CF	System of Environmental-Economic Accounting – Central Framework
SEEA EA	System of Environmental-Economic Accounting – Ecosystem Accounting
SEPO	Senate Economic Planning Office
SIAD	Sustainable Integrated Area Development
SIBOL	Sustainable Interventions for Biodiversity, Oceans, and Landscapes
SIPLAS	Siargao Island Protected Landscape and Seascape
SNA	System of National Accounts
SOCCSKSARGEN	South Cotabato, Cotabato, Sultan Kudarat, Sarangani, and General Santos (Central Mindanao region)
TEEB	The Economics of Ecosystems and Biodiversity
TWG	Technical Working Group
UN	United Nations
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division
USAID	United States Agency for International Development
WAVES	Wealth Accounting and Valuation of Ecosystem Services
WESM	Wholesale Electricity Spot Market

Glossary

Asset
A store of value representing a benefit or series of benefits accruing to an economic owner by holding or using the entity over a period of time. It is a means of carrying forward value from one accounting period to another. (UN SEEA)

Ecosystem
An ecosystem includes all living things in a given area, as well as their interactions with each other, and with their non-living environments (weather, earth, sun, soil, climate, atmosphere). (UNEP)

Ecosystem Assets (EA)
The ecosystem assets are the primary spatial units for ecosystem accounting. EAs are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components and their interactions. (UN SEEA EA, paragraph 3.5)

Ecosystem condition accounts
A central feature of ecosystem accounting is its organization of biophysical information on the condition of different ecosystem types. The ecosystem condition account organizes data on selected ecosystem characteristics and the distance to a reference condition to provide insight into the ecological integrity of ecosystems. It will also organize data relevant to the measurement of the capacity of an ecosystem to supply different ecosystem services. (UN SEEA EA, paragraph 2.41)

Ecosystem extent accounts
Ecosystem extent accounts organize data on the extent or area of different ecosystem types. Data from extent accounts can support the derivation of indicators of composition and change in ecosystem types and thus provide a common basis for discussion among stakeholders including related to conversions between different ecosystem types within a country. (UN SEEA EA, paragraph 2.40)

Ecosystem service
The contributions of ecosystems to benefits used in economic and other human activity. (UN SEEA CF Central Framework, paragraph 2.22)

Ecosystem services flow accounts – monetary terms	Commonly, estimates of ecosystem services in monetary terms are based on estimating prices for individual ecosystem services and multiplying through by the physical quantities recorded in the ecosystem services flow account in physical terms. (UN SEEA EA, paragraph 2.43)
Ecosystem services flow accounts – physical terms	The supply of final ecosystem services by ecosystem assets and the use of those services by economic units, including households enterprises, and government, constitute one of the central features of ecosystem accounting. (UN SEEA EA, paragraph 2.42)
Emission	Emissions are substances released to the environment by establishments and households as a result of production, consumption and accumulation processes. (UN SEEA)
Environmental Assets	The naturally occurring living and non-living components of the Earth, together constituting the biophysical environment, which may provide benefits to humanity. (UN SEEA CF Central Framework, paragraph 2.17)
Monetary ecosystem asset accounts.	Asset accounts are designed to record information on stocks and changes in stocks (additions and reductions) of assets. The ecosystem monetary asset account records this information in monetary terms for ecosystem assets based on the monetary valuation of ecosystem services and applying the net present value approach to obtain opening and closing values in monetary terms for ecosystem assets at the beginning and end of each accounting period. (UN SEEA EA, paragraph 2.44)
Natural Capital	Natural capital refers to the stock of renewable and non-renewable resources (e.g., plants, animals, air, water, soils, and minerals) that provide a flow of benefits to people (UN SEEA). It also includes the ecosystem services that are often "invisible" to most people, such as air and water filtration, flood protection, carbon sequestration, pollination of crops, and habitats for wildlife. (World Bank, 2011).
Natural Capital Accounting (NCA)	Natural capital accounting (NCA) is an umbrella term covering efforts to use an accounting framework to provide a systematic way to measure and report on stocks and flows of natural capital. NCA covers accounting for individual environmental assets or resources, both biotic and abiotic (such as water, minerals, energy, timber, fish), as well as accounting for ecosystem assets (e.g., forests; wetlands), biodiversity, and ecosystem services. (United Nations Statistics Division Definition)

Natural resources

Natural resources include all natural biological resources (including timber and aquatic resources), mineral and energy resources, soil resources, and water resources. (UN SEEA CF Central Framework, paragraph 2.101)

Physical flows

Physical flows are reflected in the movement and use of materials, water, and energy. (UN SEEA CF Central Framework, paragraph 2.88)

Residuals

These are flows of solid, liquid, and gaseous materials and energy, that are discarded, discharged, or emitted to the environment (e.g., emission to air) by establishments and households through processes of production, consumption or accumulation but may also flow within the economy. (UN SEEA CF Central Framework, paragraph 2.92)

Stocks (in monetary terms)

The measurement of stocks in monetary terms focuses on the value of individual environmental assets and changes in those values over time. (UN SEEA CF Central Framework, paragraph 2.104)

Stocks (in physical terms)

In physical terms, stocks refer to the total quantity of assets at a given point in time. (UN SEEA CF Central Framework, paragraph 2.99)

System of Environmental-Economic Accounting—Ecosystem Accounting (SEEA EA)

A spatially-based, integrated statistical framework for organizing biophysical information about ecosystems, measuring ecosystem services, tracking changes in ecosystem extent and condition, valuing ecosystem services, and assets and linking this information to measures of economic and human activity. (UN SEEA EA Ecosystem Accounting, paragraph 1.3)

UN SEEA Central Framework

The System of Environmental-Economic Accounting (UN SEEA CF) Central Framework is a multipurpose conceptual framework for describing the interaction between the economy and the environment, and the stocks and changes in stocks of environmental assets. Utilizing a systems approach to organizing environmental and economic information, it covers, as completely as possible, the stocks and flows that are relevant to the analysis of environmental and economic issues. (UN SEEA CF Central Framework, paragraph 2.1)

Executive Summary

The Roadmap to Institutionalize Natural Capital Accounting (NCA) in the Philippines is developed by the National Economic and Development Authority (NEDA) together with the Philippine Statistics Authority (PSA) and the Department of Environment and Natural Resources (DENR). This document provides strategic guidance on the national implementation of NCA from 2022 to 2040. It presents the critical activities, milestones, and outputs for each planning period to fully institutionalize and integrate NCA, including valuation of ecosystem services in the government's planning, investment decisions, and policymaking process. The activities in the Roadmap are tailored to respond to the issues and gaps on localized framework[1], data concerns, human resources and technical capacity, and institutional arrangements. This document underwent several technical discussions with the members of the Interagency Committee on Environment and Natural Resources Statistics (IACENRS)[2] and was peer reviewed by international and national experts working on NCA. The IACENRS approved the Roadmap on March 30, 2022 through Resolution No. 01 Series of 2022.

This document starts with an assessment of previous and current initiatives and attempts to institutionalize NCA since the 1990s. It also presents the overarching policy frameworks and plans as a basis in the crafting of priority activities. The Roadmap has six components: (a) compilation of natural capital accounts; (b) estimation of natural capital – adjusted macroeconomic indicators; (c) policy use and applications; (d) data management systems; (e) capacity development; and (f) dissemination. Budgetary support should be secured to facilitate the target activities under each component.

The institutional arrangements for implementing the Roadmap have been thoroughly discussed among concerned government agencies. The PSA shall have the overall responsibility for the institutionalization and implementation of NCA in the short-, medium- and long-term. The PSA Board will provide strategic direction and guidance on matters related to the designation of natural capital accounts to be developed based on policy issues and priorities; localization of the accounting frameworks for the improvement of statistical coordination; and harmonization of government statistical operations, standards, and classifications related to NCA. NEDA, as the chair of the PSA Board, will steer and oversee the progress of the Roadmap activities, specifically ensuring that the outputs of the accounts will inform policies, plans, and investment decisions. The DENR and its attached agencies will be responsible for developing the integrated ENR database, compiling site-specific ecosystem accounts, and instituting capacity development and dissemination programs within their organizations.

The Roadmap is a flexible document that allows for regular updating to ensure its responsiveness to future and emerging development priorities. While the current version focuses on public systems, its coverage can be expanded in the future to cover the integration of NCA in the private sector such as the introduction of NC valuation in business planning and decision-making to account for environmental sustainability in their operations.

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[1] This refers to the operationalization of international frameworks using the Philippine context.

[2] Philippine Statistics Authority, *Memorandum Order No. 02 s.2014 Establishing the Interagency Committee on Environment and Natural Resources Statistics,* December 23, 2014 https://psa.gov.ph/sites/default/files/MO%20no2.pdf

01

INTRODUCTION

1.0 Introduction

Our natural capital is an important factor in spurring the Philippine economy. In addition to economic and social capital, natural capital is a key component of our country's wealth. Natural capital refers to the stock of renewable and non-renewable resources (e.g., plants, animals, air, water, soils, and minerals) that provide a flow of benefits to people.[3] It also includes the ecosystem services that are often "invisible" to most people, such as air and water filtration, flood protection, carbon sequestration, pollination of crops, and habitats for wildlife.[4]

Central to economic growth is the capacity of the environment to sustain ecosystem services that provide the needed subsistence and livelihood for resource-dependent communities and capital for infrastructure, machineries, manufacturing, and production sectors. However, as our natural capital is exponentially extracted, the declining stocks and degrading environmental condition are inadvertently neglected. The value of these ecosystem services is not readily captured in the market, so their exact contribution to the economy is often unknown. Humans tend to forget that nature continuously provides the needed ecosystem services that benefit long-term income and growth and sustain a well-functioning economy.

1.1 Natural Capital Accounting and its Framework

The statistical community steers the development of tools to measure natural capital using agreed accounting structures, rules, classifications and definitions. Integrating ecosystem accounts with national accounts enables the former to expose critical connections between the pillars of sustainability.[5] Natural capital accounting (NCA) is a useful tool to measure the changes in the stock of natural capital and integrate the value of ecosystem services into accounting and reporting systems for a given region or ecosystem. NCA uses an accounting approach that integrates, using a coherent framework, various economic, socio-demographic and environmental data into aggregates and indicators. NCA provides accounting frameworks to "put together" dispersed environmental data and integrate with conventional income accounts.[6]

The Philippines has adopted the United Nations System of Environmental-Economic Accounting (UN SEEA) Framework, particularly the Central Framework (CF) and the Ecosystem Accounting (EA) Framework, consistent with the System of National Accounts (SNA). The SNA provides a

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[3] United Nations, "Natural Capital and Ecosystem Services FAQ | System of Environmental Economic Accounting," seea.un.org (New York: United Nations, September 2021), https://seea.un.org/content/natural-capital-and-ecosystem-services-faq.

[4] World Bank, "Frequently Asked Questions on Natural Capital Accounting (NCA) | Wealth Accounting and the Valuation of Ecosystem Services," www.wavespartnership.org (Washington, DC: World Bank Global Program on Sustainability, 2011), https://www.wavespartnership.org/en/frequently-asked-questions-natural-capital-accounting-nca#1.

[5] United Nations Statistical Commission, "UNSD — United Nations Statistical Commission," unstats.un.org (United Nations), accessed March 18, 2022, https://unstats.un.org/unsd/statcom/50th-session/side-events/20190305-1M-natural-capital-accounting/.

[6] United Nations, "Natural Capital and Ecosystem Services FAQ."

comprehensive conceptual and accounting framework to compile and report macroeconomic statistics for analyzing and evaluating the overall performance of the economy. Both SEEA CF and the SEEA EA are designed to provide a system that complements the SNA by using the same accounting principles on the integration of physical and monetary measures concerning the environment which enable the comparison of data from the national accounts.

The **Central Framework** provides concepts, definitions, and classifications to support integrated accounting for physical flows, environmental transactions and transfers, and individual environmental assets. Physical flows are the natural inputs from, and residual flows to, the environment such as water, energy, air emissions, and solid waste. Transactions and transfers include environmental taxes, environmental subsidies, and environmental protection expenditures. Individual environmental assets are mineral and energy resources, timber, fish, land, soil, water, etc.

Ecosystem Accounting takes a spatial approach to accounting in organizing biophysical information about ecosystems – measuring ecosystem services, tracking changes in ecosystem extent and condition, valuing ecosystem services and assets, and linking this information to measures of economic and human activity. In the context of monetary valuation, the SEEA EA applies the SNA concept of exchange values.

In linking SEEA CF and EA, the required data are aligned such that data on ecosystems under SEEA EA can be combined with the data from the SEEA CF accounts on environmental pressures, individual resource stocks, and environmental responses (in the form of expenditures, taxes, and subsidies) to provide a comprehensive picture of the environmental-economic relationship.[7] In the development of this NCA Roadmap, the same principles are upheld to be consistent with the internationally agreed-upon standards and methods.

1.2   Accounts-to-Policy Approach

Understanding policy issues in the environment that inhibit economic growth is an integral part of NCA. The Roadmap emphasizes linking accounts to decision-making. In the Philippines, we recognize the application of accounts from the macro perspective and site-specific and direct policy use. From a broader perspective, the incorporation of natural capital, especially the values of ecosystem services, into national accounts will demonstrate the interactions of economic activity with the environment and lead to better economic decisions.

The economic performance of a country is primarily measured in terms of Gross Domestic Product (GDP). However, GDP only measures the value of a finished product within a given time. It does not account for much broader forms of wealth such as the regulation and protection services that forests and wetlands provide. GDP also does not consider pressures on natural assets and environment that affect their ability to continue to provide the needed ecosystem services that sustain a well-functioning economy.

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[7] United Nations, et. al., *System of Environmental-Economic Accounting–Ecosystem Accounting.* (New York: United Nations, September 2021) White cover publication, pre-edited text subject to official editing
https://seea.un.org/sites/seea.un.org/files/documents/EA/seea_ea_white_cover_final.pdf

NC accounts can generate extensive information that allow for better assessment of economic performance, which will enable more appropriate economic reforms.

At site-specific level, it is imperative that accounts facilitate informed decision-making of political leaders and communities. The accounts can guide in weighing the gains and trade-offs of a development intervention, providing evidence- and science-based foundations for a solid understanding of how local decision-makers can address issues and problems on competing uses of the country's natural resources. Translating accounts to policy is important so that policies and decisions on environment and natural resources are geared toward benefiting society at large.

At present, the Philippines still needs to address certain policy questions such as (a) which ecosystems generate which ecosystem services? (b) To what extent do ecosystem services contribute to economic and other human activities? (c) Which ecosystems are still in the best condition, and which are the most degraded? and (d) How have these ecosystems changed and what has been the impact on the generation of their services?

NCA can help address the policy questions above and link the economy and the environment better.

02

ASSESSMENT OF THE PAST AND CURRENT STATE OF NCA INSTITUTIONALIZATION

2.0 Assessment of the Past and Current State of NCA Institutionalization

This section provides an overview of the past and current state of institutionalization of NCA in the Philippines.

PAST AND PRESENT NCA INITIATIVES IN THE PHILIPPINES

1991-2000
Environmental and
Natural Resources
Accounting Project
(ENRAP)

1997-2000
EO 406
Creation of
PEENRA System

2000's
Philippine
Economic-
Environmental and
Natural Resources
Accounting
(PEENRA)

2014-2017
Philippines-Wealth
Accounting and
the Valuation of
Ecosystem
Services
(Phil-WAVES)

**2018-
PRESENT**
Ongoing asset
and flow
accounts
development

Figure 1. Past and Present Key NCA Initiatives in the Philippines

2.1 Past and Emerging Policies on NCA

In 1997, Executive Order (EO) 406 was issued to institutionalize the PEENRA (Philippine Economic-Environmental and Natural Resources Accounting) System, mandating the Department of Environment and Natural Resources (DENR), National Economic and Development Authority (NEDA), and the National Statistical Coordination Board (NSCB) to create units within their respective organizations to support the environment and natural resources (ENR) accounting system. The EO was issued primarily in line with the priorities of the Medium-Term Philippine Development Plan (MTPDP) 1993-1998 and the Philippine Agenda 21. To provide direction for the coordinated functioning of the PEENRA units, EO 406 also stipulated the creation of the PEENRA Steering Committee chaired by NEDA, with members such as the NSCB, National Statistics Office (NSO), DENR, Department of Agriculture (DA), and Department of Trade and Industry (DTI), as well as representatives from the non-government sector (i.e., one each from academe, non-governmental organizations [NGOs]/peoples' organizations [PO], business sector, and labor sector). The NSCB was assigned as the secretariat of the committee.

In 1997, the DENR created a PEENRA unit within its Policy and Planning Studies Office (PPSO) with a budget lumped under "Other Services." PPSO is now known as the Policy and Planning Service

(PPS). At around the same time, NEDA's Agriculture Staff, without any additional budget, acted as the PEENRA unit within NEDA in collaboration with its National Policy and Planning Staff (NPPS).

Other government agencies, including DA and DTI, identified existing units to include functions related to PEENRA matters. The NSCB's request to create a PEENRA unit in 2000 did not progress due to a then-existing policy of "no creation of new units" in the government. As part of the PEENRA project, NSCB provided counterpart funds to pay for the salaries of contractual personnel. The PEENRA Steering Committee also took the position that there was a need to improve the compilation methodologies, the coverage, and the framework of PEENRA before recommending its designation as official statistics.

A question had arisen on whether a legislative measure, instead of a mere executive policy, was necessary to sustain government funding of NCA activities. In 2000, then Senator Loren Legarda filed Senate Bill No. 1896 (which did not progress) to institutionalize the environmental and natural resources accounting system. There was an expectation that the enactment would lead to more funding for institutionalizing the PEENRA system. In April 2021, Deputy Speaker Legarda filed the Philippine Ecosystem and Natural Capital Accounting (PENCAS) Law of 2021 (HB 9181), which sought to institutionalize NCA to reflect the environmental inputs and outputs in the determination of national accounts. One salient feature of the bill is the development of ecosystem accounts and creation of NCA units within government agencies, including the DENR. As of March 2022, the bill is still pending with the House of Representatives' Committee on Natural Resources.

2.2 Past and Current Initiatives on NCA

In the 1990s, NCA was still in the early stage of development and no internationally agreed-upon methodology had been adopted. Consequently, different methods were proposed and piloted by some countries. An international agreement was only formally reached in 2012 when the UN Statistics Commission adopted the System of Environment – Economic Accounting (UN SEEA) Central Framework as an international statistical standard. In 2021 it adopted SEEA Ecosystem Accounting.

1990s-Early 2000s

The Philippines is one of the pioneers of environmental accounting in Southeast Asia. In the 1990s up to the early 2000s, two major projects have been implemented by the government – the Environmental and Natural Resources Project (ENRAP) and the Philippine Economic-Environmental and Natural Resources Accounting (PEENRA) Project. The DENR led the implementation of ENRAP, funded by United States Agency for International Development (USAID), which adopted the Henry Peskin approach to environmental accounting. With funding and technical assistance from the United Nations (UN), the National Statistical Coordination Board (NSCB)[8] implemented PEENRA using the SEEA framework.[9]

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[8] In 2013, the NSCB was absorbed by the Philippine Statistics Authority (PSA) in the structural reorganization of the various Philippine statistical agencies. It is attached to NEDA for purposes of policy coordination. The earlier NCA efforts that led to the formalization of PEENRA at the NSCB were the DENR-NEDA-led Integrated Environmental Management for Sustainable Development (IEMSD) Programme of the UNDP that started in 1995 and the NSCB-led Environment and Natural Resource Accounting (ENRA) II project

[9] National Statistical Coordination Board (NSCB), *Annual Accomplishment Report, Year 2000* (Makati City: ENRA II Project: Institutionalization of the PEENRA System, 2001)

There were differences in the approaches of ENRAP and PEENRA in terms of the framework for national income accounts adjustment and the valuation methods. While ENRAP was focused on data use for policy applications, PEENRA, with NSCB being a statistical agency, was more focused on data production and the development of environmental accounts. Since PEENRA was SEEA-based, the valuation methods used information that are market transactions-based. In accounting, it excluded consumer surplus-based methods such as contingent valuation and choice experiment methods, and other stated preference methods that are based on survey or responses of individual's preferences in hypothetical situations.

For PEENRA, asset accounts – both physical and monetary – for five resources (fishery, forest, minerals, land, and water) were compiled. In particular, "economic activity accounts" or flow accounts of emissions, both in physical and monetary terms, were compiled for fourteen subsectors in agriculture, fishery and forestry sector; manufacturing, mining, electricity generation; and land transport services. Under PEENRA, the NSCB piloted the compilation of environmental accounts at the subnational level for the Cordillera Administrative Region (CAR) and Palawan. ENRAP also compiled environmental accounts at the subnational level for Cebu, Lingayen Gulf, Metro Manila, and SOCCSKSARGEN.

Apart from the compilation of the accounts, other accomplishments of ENRAP and PEENRA were the (a) development of the ENR statistics database; (b) establishment and strengthening of institutional linkages; and (c) development of capabilities of human resources for environmental accounting.[10]

2013 to 2021

The Philippines' participation in the global partnership on Wealth Accounting and Valuation of Ecosystem Services (WAVES) from 2013 to 2017[11] sparked renewed interest in NCA among various stakeholders in the country. The Philippines WAVES (Phil-WAVES) project heightened awareness and enhanced local capacity on the use of NCA in policy analysis and decision-making and resource management. NEDA led the implementation of Phil-WAVES with the Philippine Statistics Authority (PSA), DENR, Palawan Council for Sustainable Development (PCSD), and the Laguna Lake Development Authority (LLDA) as partner agencies in the compilation of the accounts and policy analysis.

The Phil-WAVES project used the UN SEEA 2012 - Central Framework, and the SEEA Ecosystem Accounting. The PSA led the (a) estimation of the macroeconomic indicators, such as produced capital (PC), comprehensive wealth (CW), adjusted net national income (ANNI) and adjusted net national savings (ANNS), and (b) development of the national-level mineral accounts and mangrove accounts. The LLDA and PCSD compiled the ecosystem accounts for Laguna de Bay and Southern Palawan, respectively. At the national level, Phil-WAVES mainly focused on the compilation of accounts and undertook limited policy analysis.

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[10] Sylvia M. De Perio, "Institutionalization of the Philippine Economic-Environmental and Natural Resource Accounting (PEENRA) System," Session 15, *International Workshop on Environmental and Economic Accounting* (September 18-22, 2000)

[11] Led by the World Bank, WAVES core implementing countries include developing countries—Botswana, Colombia, Costa Rica, Guatemala, Indonesia, Madagascar, the Philippines and Rwanda—all working to establish natural capital accounts

Lack of appreciation is said to be the major factor for the failure to institutionalize NCA after ENRAP and PEENRA projects. Hence, capacity building and policy dialogue and communication have been included as important components of the Phil-WAVES project. The usefulness of the ecosystem accounts in policymaking and resource management is more readily apparent for the environmental managers than the natural asset accounts at the national level. Under the Phil-WAVES Project, NEDA spearheaded the development of the NCA Roadmap in 2017. The NEDA, PSA and DENR updated the Roadmap to consider the country's current and emerging priorities and provide clear institutional, policy, and implementation mechanisms. The components of the Phil-WAVES project are summarized in **Appendix A**.

The PSA, through the locally-funded PEENRA, further improved and developed environmental-economic accounting in the country from 2014 to 2020. Asset accounts for metallic minerals, non-renewable energy resources, and tree-covered areas as well as water flow accounts were compiled and continually updated. Environmental accounts at the sub-national level were also developed by pilot regions, namely:

- Cordillera Administrative Region: Minerals, Land, Timber, Water, and Tourism Accounts
- Central Luzon Region: Land and Timber Asset Accounts
- Caraga Region: Minerals, Land and Timber Asset accounts
- Northern Mindanao Region Water Flow Accounts

To improve the data support for environmental accounts, the PSA publishes the Compendium of Philippine Environment Statistics (CPES) every two years. PSA Regional Offices V and CAR also released their Regional Compendium of Environment Statistics (RCES) through the funding of the PEENRA Project. In addition to these activities, the PSA is also developing Land and Timber Asset Accounts, Ecosystem Accounts, and Material Flow Accounts at the national level. Moreover, EO 174 s. 2014 *(Institutionalizing the Philippine Greenhouse Gas Inventory Management and Reporting System)* involves the PSA in the calculation of greenhouse gas emissions of the agriculture sector along with the Department of Agriculture and with the guidance of the Climate Change Commission.

Other available environmental accounts from the Environment and Natural Resources Accounts Division (ENRAD) under the Macroeconomic Accounts Service of the PSA are:
- Mineral Accounts of the Philippines, annual;
- Water Accounts of the Philippines, annual release;
- Energy Accounts of the Philippines, annual release; and
- Compendium of Philippine Environmental Statistics (CPES), published every two years.

2.3   Other NCA-Related Efforts

As part of NCA, valuation is important in the estimation of monetary values for ecosystem assets and services. Consistent with the System of National Accounts (SNA) approach, the SEEA central and ecosystem accounting frameworks use exchange values and preclude welfare values or consumer surplus-based values to value non-market goods. The valuation concept then used in NCA is that of exchange values, that is, those values that reflect the price at which ecosystem services and ecosystem assets would be exchanged between buyer and seller if a market existed.

There is substantial literature on the valuation of ecosystem assets and services in the Philippines. Much of the valuation work is applied to coastal and marine, forestry, and water resources; to address air and water pollution issues; and to design payments for ecosystem services (PES) schemes. International development agencies such as the World Bank, Asian Development Bank (ADB), USAID, and European development organizations have promoted the incorporation of the valuation of environmental services in project evaluation (including benefit-cost analysis), especially of projects with significant environmental impacts. Local universities, such as the University of the Philippines Los Baños, also conduct valuation studies with applications in environment and natural resource management. There are also non-government organizations and consulting firms like the Resources, Environment, and Economics Center for Studies (REECS), Conservation International – Philippines, and Institute for Climate and Sustainable Cities (ICSC) that undertake valuation studies as input to policy analysis.

Many studies on valuation of ecosystem services in the Philippines were also done under the Economy and Environment Program for Southeast Asia (EEPSEA). The EEPSEA was founded in 1993 to build the research capacity of local researchers in environmental economics through research and training grants, with the goal of helping local researchers provide sound advice to policymakers. With the initiative of REECS and some EEPSEA participants, the Resource and Environmental Economists Association of the Philippines was organized to promote the sharing of research outputs.

Some of past, ongoing, and proposed NCA-related initiatives in the country are enumerated below:

- *The Economics of Ecosystems and Biodiversity (TEEB) pilot country study done by the DENR for the Philippines.* TEEB is a global initiative with the principal objective of mainstreaming the values of biodiversity and ecosystem services in decision-making at all levels. The country study identifies the ecosystem services vital to meeting the country's policy priorities and makes recommendations on how these services can be integrated into policies.

- *Capturing Coral Reef and Related Ecosystem Services (CCRESS)* is a World Bank-funded project from 2014-2018 with El Nido, Palawan as its local site. It aims to demonstrate how coastal communities can sustainably capture the benefits of ecosystem services. CCRESS highlighted the value of "blue" natural capital and ecosystem services to coastal communities and other stakeholders in the management of a country's natural assets for sustainable development.

- *Natural Capital Program (NCP).* The International Finance Corporation (IFC), the private sector arm of the World Bank Group, explored how companies consider natural capital in their business decisions, including how to facilitate the adoption of tools and methods to measure, manage, report, and value natural capital through the NCP. The NCP examined the country context and global industry linkages in the tourism sector. The Philippines' pilot site was El Nido, Palawan, where IFC worked with PCSDS, the government's counterpart, and Ten Knots Corporation, a private sector participant.

- *Ten Knots Hotel Resort.* Ten Knots is a hotel resort company based in the Philippines with five island resorts in Palawan. Together with the PCSD, it assessed how improved management of the El Nido terrestrial and marine protected area could enhance the profitability and long-term sustainability of tourism. It investigated the costs and benefits for resorts, dive and tour boat operators, fishers, and government associated with three alternative management scenarios.

- *Philippine Sustainable Interventions for Biodiversity, Oceans, and Landscapes (SIBOL) project.* Funded by USAID, SIBOL is a 5-year project launched in 2020 and currently being implemented to support the sustainable management of the country's natural resources and combat environmental crimes. With a total funding of PHP 1.1 billion, the project is expected to contribute to an effective conservation management and measurement of the value of natural resources that contribute to the country's economic development and environmental resilience.

- *Natural Capital Accounting and Assessment: Informing development planning, sustainable tourism development, and other incentives for improved conservation and sustainable landscapes.* This is an USD 18 million GEF-funded project in the country that aims to improve financial sustainability of protected areas and landscapes by mainstreaming the values of biodiversity and natural capital in government planning, particularly for eco-tourism development. Once the project is approved for implementation, DENR-Biodiversity Management Bureau (BMB) will take the lead as executing agency.

2.4   Lessons Learned: Issues and Challenges

This section highlights the challenges and issues encountered in the compilation of natural capital accounts. The identification of activities in the NCA Roadmap also builds on the lessons learned in the past.

After the externally-funded ENRAP and the PEENRA projects, NCA has still not taken hold in the government system as envisioned by EO 406. The failure to institutionalize NCA within government has been attributed to many factors: (a) the lack of government buy-in to the new system; (b) that compilation of environmental accounts was aimed primarily to adjust the national accounts; and (c) the accounts were highly aggregated and were not used for specific policies. The lack of success in obtaining GAA funding for NCA activities despite EO 406 was an indication of the limited appreciation for NCA in government. Hence, funding is key to fully operationalize and sustain NCA activities in the country.

Previous attempts to institutionalize NCA — not only in the Philippines but also at the global level — have been unsuccessful due to the lack of a clear policy link, disagreements on methodology, lack of ownership, and limited capacity and resources.

In the Philippine context, NCA implementation faces major bottlenecks related to data, human resources, standards, and local application.

2.4.1 Data Concerns

Undertaking NCA is a challenging task but the complexity of natural capital and the ecosystem units makes it even more so. The lack of updated data and inconsistencies in administrative data and surveying, modelling, and mapping information are among the issues on data collection. Hence, it is important to advance processing and consolidation of ENR data into an integrated database with the uniform metrics.

The two major data concerns are as follows:

Limited data infrastructure. Based on Phil-WAVES experience, administrative data has been an important input to NCA. NCA would require government agencies involved in the country's statistical system to harmonize and upgrade the collection and management of administrative data to harness their use in monitoring, evaluation, and policymaking.

Even if primary data collection is done by other government agencies, PSA can provide technical assistance to other government agencies in the collection, compilation and processing, maintenance, and dissemination of data for efficient data generation. With developments in information technology, there is scope for greater computerization starting from the data collection stage to data management to data sharing.

Fragmented data sharing platform. Within the DENR, the Knowledge and Information Systems Service (KISS) plays a role similar to the PSA. In fact, KISS has an ongoing computerization program to link data and reports at the Community Environment and Natural Resources Office (CENRO) level to the DENR Central Office.[12] However, updating and maintaining the ENR data management system requires resources (e.g., human resources and computer hardware and software). Generation of ENR data entails use of geospatial data from geographic information system (GIS), but the problem of proper storage and sharing of GIS maps and other data remains unaddressed.

2.4.2   Human Resources and Capacity Development

NCA requires a pool of experts in various fields, including statistics, economics, environmental science, GIS mapping, and modelling tools. Training technical staff to integrate and analyze multiple information systems from various sources is critical in the compilation of accounts. Providing relevant capacity development is important to the uptake and effectiveness of the use of NCA to support decision-making processes. However, maintaining a repository of information in the agencies is challenged by possible changes in the government (e.g., staff transfer, high-turnover rate, change in administration).

In general, there is a low appreciation of the usefulness of NCA in environmental and resource management. Therefore, it is important to clarify the policy use of NCA at the outset and develop the capacity within the various DENR offices to appreciate, understand, and undertake NCA. Nonetheless, the analytical work on NCA in the past and methodologies that have been developed have resulted in increasing public awareness of environmental issues and demand for NCA to inform policy analysis.

In the medium term, DENR is expected to be the focal agency for subnational level ecosystem accounting, which consists of site-specific ecosystem accounting units, also known as ecosystem accounting areas. This choice of ecosystem accounting unit is consistent with the integrated area development approach adopted by the DENR and is more responsive to DENR's immediate need of ecosystem accounting to aid decision-making in resource management. Also, the technical expertise on ecosystem science and management resides with the DENR since it has closer

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[12] During the compilation of ecosystem accounts for Southern Palawan, it was discovered that the CENRO and PENRO (Provincial Environment and Natural Resources Office) offices in Palawan are not yet linked to the DENR Central Office.

administrative control over the ecosystem areas. The links between the national level natural capital asset accounts and ecosystem accounts developed by the PSA and the ecosystem accounts developed by DENR need to be further explored.

Institutionalizing NCA within the DENR requires wider participation of relevant bureaus and offices of the agency. Like the policy and coordination role of NEDA in the Phil-WAVES project, the Policy and Planning Service (PPS) of the DENR can be the agency's focal office for NCA. The PPS is in the best position to identify and recommend which ecosystems are to be prioritized and what policy issues would be addressed by ecosystem accounting. Other DENR units including the Ecosystems Research and Development Bureau (ERDB), KISS, Foreign-Assisted and Special Projects Service (FASPS), and National Mapping and Resource Information Authority (NAMRIA) will play a major role in the implementation of NCA activities.

2.4.3 Link to National Accounts

The exact use of ecosystem accounts in the estimation of the national accounts remains unclear. For instance, considering the issues on under-coverage and double counting in the estimation of national accounts, how would the generation of ecosystem services such as water regulation, which contribute to crop production, be reflected in the national accounts for the agriculture sector? Given that the ecosystem accounting methods have been tested, technical discussions with the compilers and data producers on its link to national accounting have to begin.

2.4.4 Localization of International Frameworks into the Philippine Context

While the UN SEEA frameworks provide standard accounts compilation processes, it would be easier to adopt the standardized methods to the Philippine context. Some terms and classifications in the international frameworks are not applicable to the Philippines' systems (e.g., 'artificial surfaces' are classified as built-up land cover in the Philippines, no glacier and permanent snow). Hence, interpretation of definitions of various classifications and accounting steps are not easily performed.

03

OVERARCHING FRAMEWORKS FOR NCA INSTITUTIONALIZATION

3.0 Overarching Frameworks for NCA Institutionalization

The development of the Roadmap is anchored on the global and country-specific development goals and strategies based on the priority issues in the Philippines. This section guides the identification of the designated natural capital accounts to be developed. The policy thrust is toward sustainable development, climate change adaptation, and disaster risk reduction. The goals relevant to environment sector are embodied in the Sustainable Development Goals (SDG) and the country's first Nationally Determined Contribution (NDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in 2021. The Philippines is also a signatory to the Sendai Framework for Disaster Risk Reduction 2015-2030.

Specific strategies, plans, and desired outcomes are espoused in the Updated Philippine Development Plan 2017-2022 that is anchored on the 10-point socioeconomic agenda of the Duterte Administration. The priority programs and policy issues of the Department of Environment and Natural Resources (DENR) and other policy issues with respect to agriculture, fishery, and energy are also discussed.

3.1 International Policy Frameworks

3.1.1 Sustainable Development Goals

In 2015, the Philippines committed to the 2030 Agenda for Sustainable Development and the implementation of the Sustainable Development Goals (SDGs). The natural resource and environmental sector, including the issues of climate change and disaster risk management, are incorporated in 8 of the 17 goals.[13]

These goals are interrelated with the other SDGs. For example, efficient natural resource and environmental management can potentially reduce poverty (Goal 1: No Poverty), promote inclusive and sustainable economic growth (Goal 8: Decent Work and Economic Growth), and reduce income inequality (Goal 10: Reduced Inequalities). Recognizing that there are "different national realities, capacities, and levels of development" and that each nation determines its "policy space and priorities,"

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[13] Goal 6: Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all; Goal 7: Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable and modern energy for all; Goal 9: Industry, Innovation and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation; Goal 11: Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient and sustainable; Goal 12: Responsible Consumption and Production – Ensure sustainable consumption and production patterns; Goal 13: Climate Action – Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy; Goal 14: Life below Water – Conserve and sustainable use of the oceans, seas and marine resources for sustainable development; Goal 15: Life on Land – Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

the SDG commitments are "voluntary and country-led." The Philippine government then must prioritize among the SDG goals and formulate public policy and programs to operationalize and attain the goals.[14]

The integration of the SDGs into national and local priorities is being pursued through the creation of special committees to oversee SDG-related work within the government; the inclusion of the SDGs in the annual Budget Priorities Framework; the factoring in of the SDGs in the government's long-term vision, medium-term development plan, and sectoral plans; and the inclusion of the SDGs in the Philippine Statistical Development Program (PSDP) of the PSA for progress monitoring and data generation. The Knowledge and Information Systems Service (KISS) office of the DENR also monitors progress for some of the SDGs. In addition, NCA can serve as a tool to monitor progress against these SDG indicators and facilitate better understanding of trade-offs and synergies in informing policy.

3.1.2 2015 Paris Agreement on Climate Change

To address the looming climate crisis, 196 parties to the UNFCCC adopted the Paris Agreement (PA) in December 2015. The PA lays out a global action plan to reduce climate change risks by limiting global warming below 2°C, and, if possible, below 1.5°C above preindustrial levels.[15] The Paris Agreement is an important step in international efforts to combat climate change.

Support for this global action, such as standardized approaches like the NCA, is vital to monitor the interaction of the environment, society, and the economy, specifically in stocktaking greenhouse gas (e.g., carbon dioxide) emissions.

3.1.3 Sendai Framework for Disaster Risk Reduction 2015-2030

The Philippines is a signatory to the Sendai Framework for Disaster Risk Reduction 2015-2030. Under the framework agreement, four priority areas for action are (1) understanding disaster risk, (2) strengthening disaster risk governance to manage disaster risk, (3) investing in disaster risk reduction for resilience, and (4) enhancing disaster preparedness for effective response and to "build back better" in recovery, rehabilitation, and reconstruction. Seven global targets – including reduction in disaster mortality, the number of affected people, disaster economic loss, and disaster damage to critical infrastructure and disruption of basic services – have been set. NCA can help national and local government agencies in formulating policy related to disaster risk reduction and proper management of resources by calculating the economic costs of a hazard (e.g., flood, fire, landslide), which includes the estimations for the value of ecosystem services that a particular ecosystem can provide.

3.2 National Policies and Plans

3.2.1 *AmBisyon Natin* 2040

In 2015, the National Economic and Development Authority (NEDA) spearheaded the long-term visioning process towards the formulation of AmBisyon Natin 2040. It describes the kind of life

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[14] In line with the thrust of NCA, a benefit-cost analysis (that also consider environmental impacts) of actions to attain the SDG goals can guide in setting the prioritization of the SDG goals.

[15] United Nations, "Paris Agreement Signing Ceremony - 22 April 2016," United Nations Sustainable Development, April 22, 2016, https://www.un.org/sustainabledevelopment/parisagreement22april/#FAQs

that people want to live and how the country is envisioned to be by 2040. AmBisyon serves as an anchor for development tourism planning across at least four national administrations. The aim is for the Philippines to be a high-income country by 2040, with per capita income tripling to USD 11,000 from its 2015 level and a sustained annual GDP growth of at least 6.5 percent. The 2040 vision for the country is as follows:

> "The Philippines by 2040: *matatag, maginhawa, at panatag.* The country is a prosperous middle-class society where no one is poor. People live long and healthy lives and are smart and innovative. The Philippines is a high-trust society where families thrive in vibrant, culturally diverse, and resilient communities."

Of the eight priority sectors identified to have a direct impact on *AmBisyon Natin* 2040,[16] three sectors can be considered to have strong links to ENR: housing and urban development, tourism and allied services, and agriculture. Manufacturing, connectivity (including vehicles and transport systems), and health and wellness services are also associated with some environmental concerns (e.g., water and air pollution generated by these sectors and their associated health costs).

3.2.2 10-Point Socio-economic Agenda

The Duterte administration has set its policy direction in its 10-point socioeconomic agenda. With the goal of inclusive growth and poverty reduction, the agenda aims to slash poverty incidence to 14 percent by 2022 from 21.6 percent in 2015. ENR is strongly linked to two of the agenda items: (a) promoting rural and value chain development toward increasing agricultural and rural enterprise productivity and rural tourism and (b) ensuring security of land tenure to encourage investments and address bottlenecks in land management and titling agencies.

3.2.3 Philippine Development Plan (PDP) 2017-2022

The updated Philippine Development Plan (PDP) 2017-2022 continues the government's thrust towards inclusive growth, a high-trust and resilient society, and a globally-competitive knowledge economy. The PDP underscores ecological integrity, clean and healthy environment, and building up the socio-economic resilience of resource-dependent communities and ecosystems as among the foundations to achieve inclusive growth and sustainable development. In particular, it identifies mainstreaming of ecosystem values into national and local development planning and development of indicators and measures that will accurately capture the contribution of natural capital to the country's development. Toward this end, specific strategies that will be pursued include upscaling natural capital accounting that includes valuation of ecosystem services.

NCA provides important data and information on the stock and status of the country's ecosystems and resources. The NCA as a tool (a) allows for more systematic collection, monitoring, and reporting of data from both the national and local governments, including academic and research institutions;

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[16] *AmBisyon Natin* 2040's eight priority sectors are: (a) housing and urban development; (b) education services; (c)manufacturing; (d) health and wellness services; (e) tourism and allied services; (f) agriculture; (g) connectivity; and (h) financial services.

(b) facilitates informed decision-making of political leaders and local communities on conservation areas; (c) assesses trade-offs and provides better alternatives; (d) enables income and employment generation in rural areas and creates wealth for the nation; and (e) provides incentives for the management of ENR (e.g., payments for ecosystem services).

The PDP also espouses an ecosystems approach, particularly in conducting regular nationwide fish stock inventory and assessment as among its sub-strategies for expanding economic opportunities in agriculture, forestry, and fisheries (AFF) and ensuring food security.

3.2.4 Philippine Action Plan for Sustainable Consumption and Production (PAP4SCP)

The PAP4SCP envisions having more Filipinos produce and consume green goods and services to accelerate the shift towards sustainable and climate-smart practices and lifestyles that will contribute to *AmBisyon Natin* 2040. The Action Plan prioritizes actions that internalize and integrate economic activities' social and environmental impacts on the market system. These actions include valuation of the costs and benefits of production and consumption processes through natural capital accounting to determine ecological limits and possible negative externalities. One of the intermediate outcomes of the PAP4SCP is the institutionalization of natural capital accounting through the following critical nodes: (a) policy and regulation; (b) research and development, innovation, and technology; (c) infrastructure; and (d) promotion and education.

3.2.5 Philippines' Nationally Determined Contributions (PH-NDC)

In line with the Paris Agreement, the Climate Change Commission (CCC) led the formulation of the country's 1st Philippines' NDC, with support from NEDA and the key sectoral agencies, namely the DA, DENR, DOTr, and DOE. The PH-NDC, submitted to the UNFCCC on April 15, 2021, commits the country to 75 percent cumulative emission reduction (2,505.23 million metric tons of carbon dioxide equivalent) from 2020 to 2030. Of these reductions, 72.29 percent are conditional (based on the support that will be provided by Annex 1 Parties of the Convention) while 2.71 percent are unconditional/will be implemented using domestic resources.[17]

Moving forward, the government is working on the finalization of policies and measures (PAMs) in agriculture, waste, industry, transport and energy sectors to operationalize the NDC.

3.2.6 National Climate Change Action Plan (NCCAP)

The National Climate Change Framework Strategy has been translated into the National Climate Change Action Plan (NCCAP) which centers on seven key thematic areas as the strategic direction for 2011 to 2028. This includes the following priority areas: food security, water sufficiency, ecological and environmental stability, human security, climate-smart industries and services, sustainable energy, and knowledge and capacity development. NCCAP also assesses the country's

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[17] The Philippines' NDC can be accessed at:
https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Philippines%20First/Philippines%20-%20NDC.pdf

current climate change risk and highlights the strategic direction for 2011 to 2028 as a response to the current situation and projected impact. Under the "ecological and environmental stability" thematic area, institutionalizing natural resource accounting is one of the output areas with the following corresponding indicators: (a) wealth accounts or ENRA integrated in the national income accounts and (b) policy on ENRA developed and implemented.

3.3 Vision For The Environment and Natural Resources Sector

Consistent with *AmBisyon Natin 2040*, the ENR sector management also aims to "ensure ecological integrity and improve the socioeconomic condition of ENR dependent communities through enhanced cosystem services." However, the country remains challenged by several policy issues on ENR management as summarized in **Table 1**.

Table 1. Environment and Natural Resources Policy Issue Matrix

ENR Sector	Policy Issue
Forest resources	**Forest degradation.** The country's forest resources, comprising about 53 percent of the country's total land area,[18] are increasingly under pressure. The main drivers of deforestation and forest degradation problems include the gathering of fuelwood for cooking and charcoal making, slash-and-burn practices, upland agricultural cultivation, and illegal logging. The increase in rural population due to high fertility rates, the dependence on shifting cultivation, and rural poverty have added further stress on forest resources.
Land resources	**Degradation of land resources.** Accelerated erosion, pollution, and land conversion are the major issues that affect the quality of the country's land resources. Soil erosion, especially in upland areas and near water bodies, has resulted in less productive lands and difficulties in rehabilitating degraded lands. The unabated increase in the volume of wastes generated from households and industries has produced long-term impacts on the quality of both land and water resources._ _**Competing uses of limited land resources.** The lack of standard methodology to measure and monitor the total land cover has hampered the government's ability to effectively manage the country's natural resources. This can be supported by instituting a national land use framework to harmonize sector-spatial land use policies and address competing uses of limited land resources. The framework can address the lack of consistent quantitative analysis of land cover and land cover change.[19]

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[18] This figure includes both classified forestland (50.2%) and unclassified forest land (2.5%) (Department of Environment and Natural Resources 2012).

[19] David M. Wilson and Rodel D. Lasco, "Chapter 2: The Context of Land Cover Changes in Agriculture and Forestry," in *The Future of Philippine Agriculture under a Changing Climate: Policies, Investments and Scenarios*, eds. Mark W. Rosegrant and Mercedita A. Sombilla (Singapore: ISEAS – Yusof Ishak Institute / NEDA / CCAFS / PIM, 2018)

ENR Sector	Policy Issue
Coastal and Marine Resources, including fisheries	**Unsustainable coastal development practices: illegal, unreported, and unregulated fishing and overfishing.** As early as the 1960s, the country has already reached Maximum Economic Yield (MEY) for demersal fishes, some areas indicate declining catch per unit effort (CPUE) for small pelagic fish (e.g., sardines) since the 1950s.[20] This is supported by a 2013 assessment of the BFAR indicating declining fish catch per every effort, where a fisher gets only 62 percent of the catch of a 1980 fisher (given the same effort). Further, the BFAR reported in 2013 that 10 out of 13 of the country's fishing grounds have signs of overfishing.[21] Declining CPUE and breaching the MEY are among the factors causing the decline in the value of the fisheries resources and negatively affected the coastal and marine environment. **Degradation of the country's coastal and marine habitats.** Over the last decade, the country already lost a third of the country's coral cover based on the National Assessment of Coral Reef Environment (NACRE) Program assessment.[22] This is corroborated by the finding of the coastal resource mapping undertaken by the National Mapping and Resource Information Authority (NAMRIA) indicating a decline in the country's coral and seagrass cover from 2009 to 2016. **Limited availability of periodically updated data and resource assessment.** This affects the formulation of evidence-based plans and programs and makes it difficult to fully harness available opportunities from coastal and marine resources to generate income and contribute to the economy. Other threats stem from the (a) sensitivity and exposure of the sector to extreme weather conditions and climate variability for capture fisheries and (b) tendency to overstock and overfeed leading to eutrophication and fish kills, limited local sources of production inputs (40% of fish meal and other raw materials for feeds are imported), and (c) prevalence of diseases that affect production, especially for aquaculture.[23]
Minerals	**Lack of downstream industries.** The development of mining projects across the country has increased local and regional economic development through the investment of mining companies in infrastructure projects such as roads, utilities, and other facilities. However, the lack of downstream industries to develop minerals inhibits the country from harnessing the full

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[20] Stuart J. Green, et al. "Philippine Fisheries in Crisis: A Framework for Management," Coastal Resource Management Project of the Department of Environment and Natural Resources, Cebu City, Philippines, 2003 quoted in Danilo C. Israel, et.al. "Reducing the Unintended Consequence of Overfishing due to Open Access: Learning from the Zamboanga Experience," *PIDS Discussion Paper 2016-44*. Makati City: Philippine Institute for Development Studies, December 2016

[21] These include (a) Lingayen Gulf; (b) northern Zambales; (c) Camotes Sea; (d) Honda Bay, (e)Babuyan Channel; (f) Lagonoy Gulf; (g) Sorsogon Bay; (h) Hinatuan Bay; (i) Dinagay Bay; and (j) Davao Gulf.

[22] Commissioned by the Department of Science and Technology in cooperation with the Department of Environment and Natural Resources and De La Salle University, among others.

[23] Based on the findings of the Roundtable Discussion on Fisheries on June 21, 2019

ENR Sector	Policy Issue
	benefits derived from extractive activities, particularly in enhancing productivity and generating employment.
Energy	**An affordable and adequate supply of energy.** While the Philippines is the world's second-largest geothermal producer, electricity generation capacities need to be expanded. To meet the growing energy demands, the Department of Energy (DOE) will continue to provide additional capacity for power generation through aggressive implementation of the plans, programs, and policies of the government, including the Clean Energy Scenario that aims to achieve at least 30 percent share of renewable energy in the total capacity mix for power generation and significant increase of natural gas utilization. Some challenges to the energy sector are (a) ensuring energy security and competitive energy pricing; (b) increasing energy efficiency and reducing energy intensity; (c) reducing greenhouse gases (GHG) from the energy sector and transitioning to a low-carbon economy; (d) climate-proofing and rehabilitation of energy systems and infrastructure; (e) developing and utilizing indigenous energy resources; (f) increasing the share of renewable energy in the energy mix, and (g) improving access to modern energy services.
Enviromental Quality	
Water	**Access to clean and affordable water.** The quality of Philippine waters is being affected by rapid population growth, unmanaged urbanization, and increased economic activities, particularly in densely populated areas and regions, which drives the water demand. In areas with a high concentration of agriculture and industrial activities, the discharge of agricultural, domestic, and industrial wastewater runoff contributes to the degradation of the receiving water bodies. In 2015, 332 municipalities are still considered "waterless" or with no access to adequate water supply.[24] Further, the PSA[25] estimated that 14.5 percent (3.29 million) of Filipino families have no access to a safe water supply. **Climate change impacts water resources.** Climate change impacts threaten the supply and distribution of freshwater across the country, often leading to disasters, such as the massive crop failures and water shortages experienced after the 1997–1998 ENSO events in the tropical eastern Pacific Ocean.[26] The driest possible change will have a 40 percent reduction in rainfall.[27]

[24] National Economic and Development Authority, *Philippine Water Supply and Sanitation Master Plan* (Pasig City: NEDA, 2022), p.8

[25] Philippine Statistics Authority, 2014 *Annual Poverty Indicators (API) Survey: Final Report.* (Quezon City: PSA, 2014).

[26] Rex V. Cruz, et. al., "Asia," in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,* eds. Martin L. Parry, et. al. (Cambridge, UK: Cambridge University Press).

[27] Philippine Atmospheric, Geophysical, and Astronomical Services Administration, *Observed Climate Trends and Projected Climate Change in the Philippines* (Quezon City: PAGASA, 2018), 5-7.

ENR Sector	Policy Issue
	Water pollution. Only about 36 percent of freshwater supply from surface water is considered viable for human consumption. However, this is threatened by the lack of access to sewerage and sanitation services, which contributes to water pollution. In 2015, only 4.4 percent of households nationwide had access to adequate sewerage systems based on the National Demographic and Health Survey. The lack of treatment facilities for wastewater affects both water quality and the availability of water for other uses.[28]

Mismanaged plastic litter and debris. Water pollution is further exacerbated by the leakage of mismanaged plastic litter and debris into the marine and riverine environment. Recent independent studies[29] suggest that Philippines is a significant contributor of marine and riverine litter, which is a significant problem given that marine litter contaminates water resources and impedes the capacity of waterways to serve as drainages. In addition, plastics degrade into smaller particles called microplastics (>5 millimeters) which enter the food chain as they are consumed by fish and crustaceans. |
| Air | **Air pollution in metropolitan areas.** Increasing air pollution in major urban and regional centers poses a significant risk to the overall health of the population, agricultural crops, water quality, and others. The vast majority (81%) of air pollutants come from mobile sources such as vehicles, motorcycles, trucks, and buses; 18 percent came from stationary sources (such as power plants and factories); around 0.4 percent came from area sources (e.g., construction sites, open burning of solid wastes) based on the DENR-EMB National Air Quality Status Report 2016-2018. |

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[28] National Economic and Development Authority, "Chapter 19: Accelerating Infrastructure Development." *Philippine Development Plan 2017-2022,* (Pasig City: NEDA, 2017).

[29] Jenna R. Jambeck, et. al, "Plastic Waste Inputs from Land into the Ocean," Science, 347 (6223) (February 2015): 768–771.; Kara L. Law, et. al., "The United States' contribution of plastic waste to land and ocean," *Science Advances,* 6(44) (October 2020).; Lourens J. J. Meijer, et. al., "More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean," *Science Advances,* 7(18) (April 2021).

THE NCA ROADMAP

4.0 The NCA Roadmap

4.1 Rationale and Objective

The development of the NCA Roadmap was guided by the following key questions: (a) where are we now in the institutionalization of NCA in the Philippines; (b) where do we want to go; and (c) how do we get there. Specifically, NCA in the proposed Roadmap covers natural capital asset accounts, ecosystem accounts and related environmental indicators, and adjusted macroeconomic indicators incorporating the natural capital. The natural capital asset accounts take stock and appraise environmental assets (e.g., minerals, water, and timber) as well as changes in their stocks, both in physical units and monetary units. These can be measured at the national and subnational levels, Information from the natural capital asset accounts can be helpful in wealth accounting and in assessing the sustainability of economic development.

Ecosystem accounting, on the other hand, is spatially explicit and includes the physical measurement of ecosystems and the flow of services from these ecosystems into human activities; accounts can also be physical or monetary. The linking of natural capital analysis with economic data in ecosystem accounting clarifies the contributions of the ecosystem to economic activities. Hence, ecosystem accounting can be useful in assessing the state of the ecosystem and managing resources. Some developed countries (e.g., Australia, Canada, Norway, and United Kingdom) and developing countries (e.g., Bhutan, Chile, Indonesia, Mauritius, Mexico, South Africa, and Vietnam) have either piloted or are embarking on piloting the SEEA framework on ecosystem accounting.

The main objective of the Roadmap to Institutionalize NCA in the Philippines (NCA Roadmap) is to support the incorporation of natural capital accounts in the government system – including national economic accounting systems – as part of development planning and policy- and decision-making processes. The mainstreaming of natural capital, i.e., its integration into policy frameworks and development planning, can strengthen policymaking for sustainable development.

Specifically, the NCA Roadmap aims to:

1. Lay down the recommended NC accounts and activities to address the issues and challenges in the implementation of NCA in the Philippines in the short-, medium- and long term;

2. Provide the overall institutional arrangements, including roles and responsibilities of data producers, accounts compilers, and users; and

3. Identify areas for budget support and appropriate monitoring and evaluation system.

4.2 Components of the Roadmap

The Roadmap provides the linkages of NCA activities and how each component supports mainstreaming of natural capital and its integration into policy, planning, programming, and decision-making. The major components of the Roadmap include: (a) development of natural capital

accounts; (b) estimation of natural capital – adjusted macroeconomic indicators; and (c) policy use and applications. To strengthen the process of NCA, ancillary components such as data management systems, capacity development, and dissemination must be undertaken to support the production of the accounts and macroeconomic indicators and their policy use. These components are focused on complementary measures to improve the availability and quality of data and strengthen human resource capability for account compilation and policy use of accounts. Hence, the data management systems component is intended to improve the generation, management, and sharing of data to be used by account compilers. The capacity development component is aimed to develop and upgrade the skills in account compilation and adjustment of macroeconomic indicators, and policy use of the accounts and macroeconomic indicators. To enhance the policy use of NCA outputs, dissemination activities should be undertaken by both the compilers, to promote awareness of the NCA results, and the users of the accounts to highlight the role of NCA in policy analysis.

The general workflow for NCA and the relationship among the six components of the Roadmap are illustrated in **Figure 2.**
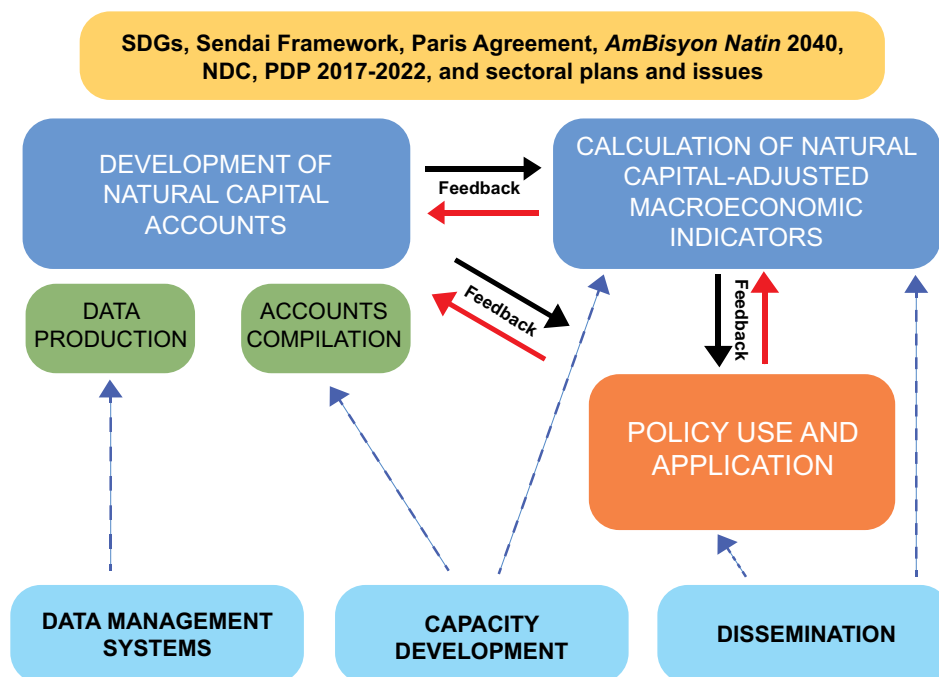
Figure 2. General Workflow of NCA Activities

The input to the compilation of accounts and the subsequent adjustment of macroeconomic indicators are data provided by the data producers. The account compilers are not necessarily the data producers, though they may produce some of the data used in the compilation.[30] The output of the compilation of the accounts and the adjustment of macroeconomic indicators are then used as inputs to policy analysis, development planning, and resource management decision-making. A feedback mechanism among the data producers, account compilers, and account users should be devised so that the process of NCA can be improved, particularly in terms of better data and methodologies.

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[30] In the workflow for mineral asset accounts shown below, it can be seen that although the PSA is the account compiler and uses some of its own data such as those on national account statistics, prices, firm surveys, and the input-output table, the compilation of the mineral asset accounts required a lot of data from the Mines and Geosciences Bureau of the DENR.

Component 1. Development of Natural Capital Accounts (National and Subnational Asset, Flow, and Ecosystem Accounts)

The compilation of accounts involves several steps such as the (a) preparatory work and design phase, which includes the formation of a technical working group or task force, initial training on the specific account development, local adaptation of the UN SEEA framework, and preliminary data assessment; (b) data collection and consolidation phase; (c) actual compilation of accounts, and (d) the preparation of technical reports. In the development of the natural capital accounts, the concepts, rules, and classifications are based on the UN SEEA frameworks which provide a clear pathway for understanding the interactions between the economy and the environment (i.e., linking environmental statistics and economic data). Hence, regular data production is key. Compilation of natural capital accounts becomes functional if the creation of metadata, identification of data sources and methods, and modelling/mapping tools are jointly done by the data providers and accounts compilers. The compilation of the physical and monetary accounts is contingent on the availability of environment and natural resources (ENR) data. Once the accounts are developed, these will undergo validation, review, and consultations to ensure accuracy and consistency of the data and parameters used prior to the release of NCA estimates.

Improving and updating the initial accounts (asset, flow, and ecosystem) may involve resolving data and methodological issues arising from the initial compilation, the coverage of other assets or ecosystem services in the accounts, or doing the accounts at the subnational level. To enhance their usefulness, asset, flow, and ecosystem accounts need to be regularly updated using more recent data so that changes in the state of natural assets can be monitored over time and appropriate intervention taken if warranted.

A.1 Asset Accounts

An important motivation for accounting for environmental assets is the concern over the long-term sustainability of our natural resources. Current patterns and practices of economic activities are depleting and degrading the available environmental assets more quickly than they can regenerate themselves. In a broader sense, NCA can help improve the management of environmental assets towards more sustainable use of resources. Moreover, it is important to determine the capacity of environmental assets to continue to provide input to the economy and society.[31] In the Philippine context, the same principles are followed such that the primary objective of compiling asset accounts is to measure the physical and monetary values of natural assets, including the changes on their stocks over time. Asset accounting then focuses on measuring addition to stocks due to natural growth and discoveries and reduction in stocks arising from natural losses and extraction of resources. It is also important to understand that in the UN SEEA Central Framework, assets are viewed as individual components. The interactions among these assets as part of ecosystem are not directly taken into account.

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[31] United Nations, et. al., *System of Environmental-Economic Accounting 2012 – Central Framework,* (United Nations, February 2014) https://seea.un.org/sites/seea.un.org/files/seea_cf_final_en.pdf

Aligned with the UN SEEA Central Framework, PSA is also looking at seven individual components that are considered environmental assets, which are prioritized to be updated and/or compiled both at the subnational (covering pilot regions and provinces) and national levels until 2040, as follows:

1. **Mineral asset accounts.** The PSA has compiled the mineral accounts for large-scale mines for the 2002-2012 and 2013-2020 periods. These existing accounts will be continuously updated by the PSA in partnership with the DENR Mines and Geosciences Bureau (MGB). The existing accounts can be improved and updated and explored to cover subnational accounts for pilot regions. The coverage of mineral accounts can also be extended to non-metallic resources and small-scale mining, which necessitate a special study on non-metallic and small-scale mining especially for the gold industry where there is significant participation of the informal sector. In 2023-2028, to determine its feasibility and scope, the PSA will undertake exploratory activities for the non-metallic mining and small-scale mining for gold and other commodities. PSA intends to carry out the activities as early as 2023-2024.

2. **Energy asset accounts.** The availability of data at the Department of Energy (DOE) on oil resources, natural gas resources, coal resources, and other energy sources will make the compilation of the energy accounts less difficult. The 2010 to 2017 Energy Asset Accounts was published by PSA in 2019, which already includes asset accounts for coal, oil, natural gas, and condensate. The latest compilation of PSA covers the years 2000-2020. In the period 2023-2028, the PSA will continue to update energy accounts and prioritize the same until 2040. Renewable energy accounts are more appropriately considered in the flow accounts to be consistent with the UN SEEA Central Framework.

3. **Water asset accounts.** Water resources consist of fresh and brackish water in inland water bodies, including surface water, groundwater, and soil water. Water resources are also included in the land accounts, with the area of water as the focus of interest. In the land accounts, the *in situ* or passive use of water (e.g., the provision of space for transportation and recreation) is considered. In the water resources accounts, the scope is on the volume of water and changes over time due to abstraction and use of water in the economy. In the updating of the water asset accounts, PSA will facilitate data collection from the National Water Resources Board (NWRB) and water utility entities to check existing stocks of water resources in the country – the additions and withdrawals from these stocks. The result will help understand better the sources of depletion and potential water quality degradation that can be considered in water-related plans and programs.

4. **Land and soil resources asset accounts.** In the SNA, land and soil resources are treated as a single asset type while in the SEEA Central Framework, these are considered as two separate assets. This recognizes the role of land in the provision of space and including soil resources as part of natural resources.[32] Physical asset accounts on land use and land cover can

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[32] United Nations, *SEEA Central Framework*.

provide important information to policy makers since conflicts in land use and the distribution of benefits underpin most of the problems in resource use. The land accounts may be disaggregated to the regional/subnational level to encompass different changes among land classes in terms of cover and/or land ownership. The total land asset in a specific region or province may not need to change over time as the changes are usually from one land use to another. However, aligned with the UN SEEA framework, the Philippines may experience an increase in total land area due to reclamation activities or decrease due to sea level rise submerging the coastal area.

The compilation of monetary asset accounts for land may be problematic because the valuation of land can be difficult. Hence, the PSA is continuously conducting research and development work to account for the complex nature of valuation of land. In terms of physical asset accounts for soil resources, the compilation will take into account the UN SEEA framework referring to the soil resources as the top layers of soil that form a biological system and provide the physical base required to support the production of biological resources and structure of the built environment. Excluded in the soil asset accounts are those soil losses arising from the extraction from the ground for construction and land reclamation. Due to complex recording of soils data and information and soil survey, the PSA will work closely with the DA - Bureau of Soils and Water Management (BSWM) on the scope and coverage, assumptions to be adopted, and methodological approaches starting 2022 to be able to come up with updated soils accounts starting 2023-2028 and beyond.

5. Timber resources asset accounts. The development of physical and monetary asset accounts for timber resources is important in analyzing its inputs for the manufacturing and construction industry for wood production. These accounts will also serve as bases for the measurement of the energy sourced from the timber resources. In the Philippines, the changes in the stock of timber due to afforestation, reforestation, and deforestations will provide a critical basis in crafting the needed policy reforms to conserve timber resources. The PSA has ongoing research on timber asset accounts, with data collection started in 2021 and expected to be completed in 2022. For 2023-2028 and beyond, the PSA will work with the DENR – Forest Management Bureau (FMB) to update the asset accounts for timber resources. This may include linking timber resources asset accounts to the land accounts and carbon accounting in ecosystem accounts. The regular conduct and updating of the forest resource assessment (FRA) of the DENR-FMB is crucial to the compilation of these accounts.

6. Biological resources. PSA will determine the priority biological resources through stakeholder consultations. Data assessment will be done to determine the feasibility of compiling the accounts for the selected resource. Data will then be collected, organized, analyzed, and compiled to populate the SEEA asset accounts tables. In 2023-2028, PSA will work with DA-BFAR to explore the compilation of fisheries asset accounts. PSA expects to start the work by 2023-2024.

A.2 Flow Accounts

Flow accounts allow for consistent analysis of the relationship between the flows of natural inputs and economic activity, the relationship between economic activity and releases, and the relationship between the flows in physical and monetary terms. For example, through the water flow accounts, the economic units responsible for the abstraction and discharge of water into the environment could be identified. In addition, the pressure on water quantities exerted by the economy can be assessed and monitored.

1. Energy flow accounts. At present, the PSA has an ongoing research and development activity on energy flow accounts. Technical reports on the compilation of these accounts are expected to be completed in 2022. The PSA will coordinate with the users to identify priority accounts such as the inclusion of renewable energy sources (e.g., solar, wind, hydro, and geothermal) in the energy flow accounts. PSA is continuously coordinating with the DOE for the energy balance tables.

2. Water flow accounts. The PSA first published Water Flow Accounts in 2019. In 2021, the PSA released the Water Flow Accounts covering the physical flow accounts for water resources of the Philippines for the period 2010-2019. In compiling these water flow accounts, the NWRB made significant contribution by providing data on the country's volume of water allocated per year by source from surface water or groundwater and by use (i.e., municipal, industrial, irrigation, power, fisheries, livestock, recreation, other purposes). On data on water production, billed volume, losses, and water prices, the PSA is supported by Maynilad Water Services Inc. (MWSI), Manila Water Company Inc. (MWCI), and Local Water Utilities Authority (LWUA).

3. Material flow accounts. Material flow accounts will be developed by PSA. In 2022, PSA is focusing on research and development to refine the scope and methods on the recording of physical flows of products, air emissions, solid waste, and other residual flow. Considering that materials are inherently natural inputs, products, and residuals, it is important to conduct research on data requirements, sources, and economic boundaries with respect to flow of materials to complete the physical supply and use table. After the research work, PSA will compile material flow accounts from 2023-2028 and beyond with regular updating.

4. Other flow accounts. In 2023-2028, PSA will conduct exploratory activities on the development of water emissions and air emissions accounts at the national and subnational levels. These accounts will be able to inform the formulation of policy reforms needed to address pressures on the environment and measures aimed at reducing emissions. Such information may include characteristics of emission-related activities – how much is being emitted and where they are being emitted. For water emissions accounts, PSA will study the specific measurement needed in quantifying the substances added to water by establishments and households (i.e., wastewater flows) such as types of substance and sources of water emissions and releases within a certain accounting period. For air emissions accounts, exploratory activities will help define the approaches to record the flows of particular gaseous and particulate substances within and between economic units. After the exploratory activities, compilation of these emission accounts will be completed and updated regularly until 2040.

The complete details on the asset and flow accounts to be developed per period until 2040 are presented in **Table 3** (The Roadmap Activities: Short-term, Medium-term, and Long-term Activities).

B. Ecosystem Accounts

In the development of site-specific ecosystem accounts in the Philippines, the DENR will adopt the UN SEEA Ecosystem Accounting Framework[33] which includes (a) ecosystem extent account (in physical terms), (b) ecosystem condition (in physical terms), (c) ecosystem services (in both physical and monetary terms), and (d) ecosystem asset accounts (in monetary terms). It is envisioned that any ecosystem accounts development initiative in the country should contain this set of accounts to provide a more integrated approach on NCA. The complete details on the ecosystem sites to be prioritized per period until 2040 are presented in **Table 3** (The Roadmap Activities: Short-term, Medium-term, and Long-term Activities).

The SEEA Ecosystem Accounting presents a framework for linking biophysical data, changes in ecosystems, and economic and human activities. While the Central Framework starts from the perspective of the economy and incorporates environmental information, the SEEA Ecosystem Accounting starts from the perspective of ecosystems and links ecosystems to economic and other human activities. Ecosystem accounting provides a framework for measuring the flows of services from ecosystems, including non-market activities, into economic and other human activities. Ecosystem assets can be viewed as consisting of various individual environmental assets interacting within a spatial area to provide a range of ecosystem services. Ecosystem accounting can then be helpful in assessing tradeoffs among different ecosystem services within a geospatial area.

Figure 3 provides an illustration of the ecosystem accounts. These are strongly interconnected and provide a comprehensive and coherent view of ecosystems. There is no single, all-encompassing ecosystem account. And while designed as a system of integrated accounts, each account has information and merit in its own right.

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[33] United Nations Statistics Division, *System of Environmental-Economic Accounting— Ecosystem Accounting (Final Draft)* (New York: United Nations, 2021).
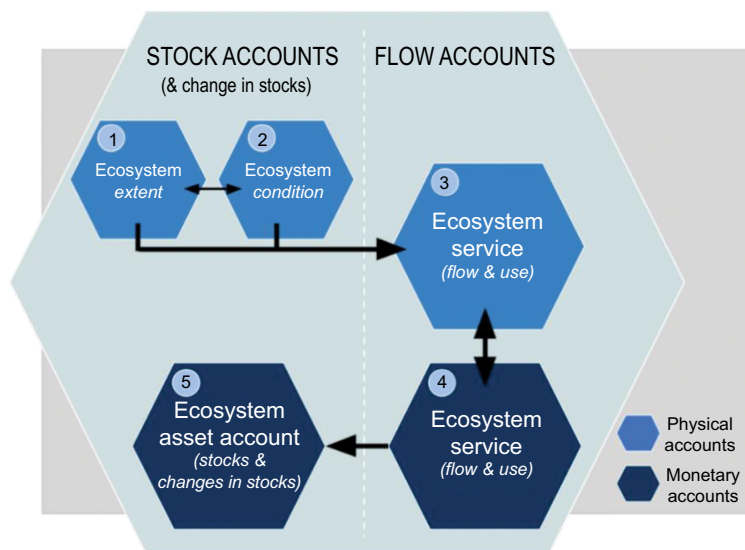
Figure 3. Summary of Ecosystem Accounts
(Source: UN SEEA, 2021)

1. Ecosystem extent accounts. Ecosystem extent accounts organize data on the extent or area of different ecosystem types. Data from extent accounts can support the derivation of indicators of composition and change in ecosystem types. This provides a common basis for discussion among stakeholders, including issues such as conversions between different ecosystem types within a country. Compilation of these accounts is also relevant in determining the appropriate set of ecosystem types that will underpin the structure of other accounts.

2. Ecosystem condition accounts. A central feature of ecosystem accounting is its organization of biophysical information on the condition of different ecosystem types. The ecosystem condition account organizes data on selected ecosystem characteristics and how far they are from the baseline condition and/or ideal state to provide insight into the ecological integrity of ecosystems. It will also organize data that helps measure the capacity of an ecosystem to supply different ecosystem services.

3. Ecosystem services flow accounts – physical terms. The supply of final ecosystem services by ecosystem assets and the use of those services by economic units, including households, enterprises, and government, constitute one of the central features of ecosystem accounting. The supply and use table is used to record the flows of final ecosystem services supplied by ecosystem assets and used by economic units during an accounting period. It also allows for the recording of intermediate service flows between ecosystem assets. In the Philippines, the ecosystem services to be accounted for will vary depending on the identified policy issues and intended policy use of the accounts per ecosystem site.

4. Ecosystem services flow accounts – monetary terms. Commonly, estimates of ecosystem services in monetary terms are computed by multiplying the physical quantities recorded in the ecosystem services flow account with the estimated prices for individual ecosystem services.

5. Ecosystem asset accounts - monetary. It records information on stocks and changes in stocks (additions and reductions) of ecosystem assets. This includes accounting for ecosystem degradation and enhancement.

The DENR requires the assistance of PSA in compiling site-specific ecosystem accounts. In particular, the PSA can assist the DENR in improving the methodologies of data generation and compilation; harmonizing concepts, definitions, and classification systems; and ensuring the methodologies are aligned with the accounting frameworks.

At a later stage of NCA, the links between the national satellite accounts and the site-specific (subnational) ecosystem accounts can be explored. The national level accounts and subnational accounts can be used to check each other for consistency. Site-specific ecosystem accounts can provide information for scaling up to the national level. Both sets of accounts can have complementary use in policy analysis.

The DENR, together with its bureaus and attached agencies, identified the sites for ecosystem accounting. The sites included in the planning periods 2022 and 2023-2028 were project sites of the ongoing Philippine Sustainable Interventions for Biodiversity, Ocean, and Landscapes (SIBOL) and the proposed Natural Capital Accounting and Assessment of the Global Environment Facility 7 (GEF7). For the succeeding planning periods (i.e., 2029-2034, 2035-2040), the selected sites were determined from the list of sites under the Sustainable Integrated Area Development (SIAD) and vulnerable areas included in the Risk Resiliency Program (RRP) **[see Appendix Table A4]**.

- Tier 1: the existing major policy issues involve tenure issues, land conversion, deforestation, solid waste, and water quality;

- Tier 2: characterized as key biodiversity areas, mining areas, critical watershed or river basin, climate change, and disaster; and

- Tier 3: characterized as environmentally-critical areas and/or environmentally-critical projects that fall within the scope of the Environmental Impact Statement System.[34]

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[34] Issued in 1981, Presidential Proclamation 2146 "Proclaiming Certain Areas and Types of Projects as Environmentally Critical and Within the Scope of the Environmental Impact Statement System Established Under PD1586" identifies the critical projects and areas.

The identified priority ecosystem sites based on the evaluation criteria are provided in **Table 2.**

Table 2. Priority Ecosystem Sites for Ecosystem Accounting in the Philippines

Period (years)			
2022	**2023-2028**	**2029-2034**	**2035-2040**
1. Masinloc-Oyon Bay Protected Landscape and Seascape (MOBPLS) in Zambales 2. Mt. Mantalingahan Protected Landscape (MMPL)	3. Laguna de Bay (LdB) 4. Southern Palawan 5. Puerto Princesa Subterranean River National Park (PPSRNP) 6. Cleopatra's Needle Critical Habitat (CNCH) 7. Siargao Island Protected Landscape and Seascape (SIPLAS) 8. Mt. Hamiguitan Range Wildlife Sanctuary (MHRWS) 9. Victoria-Anepahan Mountain Range (VAMR) 10. Calamianes Group of Islands	11. Chico River Basin (CRB) and Mt. Pulag National Park (MPNP) 12. Laur in Pantabangan, Nueva Ecija 13. Sierra Madre in Nueva Ecija 14. Sierra Madre in Cagayan 15. Iloilo 16. Apayao 17. Zambales 18. Northern Samar 19. Eastern Samar 20. Zamboanga Del Norte	21. Kaliwa Watershed in Marikina and Sierra Madre 22. Sorsogon 23. Samar (formerly named Western Samar) 24. Cebu 25. Kalinga 26. Ifugao 27. Catanduanes 28. Surigao Del Sur 29. Southern Leyte 30. Bukidnon

Figure 4 shows the location of identified ecosystem sites for ecosystem accounting per planning period (2022, 2023-2028, 2029-2034, 2035-2040). The brief description for each ecosystem site is summarized in **Appendix B.**
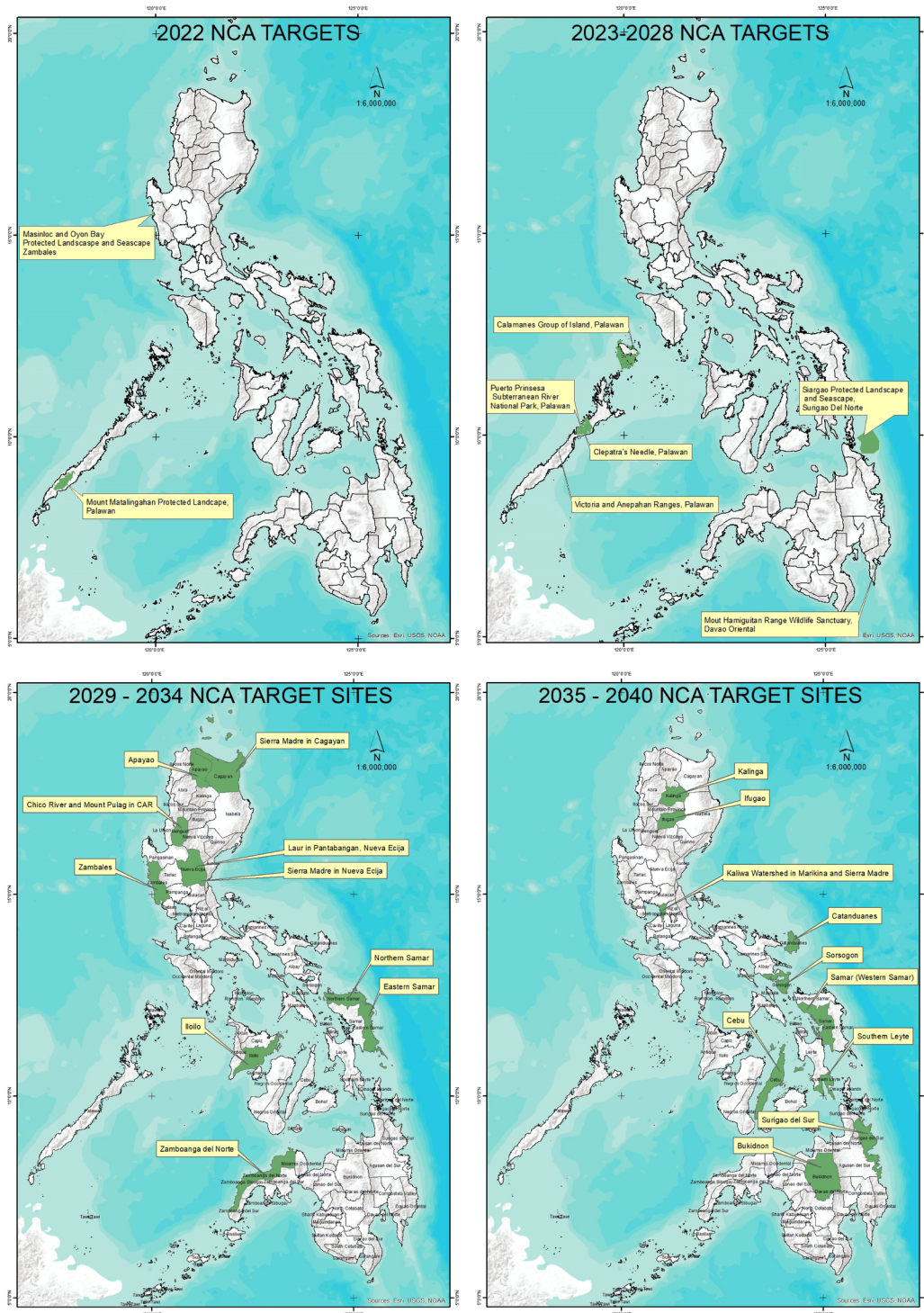

Figure 4. Location of Target Sites for Ecosystem Accounting

The selected 30 ecosystem sites can be increased, with the additional sites drawn from the list of ecosystem sites subjected to prioritization criteria. The DENR can increase the number of ecosystem sites to be prioritized until 2040 depending on the capacity development work and availability of funding from the government and development partners.

<table>
<tr><td colspan="2" align="center">**Expected Milestones**</td></tr>
<tr><td>**End of 2022**</td><td>☐ Compilation of national and subnational environmental asset accounts (pilot regions), exploratory work on flow accounts (material flow and renewable energy), and preliminary work on new ecosystem accounts</td></tr>
<tr><td>**End of 2028**</td><td>☐ Exploratory activities and research and development work on biological resources, non-metallic minerals, small-scale mining, water and air emissions; and compilation of ecosystem accounts for new priority sites</td></tr>
<tr><td>**End of 2034 and 2040**</td><td>☐ Regular compilation of complete set of natural capital accounts</td></tr>
</table>

Component 2. Calculation of Natural Capital-Adjusted Macroeconomic Indicators

The PSA will lead the calculation of natural capital-adjusted macroeconomic indicators. This component of the Roadmap underscores the importance of incorporating NCA in the country's economic performance. Adjustment is necessary to account for natural capital in the country's comprehensive wealth, which we use to generate income. At present, the economic performance is measured using the UN SNA, an internationally-agreed statistical standard that provides an overview of economic processes and record of how production is distributed among consumers, businesses, government, and foreign nations in the form of macroeconomic indicators, such as the gross domestic product (GDP) and gross national income (GNI), among others. However, while it measures economic activity, it does not fully capture the sustainability of such activities, especially the following:

- *Ecosystem services*. Under the SNA, for an activity to be treated as productive, it must be carried out by an institutional unit that exercises ownership rights over whatever is produced. Thus, the natural growth of wild fruits or fish stocks is not counted as production. Water supply from river basins and watersheds are not treated as production processes unless they are subjected to dam storage or piping. Likewise, rainfall is not accounted for in the GDP despite being an important factor in agricultural production.

- *Natural capital depletion and degradation.* The GDP and GNI as macroeconomic indicators do not account for the degradation and depletion of the environment and natural resources. The environmental impacts of economic activities, such as pollution, are also not covered in the accounts. For instance, a country's rapid GDP growth could be driven by unsustainable use of natural resources, which threatens its long-term ability to support economic activities.

In view of this, it is useful to have the natural capital-adjusted macroeconomic indicators to account for and analyze the sustainability of the country's economic and development processes.

In particular, the PSA will explore the calculation of (a) Adjusted Net National Income (ANNI); and (b) Adjusted Net National Savings (ANNS). This includes determining the trends in the national balance sheets and estimating its main components that comprise our comprehensive wealth (CW), covering the natural capital (e.g., minerals, energy, biological resources), along with produced capital and human capital. Conventional national accounts provide information on produced capital and financial capital, while NCA enables natural capital to be covered in the assessment.

For 2022, PSA will focus on capacity-building activities targeted to improve technical capacities in the estimation of these NC-adjusted indicators, especially the parameters, metrics, and assumptions to be adopted. Part of the capacity development is doing analytical work on measuring the depletion of natural capital, cost of environmental degradation, and pollution damages. PSA will also work closely with the DENR on the development of economic indicators for ecosystem services to be used in the adjustment of macro-economic indicators and national wealth.

For 2023-2028, PSA will come up with the NC-adjusted macroeconomic indicators capturing the minerals (metallic), energy, timber, and biological resources accounts. Since biological resources and metallic small-scale mining are being explored to be compiled from 2023 to 2024, their inclusion in the calculation of NC-adjusted macroeconomic indicators will commence in 2025-2028. In the same period, PSA will conduct capacity building on incorporating ecosystem assets and services in the NC-adjusted macroeconomic indicators. Depending on the capacity development, PSA will incorporate ecosystem accounts in the adjusted macroeconomic indicators from 2029-2034 and beyond. This also involves systematic analytical work and technical discussions on linking and situating the ecosystem accounts in the Philippines' comprehensive wealth.

PSA will also explore the usefulness and applicability of other macroeconomic indicators in the Philippine context such as the (a) Environmentally-adjusted Total Factor Productivity (Env-TFP) and (b) Depletion-Adjusted Fiscal (Operating) Balance. The Env-TFP has been pioneered by the Organisation for Economic Co-operation and Development (OECD) (called Multifactor Productivity or MFP) under their Green Growth Indicator Framework, and preliminary estimates were also made by the World Bank in *The Changing Wealth of Nations 2018*[35] The Depletion-Adjusted Fiscal (Operating) Balance indicator adjusts the national government's fiscal balance for depletion of natural capital and can be extended to depreciation/degradation.

As these NC-adjusted macroeconomic indicators are derived and linked with the national income accounts, the PSA macroeconomic database, including the Input-Output table, is vital in this estimation. Other relevant data sources include the Bangko Sentral ng Pilipinas (BSP) for the balance of payments, and the Commission on Audit (COA) and Department of Budget and Management (DBM) for government expenditures and sources of financing. With regular estimation and publication of these adjusted macroeconomic indicators, decision-makers will be better informed and guided in policy, planning, and investment programming. Specifically, this will help: (a) NEDA in policy review and evaluation and in socioeconomic planning and programming, (b) the Department of Finance (DOF) in finance and investment decisions, and (c) DBM in budgeting, among others.

	Expected Milestones
End of 2022	☐ Capacity development and scoping work on integrating economic indicators for ecosystem services in the adjusted macroeconomic indicators and national wealth
End of 2028	☐ Release and publication of preliminary NC-adjusted macroeconomic indicators and more capacity building work on incorporating ecosystem assets and services in the NC-adjusted macroeconomic indicators
End of 2034	☐ Strengthening demand, appreciation, compilation, and use of NC-adjusted macro-economic indicators
End of 2040	☐ Continuous work and publication of NC-adjusted macroeconomic indicators

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[35] Glenn-Marie Lange, Quentin Wodon, and Kevin Carey, *The Changing Wealth of Nations 2018: Building a Sustainable Future* (Washington DC: World Bank, 2018)

Component 3. Policy Use and Application of Natural Capital Accounts and Macroeconomic Indicators

The inclusion of policy use as a major component of the NCA Roadmap aims to address the lack of appreciation in the use of the environmental asset and ecosystem accounts and environmentally-adjusted macroeconomic indicators. The choice of accounts to be prioritized will be guided by the early practical application of the accounts in policymaking and resource management decision making. The activities in this component are timely since ongoing reforms focus on transparent and science-based decision-making while pursuing sustainable, inclusive, and resilient growth.

> **BOX 1**
> **In the Philippines, the government recognizes that NCA will help:**
>
> ☐ Guide the formulation of development plans, policymaking process, investment programming, and monitoring toward sustainable development. The use of a balanced set of indicators for social, economic, and environment in planning allows choices that support economic and social needs without compromising ecological integrity.
>
> ☐ Facilitate informed decision-making of political leaders and local communities on development options/activities vis-à-vis trade-offs. NCA will guide in weighing the gains and trade-offs of a development intervention using SD-lens to properly manage the competing uses of our natural capital.
>
> ☐ Improve the reporting of the country's performance and monitoring of ENR indicators. NCA allows for more systematic collection, monitoring, and reporting of data from both the national and local governments, including academic and research institutions. The indicators identified for the NCA will help update and improve the compilation of ENR statistics/data following the UN System of Environmental-Economic Accounting (UN SEEA) framework in the context of the Philippines.

For greater functionality of NCA, it is imperative that the PSA regularly compile input-output tables and construct produced capital stock series (in constant and current values). The two data series can be useful in analyzing distributional effects of economic policies and in estimating production technologies. These two data sets should be institutionalized as well at the PSA – there should be regular production of these statistics to enable more sophisticated econometric estimation and economic analysis. The 2018 Input-Output was released by the PSA in December 2021 and will be updated every six years. The Social Accounting Matrix (SAM) is targeted to be released in 2022.

The discussion of the possible policy applications or use of the accounts should start together with the development of the framework for the accounts. At this stage, a preliminary paper on policy use of the accounts can be prepared and additional data requirements for the policy analysis can be identified. NEDA can conduct policy analysis of PSA-produced accounts with the DENR or other concerned agency for the site-specific ecosystem accounts. However, policy use of the compiled natural capital accounts, whether compiled by PSA or another government agency, should not be limited to NEDA and the DENR. Other government agencies, such as the Department of Agriculture (DA), should be encouraged to use the accounts in their policy analysis. Further, use of the accounts

by nongovernment entities such as the academe, research and consulting groups, and civil society. should be promoted. The accounts may even be helpful to the private sector for planning and business development purposes.

The following discussion outlines the specific activities, milestones, and stages for succeeding period for Component 3. For 2022, the priority activities under this component of the Roadmap will help facilitate institutionalization for the succeeding planning period.

Inclusion of NCA-related indicators in the 2023-2028 PDP Results Matrix

NEDA, together with the DENR, and with the concurrence of the concerned Planning Committee, will ensure that natural capital accounting will be sustained in the 2023-2028 Philippine Development Plan. In particular, updating of existing and development of new ecosystem accounts will be identified as one of the priority strategies in the succeeding PDP to be formulated in the third quarter of 2022. To ensure timely and appropriate interventions and properly evaluate the effectiveness of ENR management interventions, NCA-related indicators will be adopted. For instance, ecosystem extent and condition accounts will be used in monitoring the impact of government interventions on the country's forest, coastal and marine, land, and mineral resources, including biodiversity. NCA will also be useful in improving the indicators used for monitoring the availability and quality of the country's water resources. Determining the outcome or output level indicators, annual targets, assumptions, mode of reporting, and responsible agency under the ENR Chapter of the PDP will be discussed during the plan formulation process.

Studies/assessment on the integration of NCA in development, sectoral and spatial planning, policy, and budgeting

In 2022, NEDA, in partnership with the DENR, the Department of the Interior and Local Government (DILG), the Local Government Academy (LGA), the Department of Human Settlements and Urban Development (DHSUD), and the Office of Civil Defense - National Disaster Risk Reduction and Management Council (OCD-NDRRMC), should conduct an assessment or study to recommend specific mechanisms for incorporating NCA in national development planning, resource management, and decision-making to aid in the adoption of NCA. The results of this study/assessment should serve as input on the reference manual and/ or guidance document that will be formulated for National Government Agencies (NGAs) and Local Government Units (LGUs) in integrating NCA into sectoral and spatial plans for the next planning period.

Adoption of NCA in national and local planning, policy, and budgeting

After the study, the DILG, DHSUD, OCD, Climate Change Commission (CCC), and DENR will ensure adoption and implementation of NCA in national, local development, sectoral and spatial planning, resource management, and decision-making. A Joint Memorandum Circular (JMC) among key government agencies shall be crafted and adopted in 2022. The JMC should

be consistent with the timeline of activities specified in the Synchronized Local Planning and Budgeting Calendar (SLPBC) of LGUs. This also entails a regular series of workshops and technical discussions with DHSUD, DILG, DENR, and other key government partners to create a guidance document or reference manual for the LGUs on the adoption of NCA in local development planning, policy, and budgeting.

To guide the national agencies and LGUs properly in mainstreaming NCA in national and local sectoral and spatial plans, NEDA, together with DILG and other concerned planning units of key agencies, will formulate guidelines on (a) mainstreaming NCA in the said plans or (b) the application of NCA as a tool in sectoral and spatial plans in 2023. These guidelines should build on the results of the studies/assessment on the integration of NCA in local development planning, policy, and budgeting. It should present a step-by-step process or possible key entry points for integrating NCA in (a) local development plans, specifically in the Comprehensive Land Use Plan (CLUP), Comprehensive Development Plan (CDP), (b) sectoral and/or thematic plans (e.g., Local Climate Change Action Plan [LCCAP], Local Disaster Risk Reduction and Management Plan [LDRRMP], Forest Land Use Plans [FLUP]) and (c) other strategic/sectoral plans such as the Philippine Biodiversity Strategy and Action Plan (PBSAP).

The guidelines should also present the natural capital accounts-based indicators and information for sectoral plans and policies enabling uptake and use of NC accounts in development planning, particularly in the formulation or updating of local development plans in the subsequent period. These guidelines are expected to be implemented in 2023, which should prepare NGAs and LGUs to champion the application of NCA as a tool in development planning. Inclusion of NC accounts in sectoral and spatial plans provides a basis for additional analysis, including forecasting, scenario building, or trade-off analysis, needed in the development planning of sectoral aspects (e.g., environment, social, and infrastructure) and policy formulation.

Development of policy papers on NCA

For 2022, the design of papers (e.g., policy notes/briefs) should rationalize the need for policy instruments to institute NCA in the Philippines and the required budget support from GAA to do so. Since support from the legislative branch is crucial, the DENR with the help of NEDA and PSA shall coordinate with the Senate Economic Planning Office (SEPO), Congressional Policy and Budget Research Department (CPBRD), Philippine Institute for Development Studies (PIDS), and Development Academy of the Philippines (DAP), among others, on the preparation and publication of policy briefs and notes on NCA to inform the concerned policymakers.

Expected Milestones

End of 2022 ☐ Policy issuances directing the integration of NCA in sectoral, spatial, and national/local development planning requirements and processes

☐ Publication of policy notes/briefs related to NCA tailored for the policymakers/decision-makers, local planners, business/industry sector, and government agencies

☐ Approval of the NCA indicators/parameters in the PDP-RM

These milestones will strengthen the execution of streamlining NCA in plan formulation in the succeeding planning cycle. It will provide the needed foundation to move ahead with NCA activities in anticipation for the change in administration.

For 2023-2028, the DENR will sustain its coordination with concerned stakeholders in the development of policy notes/briefs on NCA. This period will focus on translating the environmental asset and flow accounts and ecosystem accounts into policy. Policy users will compile and synthesize the results of natural capital accounts, including site-specific ecosystem accounts, and prepare policy papers for the adoption of appropriate policymaking bodies. For instance, the DENR shall regularly compile the result of the natural capital accounts and prepare a policy brief per thematic area (e.g., forest, land, biodiversity, coastal, and marine ecosystem) which can be used by concerned bureaus as input in preparing technical bulletins or administrative orders of the Department. In this period, other priority activities will need to be implemented:

NCA in investment programming and appraisal

Public investments are instruments used by the government in pursuing the overall development agenda. The programs and projects implemented by NGAs and LGUs should be aligned with and responsive to the overall development thrusts of the country, and within the limited resources available at their disposal. In principle, government should maintain a running list of potential interventions, out of which investment priorities are continuously identified for feasibility evaluation and eventual implementation. In the Philippines, major capital projects of the government are selected and approved by the Investment Coordination Committee (ICC) under the NEDA Board. Approval of these projects is based on the result of evaluation or appraisal by the NEDA Technical Board and Secretariat, particularly on their technical, financial, institutional, economic, environmental, and social viability.

NEDA should work with concerned government units in developing a reference or guidance document (e.g., guidebook) on NCA by 2023. This document will be useful for proponents in incorporating the NC parameters and indicators, including values of ecosystem services in project development and appraisal. Subsequently, this document will be useful for NEDA in project appraisal/evaluation, especially of infrastructure projects in environmentally critical areas. This reference document should contain natural capital accounts-based indicators and information that will help standardize NCA indicators/parameters in project development, providing references on minimum uniform metrics to incorporate ecosystem values. NCA is

useful in providing standard parameters and guidelines for assessing and quantifying possible impacts (positive or negative) of a proposed intervention or project on the environment, including the trade-offs and synergies. For instance, this will help in estimating the overall costs and benefits of an intervention beyond the usual financial and economic parameters, including those submitted for review and evaluation of the Investment Coordination Committee (ICC) of the NEDA Board.

Integration of NCA in the Philippine Environmental Impact Statement System (PEISS)

The DENR will lead this activity with support from NEDA and PSA. One entry point to incorporate NCA in investments is by using NCA parameters in the Environmental Impact Assessment (EIA) under the PEISS. The DENR Environmental Management Bureau (EMB) will explore this through a study or assessment of its potential integration in the EIA process. The study should provide recommendations on types of parameters needed and the valuation approach to be used to assess the project's environmental compliance.

Development of Financing Instrument with the potential for upscaling

As opportunities for green and sustainable finance continue to expand, ecosystem accounts will become indispensable tools in assessing the environmental impact of such financing schemes. NCA could also be useful in directing financial flows to green investments. In 2023, the Philippine government will work with financial institutions to ensure that environmental criteria are integrated in their respective investment practices. NEDA will work with the DENR, DOF, and other relevant agencies on the development of financing instruments based on the existing and newly-developed ecosystem accounts and pilot-testing in the identified priority sites will be explored in 2023-2028. The ecosystem accounts developed in the priority sites will then be used as input in designing a financing model such as a Payments for Ecosystem Services (PES) scheme for natural resources management activities.

Policy analysis using natural capital-adjusted macroeconomic indicators

Based on the results of the NC-adjusted macroeconomic indicators to be developed by the PSA, NEDA may undertake policy analyses or studies on the actual use of the indicators in reporting the country's economic performance. The study may be done in close coordination with the DENR and DOF to assess the current fiscal policies, penalties, or incentives relevant to ENR laws and regulations.

Expected Milestones

End of 2028
☐ Open access reference guide, technical reports, and policy analysis publication

☐ Updated PEISS-related guidelines providing the entry points for integration of NCA in environmental and social impact assessments of development initiatives

☐ Pilot financing instruments for easier incorporation of NCA in investment decision process of the government in partnership with financial institutions

☐ Integrated natural capital-adjusted macroeconomic indicators in policy analysis to measure economic performance

For 2029-2034, the government will sustain regular policy analysis and release of policy notes/briefs to ensure strong linkage and demand for accounts-to-policy in the country. In this period, the readiness of the higher education institutions to incorporate the concepts, theories, and principles of NCA in their systems will be enhanced. NEDA, DENR, and PSA should convene a series of consultations and technical discussions to implement the priority activity below and gain buy-ins from academic institutions and government regulatory bodies.

Integrating NCA in the Philippine educational system

To enhance the understanding and appreciation of future stakeholders and decision-makers on NCA, NEDA will coordinate with the Commission on Higher Education (CHED) to explore how NCA concepts, frameworks, and methodologies can be incorporated in curriculum of public and private colleges and universities. It is expected that by 2028, CHED has already developed and issued the necessary guidelines for integrating NCA in the higher education curricula. Continual review and updating of the curricula shall be conducted by CHED and relevant universities and colleges until 2040.

Expected Milestones

End of 2034
☐ It is envisioned that several milestones have already been attained to ensure smooth applications and use of NCA at this point, especially its direct use at investment decisions and prioritization at subnational level. The integration of NCA in higher education will support future workforce in advancing their competencies especially those in the field of ENR management, environmental economics, land use/urban planning, and climate change

For 2035-2040, the major milestone being envisioned in this Roadmap is the application of adjusted macroeconomic indicators. In this period, the untroubled policy application of the NC accounts is anticipated.

Application of adjusted macroeconomic indicators

The adjusted indicators embody the interrelationships between the economy and the environment and offer a better lens for measuring whether the country's growth is sustainable and able to support the overall well-being of present and future generations of Filipinos. These can also be used to analyze the level of efficiency in using natural resources as factors of production through material flow accounting, which is critical in achieving a circular economy and shifting toward sustainable consumption and production processes. The integration of NCA in macroeconomic indicators and in wealth accounting also helps assess trade-offs among and between policy and investment decisions and inform government of possible alternatives and better scenarios for development.

Expected Milestones	
End of 2040	☐ The government has fully internalized NCA in the public system across different sectors and levels
	☐ NCA is already part of the regular ENR statistics and reporting of economic performance – achieving "green" GDP

Component 4. Data Management Systems

This component of the Roadmap considers the data collection and collaboration work for decision-making. As a major data producer of environment-related data/statistics, the DENR is the primary agency concerned with NCA data management system, with its Knowledge and Information Systems Service (KISS) as the overall focal unit for implementation. The objective is for the DENR to provide good quality data readily accessible to users. Data of sufficiently good quality is needed to make evidence-based and effective policy and management decisions.

In the process of implementing NCA, further data gaps and problems can be identified. With a feedback mechanism between data producers and data users (account compilers and policy analysts), remedies can be explored to further upgrade the data systems used in NCA. At a later stage, data systems upgrading may not be limited to DENR but can be expanded to other government agencies that produce data useful for NCA. Technical assistance from the PSA will also be an important aspect of the data systems upgrading. PSA can provide technical assistance to other government agencies in the collection, setting of standards and harmonization, compilation and processing, maintenance, and dissemination of data for efficient data generation.

Establishment and maintenance of ENR database

The DENR will lead this subcomponent. The implementation of NCA requires an effective database and data management system to facilitate the storage, access, and processing of NCA data. The information and communications technology (ICT) requirements for ecosystems account development, production, and compilation will be identified. This includes hardware, software, and the appropriate architecture and governance for data processing. DENR needs financial and technical support in devising an effective data architecture and system for NCA, which will require upgrading of the following data systems components:

- *Hardware.* This includes physical working space, electronic devices such as computers, input-output devices, and storage devices that will be used for collecting data and for compiling ecosystem accounts. Adoption of Earth Observation and innovative remote sensing technologiesfor measuring the services, condition, and extent of the ecosystem, such as drones and unmanned aerial devices, will be encouraged.

- *Software.* This includes sets of programs that will be used to control and manage the overall database for ecosystem accounting as well as in processing/analyzing data. The DENR may need to procure spatial modeling or planning tools/software such as ArcGIS and other innovative mapping tools to facilitate the compilation and analysis of ecosystem accounts. Both the software and hardware of the database management unit should be regularly updated and upgraded to ensure data efficiency, security, and integration.

Database maintenance is important. Both software and hardware should be regularly updated. Similarly, to ensure access to reliable, complete, and accurate data, the database should also be regularly updated, maintained, and managed.

Data production, governance, and sharing protocol

During implementation of the Roadmap activities, it is important to identify the data generators, compilers, analysts and users, and the linkages among these institutions. The DENR and PSA will develop the design and architecture of database and information systems for data compilation and establish the flow and process for compiled data based on identified account components. To ensure that accounts compilation is consistent with national policies on data privacy and freedom of information, data handling protocols, policies, procedures, security, and privacy for compilation of accounts, especially for ecosystem accounts, should be developed and established both at the central and in local sites/field offices of the DENR. The development of protocols, production guidelines, standards, forms, data structures, and other necessities for data collection to ensure that data are compatible with other indicators used in 'regular' national accounting to link to national accounts will be undertaken. This should be done in close coordination with key government agencies that provide ENR data and information. It should also follow the UN-approved protocol and set of criteria to assure confidence, uniformity, and cross-country comparisons. Hence, the use of appropriate technologies to facilitate the processing, collection, and storage of a high volume of data is necessary. All these data and information on NCA should be embedded in the DENR Portal. Connection to the DENR Portal includes uploading, viewing, and updating of spatial data, metadata, and spatial attributes.

Further, this subcomponent is focused on improving and enhancing the availability and quality of data and the ease of access to data by the account compilers. Poor data quality can result in misleading policy prescriptions in the use of NCA results.

- *Short-term activity.* Once approved and adopted by the IACENRS, the NCA Roadmap can be used to enjoin partner agencies to provide data and assist the compilers on technical aspects of the resources (e.g., MGB for mineral accounts, DOE for energy accounts). Government agencies that are data producers and are ISO 9001:2008 certified, such as the National Mapping and Resource Information Authority (NAMRIA), have a more open policy on access to data. To help ensure proper use of the data, they require either a memorandum of understanding (MOU) for free data or a memorandum of agreement (MOA) for data that would incur further processing or expense on the part of the agency to generate.

  To facilitate the sharing of data from data producers to the account compilers and eventually the users – in line with the current administration's thrust for more open access to government information – it may be possible, through the PSA, to employ a general MOA among identified major data producers and the account compilers (e.g., PSA, DENR, DENR-partner agencies). The PSA may work out other mechanisms to facilitate access to data. An initial list of data requirements for NCA, including frequency of collection and level of disaggregation, may be drawn up. This list can be updated during the process of NCA. The KISS can start formulating a plan for upgrading the data system within DENR for NCA applications.

- *Medium-term activity.* To ensure the availability of the data required for NCA, these may also be recommended for inclusion in the PSA's designated statistics and in the PSDP. If assured of

regular data collection at specified frequency, updating the natural capital accounts can be more certain. The existing list of designated statistical activities needs to be examined and updated for the NCA data requirements. The request for some statistics to be "designated statistics" may be made after the initial compilation of an account and its demonstrated use in policy analysis.

- *Continuing activity.* During the process of NCA, the types of administrative data which can be used as inputs in NCA will be uncovered. Feedback from the account compilers (e.g., PSA as compiler of the mineral accounts) to the data producer (e.g., MGB) can help improve the system of administrative data.

Upon completing the design and architecture of database and information systems for data compilation, the accuracy, documentation, and management of data and information should be maintained. The key activities involve the establishment of a system for collection, storage, and sharing of data and information and database maintenance. It is important to process and consolidate ENR data into an integrated database with uniform metrics and parameters.

Data interoperability

Specific activities for this are the development of (a) an algorithm for data interoperability and (b) protocol for common data input/output as well as (c) an information system to manage data integration at the front-end for users and policy developers. The DENR, together with the DICT and DOST, will conduct a beta-test of the information system for data interoperability and sharing. They will also utilize cloud services and other data science technologies. Given the anticipated huge amount of data to be generated once NCA has been fully operationalized, the use of cloud services, internet-of-things, and other emerging data science technologies will be explored. Application of these digital technologies will facilitate the production of data through online submissions and access of the data in a central database. It will also enable automatic updating through cloud-based computing software and programs.

	Expected Milestones
End of 2022	☐ Work plan (identification of data requirements linking with the prerequisite for data infrastructure and setting working arrangements, protocols, and procedures) has systematized the supporting data management activities for the next period. Account compilation protocols and policies have been established to ensure efficient process for data sharing and submission in the data platforms (e.g., DENR Central Portal)
End of 2028	☐ Working data management which serves as the backbone of the entire NCA process. Data generation of ENR data at the local level has strengthened NCA compilation. Technical and financial support provided to DENR regional and field offices have resulted in the establishment of their respective local ENR databases
End of 2034	☐ Well-functioning data management systems have enabled updating of databases to accommodate emerging needs on NCA compilation
End of 2040	☐ Data automation and innovations have enabled the faster completion of accounts , making them ready for policy use

Component 5. Capacity Development

Capacity development is a critical supporting component of the NCA Roadmap. NCA requires bringing together ecological, accounting, and valuation expertise, among others. Capacity-building interventions are mainly at the account compilation and policy use phases and are focused on developing human resources to undertake NCA. A mechanism for accessing technical assistance and expert advice, both local and international, is needed. International exchanges of ideas and experiences can help raise the standards of NCA, introduce the Philippine account compilers to new methodologies, and make the process of account compilation more efficient by drawing from good practices and lessons learned from experiences in other countries.

To enhance the effectiveness of capacity development in government systems, a systematic approach to capacity building should be adopted, taking into account the following activities:

Development of training program and conduct of basic training on NCA and UN SEEA frameworks

Appendix C provides the indicative outline of the training program on NCA developed by NEDA. The training outline is intended to guide the capacity development of the government based on the learning experiences from previous NCA initiatives and the knowledge gaps that need to be addressed. Modules include refresher course topics on NCA such as the statistical frameworks, sample applications, and policy analysis. It also covers special training on the mapping and modelling applications as tools to help develop the accounts such as the geographic information system (GIS), InVEST (Integrated Valuation of Ecosystem Services and Trade-offs), ARIES (ARtificial Intelligence for Environment & Sustainability) Integrated Modelling, and Wealth accounting (including incorporation of ecosystem account).

In 2022, the PSA in close coordination with NEDA and DENR and other concerned agencies, will continue to implement programmatic training programs/modules and basic training on NCA and UN SEEA framework. These training activities will target the major NCA data producers, accounts compilers, and users to ensure alignment and harmonization of NCA concepts, methodologies, and resources. Central to this, capacity development should cover all data actors – data collectors responsible for ensuring repeatable and standard measurements; data collators who provide guidance on the proper use of emerging technologies for data collection; and data users/analyzers who will process data and understand data limitations that should be factored into decisions. Improving the capacity and competencies on NCA compilation also includes enhancing skills on spatial software, hardware systems, and data management. With the adoption of SEEA Ecosystem Accounting as an international statistical standard in March 2021, natural capital-adjusted macroeconomic indicators should consider not only individual natural resources but also ecosystem assets and the services they provide. In 2023-2028, training on NC-adjusted macroeconomic indicators will incorporate the ecosystem accounts. These training activities will be sustained until 2040.

Development of Technical Note to provide standard set of Ecosystem Typology (ET) or NCA terminology

In 2022, the PSA will lead the preparation of this technical note which must be agreed upon at the national level. This will serve as a reference document in defining and ensuring the alignment of the terms relevant to NCA work. Since ecosystem accounting concepts are relatively new to NCA users, having a technical note published by PSA based on the localized framework will be useful to better understand terms and concepts used. In 2023 and beyond, the technical note can be revisited to ensure that definitions are updated.

Establishment of local pool of trainers

To ensure sustainability, PSA, DENR and NEDA will tap groups of local NCA experts who can continue and scale-up capacity building activities, especially on wealth accounting and estimation of NC-adjusted macroeconomic indicators. The pool of local experts will be tasked to train new sets of trainers, specifically the government technical staff who will be directly involved in the actual estimation and updating of NCA, adjusted macroeconomic indicators, and their spatial applications. This will not only enhance the overall capacity of the country in undertaking NCA, but also help disseminate the relevance and importance of NCA to the country's development. Local consultants may also be hired to do NCA-related work such as scoping studies, special studies (e.g., on small-scale mining), ecosystem modeling to fill biophysical data gaps, and policy analysis. Such arrangements (e.g., tapping specialists) have advantages especially in filling the gaps in expertise within the government.

Development, review and updating of training kits and manuals

To account for the country's changing socioeconomic and environmental landscape as well as developments in the global practice of NCA, it is necessary to regularly review and update the NCA training kits and manuals. This should be led by the PSA in coordination with the DENR and other relevant agencies. The toolkits and manuals should serve as a practical guide for developing NC accounts to guide the key NCA players, especially members of the DENR technical working groups, in understanding better the process of NCA development. It should articulate the definitions, rationale, concepts, data sourcing methods, and key steps on NCA, especially on ecosystem accounting.

Competency development and human resource complement for NCA

Implementing NCA will require updating of skills and development of competencies not only of the individual personnel involved in accounts compilation but also of the units assigned to perform related functions. The DENR and other agencies that provide data may need to assess existing competencies vis-à-vis the competency and skills requirements for effective NCA implementation. The staff complement for NCA implementation should likewise be assessed and identified. Since it is critical to have a strong ENR database for NCA, the creation of additional operational units may be considered, as applicable, both at the central office and

regional/field offices of DENR and other concerned government agencies, subject to the review and approval of the DBM. This will ensure that data compilation, database maintenance, and data management will be part of the regular work of the DENR and other data producers. Skill and competency requirements will also be regularly reviewed to ensure that NCA personnel's skills and expertise are up-to-date.

The staffing and resource requirements for NCA should be taken into consideration. In PSA, regular staff for the Environment and Natural Resources Accounts Division (ENRAD) have been on board before the end of 2017. However, PSA may require additional staff once NCA is institutionalized. Personnel and training costs for some NCA work can be covered by the agency's existing budget. PSA continuously capacitates its staff to compile environmental statistics and accounts. In the DENR, there is a need to assess human and other resources that would be required for their NCA activities. KISS, in particular, may need additional resources since they would be doing the technical work of compiling the ecosystem accounts while also providing data support services. The resource requirements of other offices within the DENR and its affiliated agencies that would be involved in NCA activities also have to be determined. For example, persons/positions in FMB, MGB, EMB, Biodiversity Management Bureau (BMB), Land Management Bureau (LMB), Ecosystems Research and Development Bureau (ERDB), and NAMRIA that will work with KISS in account compilation and related tasks (e.g., data production, data management, policy analysis, dissemination, fund sourcing, and special studies) of the different offices with respect to NCA have to be identified.

Expected Milestones

End of 2022   ☐ Training needs assessment, engagement of stakeholders (including new officials and decision-makers in the next administration), designation of NCA units, and adoption of training modules have improved the understanding and appreciation of NCA work, which is crucial in developing human resources and collaboration in the succeeding period

End of 2028   ☐ Regular conduct of trainings on NCA frameworks and policy analysis, updating of training kits, updating of skills and competencies, and hiring additional personnel in the concerned government units have made the NCA accounts development process fully operational

End of 2034   ☐ Fully-functional staff dedicated for NCA have contributed to advancing and upscaling NCA work in the country

End of 2040   ☐ Local pool of experts and trainers regularly receiving and conducting capacity development activities have significantly contributed to the expansion and upgrading of NCA knowledge base in the Philippines

Component 6. Dissemination

To sustain and strengthen the demand for NCA, communication activities that involve multi-sectoral participation for enhancing public awareness on NCA and its usefulness in policy analysis need to be undertaken. Policy analyses created using the compiled asset and ecosystem accounts act as incentives for data producers and account compilers, hence the use of the accounts by other government agencies and local governments, the academe, private sector, and civil society organizations should be encouraged. Dissemination activities can enhance the relationship among data producers, compilers, and users. To do so, stakeholder mapping should be conducted to glean vital information on the target participants involved in the NCA to help obtain the buy-in needed for successful NCA implementation.

Establishment of NCA Community of Practice (CoP)

Similar to what is being done in some African countries (Botswana, Nigeria, Uganda), an NCA CoP in the Philippines can serve as a collaboration and learning platform to bring together advocates and professionals from the national and local governments, civil society, and academic and research institutions. NEDA, together with PSA and DENR, will establish this platform by 2022. The Philippines NCA CoP will provide a platform to support knowledge sharing on NCA-related initiatives. This will comprise academic institutions, the financial sector, multilateral and bilateral development institutions, civil society organizations, and government agencies (including the legislative branch), researchers, experts, and practitioners.

Crafting of NCA Communication Plan

To improve the understanding of NCA and its policy applications and promote the use of SEEA as a framework for NCA, an overall communication plan that embodies the strategy and action plan for dissemination can be formulated by the PSA. The communication plan shall include the goals, risks, audience, main messages, and programs on NCA. It shall be implemented by the PSA, as lead agency, and other government agencies involved in NCA activities with inputs from both data producers, policy analysts, policy makers, academics, and nongovernment organizations as well.

The NCA Communication Plan will (a) specify the roles and responsibilities of NCA players from inception, operation/implementation, and monitoring activities and other activity processes, (b) highlight the collaboration and feedback mechanisms among NCA players, and (c) design public awareness activities to increase the level of awareness of the community, business players, and government agencies.

Some communication platforms and tools that can be used are presentations and workshops, brochures, policy briefs, and websites. Effective dissemination can also enhance coordination and awareness of ongoing activities among those involved in NCA activities. The communication plan should also consider the following:

- Release/uploading of NCA implementation annual report;

- Linking of outputs to PSA website;

- Public awareness activities (e.g., press briefing, policy dialogues);

- Release/uploading of NCA implementation annual report on the website;

- Public awareness activities (e.g., press releases, social media cards, videographics, dashboards) and production of audiovisual and multimedia materials for NCA.

- Publication of initial results to the DENR e-library; and

- Publication of reports and curated ecosystems accounts summary data in the DENR website.

Establishment of coordination and feedback mechanisms among the NCA players

The compilation of accounts would require close coordination by the PSA and DENR with the other government agencies. For example, the PSA would need the inputs of the DOE and other energy-related agencies regarding the potential policy applications of energy accounts, the design of and setting up the localized framework of the energy accounts, and the data to be used for account compilation. Similarly, for the water accounts, the PSA is expected to solicit inputs from the agencies involved with water such as the NWRB and LWUA. For continuous improvement of the natural capital accounts, it is important to have feedback mechanisms among the data producers, account compilers, and account users through well-coordinated consultations, dialogues, and workshops.

Publication of State of the Philippine Environment and Natural Resources (SOPENR)

The DENR, in partnership with the PSA, will publish SOPENR every two or three years. This will present the state of the country's Natural Wealth and State of Ecosystem. The scope will depend on the results of the environmental asset and flow accounts as well as the ecosystem accounts in selected ecosystem sites and technical discussion with the compilers and users.

Expected Milestones	
End of 2022	☐ Collaboration platform such as NCA Community of Practice (CoP) has made NCA work in the country more transparent and effective leading to improved uptake on NCA
End of 2028	☐ Regular preparation and updating of NCA Communication Plan has ensured that the community, organization, and relevant stakeholders are always directed towards the same goals and objectives in NCA implementation. First publication of the State of the Philippine Environment and Natural Resources (SOPENR) has informed policies and decisions
End of 2034	☐ Continuous delivery of dissemination activities has made NCA institutionalization more relevant and beneficial to the users of the accounts
End of 2040	☐ Improved collaboration, coordination, and communication on NCA-related activities has significantly supported the implementation of priority activities in accounts development, policy use and application, and capacity development components

Budget Support

To support the abovementioned components, regular government funding must be secured. While the PSA has already incorporated NCA activities in their regular work program, the DENR has yet to fully incorporate NCA activities in their budget plan starting FY 2023. Funding requirements such as additional full-time staff and other resource requirements (e.g., equipment, materials, travel, consultants, training, counterpart funds for foreign-assisted projects, etc.), especially in undertaking ecosystem accounting need to be assessed.

Funding appropriations for special studies. In future budget requests for NCA implementation under the GAA, PSA and other relevant agencies should include funding for special studies, in addition to funding for training programs. Special studies may include the estimation of production and reserves in small-scale gold mining, the estimation of illegal withdrawals (water and forestry) and informal production (forestry and mining), and water pricing and subsidies, among others.

External assistance. Foreign-funded and special projects may also be a source of additional financing for NCA activities. For the DENR, it may be possible for some of the ecosystem accounts or some of the supporting components of the NCA institutionalization Roadmap or their subcomponents (e.g., capability building, data systems upgrading, etc.) to be funded under foreign-assisted projects.

Program Convergence Budgeting. The NCA Roadmap implementation can also be incorporated in the Program Convergence Budgeting under the Cabinet Cluster on Climate Change Adaptation and Mitigation and Disaster Risk Reduction (CCAM-DRR) as it directly supports the conservation and protection of environment and natural resources.

4.3 The NCA Roadmap: Short-, Medium-, and Long-Term Activities

The short-term (2022), medium-term (2023-2028) and long-term (2029 onwards) activities associated with the six major components of the Roadmap to institutionalize NCA and other supporting activities are summarized in **Table 3.**

Table 3. The Roadmap: Updated Activities from 2022 to 2040

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	**2023-2028**	**2029-2034**	**2035-2040**
•	**Component 1. Development of natural capital accounts (national and subnational assets, flow, and ecosystem accounts)**					
1.1	Asset Flow Accounts	PSA	National asset accounts: • Minerals (Metallic) • Energy (for development in 2022) • Land and Soil • Timber Subnational asset accounts for pilot regions: • Land and soil • Timber • Minerals • Water • Energy	Research and development of Biological resources: • Fisheries Continuous updating of the following Asset Accounts: • Minerals • Energy • Land and Soil • Timber • Water • Energy • Material Flow Development and continuous compilation of asset accounts at the subnational level Exploratory activities for the non-metallic mining and small-scale mining for Gold and other commodities	Continuous updating of the following Asset Accounts: • Minerals (Metallic and non-metallic) • Energy • Land and Soil • Timber • Water • Biological resources Continuous compilation of asset accounts at the subnational level	Continuous updating of the following Asset Accounts: • Minerals (Metallic and non-metallic) • Energy • Land and Soil • Timber • Water • Biological resources Continuous compilation of asset accounts at the subnational level
	Flow Accounts	PSA	Updating of water flow accounts developed in 2020	Continuous updating of flow accounts (water, energy, and material flow)	Continuous updating of flow accounts (water, energy, material flow, water emissions, air emissions)	Continuous updating of flow accounts (water, energy, material flow, water emissions, air emissions)

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	**2023-2028**	**2029-2034**	**2035-2040**
			Energy flow accounts (inclusion of renewable energy in the coverage is subject to further discussion with data producers) Material Flow (ongoing research and development)	Development and continuous compilation of the same accounts at the subnational level Exploratory activities on: • Water emissions and • Air Emissions accounts	Continuous compilation of flow accounts at the subnational level	Continuous compilation of flow accounts at the subnational level
1.2	Ecosystem Accounts • Ecosystem extent accounts • Ecosystem condition accounts • Ecosystem service accounts • Ecosystem asset accounts	DENR	Development of new ecosystem accounts • Masinloc Oyon Bay PLS (Zambales) • Mt. Mantalingahan Protected Landscape	Updating of Southern Palawan and Laguna de Bay Development of new accounts: • Puerto Princesa Subterranean River NP • Cleopatra's Needle CH • Siargao Island • Mt. Hamiguitan Range Wildlife Sanctuary • Victoria-Anepahan Ranges • Calamianes Group of Islands	Updating of Southern Palawan, Laguna de Bay, Masinloc Oyon Bay PLS (Zambales), Mt. Mantalingahan Protected Landscape New sites: • Chico River and Mt. Pulag • Laur in Pantabangan • Sierra Madre in Nueva Ecija • Sierra Madre in Cagayan • Iloilo • Apayao • Zambales • Northern Samar • Eastern Samar • Zamboanga Del Norte	Updating of the following sites: • Puerto Princesa Subterranean River NP • Cleopatra's Needle CH • Siargao Is. PLS • Mt. Hamiguitan Range Wildlife Sanctuary • Victoria-Anepahan Ranges • Calamianes Group of Islands New sites: • Kaliwa watershed in Marikina and Sierra Madre • Sorsogon • Samar • Cebu • Kalinga • Ifugao • Catanduanes • Surigao Del Sur • Southern Leyte • Bukidnon

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	**2023-2028**	**2029-2034**	**2035-2040**
●	**Component 2. Calculation of natural capital-adjusted macroeconomic indicators**					
		PSA	Capacity building for Natural capital-adjusted macroeconomic indicators Development of economic indicators for ecosystem services to be used in the adjustment of macro-economic indicators and national wealth	NC-Adjusted Macroeconomic Indicators: • Mineral (Metallic) • Energy • Timber • Biological resources Capacity-building on incorporating ecosystem assets and services in the NC-adjusted macroeconomic indicators	NC-Adjusted Macroeconomic Indicators: • Mineral (Metallic) • Energy • Timber • Biological resources • Ecosystem accounts Updating of indicators	NC-Adjusted Macroeconomic Indicators: • Mineral (Metallic) • Energy • Timber • Biological resources • Ecosystem accounts Updating of indicators
●	**Component 3. Policy Use and Application**					
		NEDA, DENR, DILG, DHSUD, OCD, LGA, CCC, CHED, SEPO, CPBRD other users	Inclusion of NCA indicators in the 2023-2028 PDP-Results Matrix (NEDA/DENR) Studies/assessment on the integration of NCA in development, sectoral and spatial planning, policy, and budgeting (NEDA, DENR, DILG, LGA, DHSUD, OCD, CCC) Adoption of NCA innational and local planning, policy, and budgeting (NEDA, DENR, DILG, DHSUD, OCD, CCC)	Development of policy notes/briefs on NCA (NEDA, DENR, PIDS, SEPO, CPBRD) Policy analysis using natural capital-adjusted macroeconomic indicators (NEDA) Study on financing instrument for upscaling (NEDA, DENR, DOF) Guidebook/Guidance document on NCA in project preparation and design (NEDA, DENR, PSA)	Inclusion of NCA modules in the educational system (CHED) Regular policy notes/briefs and policy analysis (NEDA, DENR, PIDS, SEPO, CPBRD)	Continuing incorporation of NCA both in national and local development planning, resource management, and decision-making (NEDA, DENR, DILG, DHSUD, OCD, CCC) Application of adjusted macroeconomic indicators, including ecosystem accounts (NEDA, DOF)

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	2023-2028	2029-2034	2035-2040
			Development of policy notes/briefs on NCA (NEDA, DENR, PIDS, SEPO, CPBRD)	Integration of NCA in the Philippine Environmental Impact Statement System (PEISS) (DENR)		
●	**Component 4. Data Management System**					
	● **4.1 Establishment and maintenance of ENR database**					
		DENR with DICT, DOST	Identification of infrastructure requirements for hardware, software and network that will be used for ecosystems account development, production, and compilation Proposals for expansion of data storage and handling capability of DENR and upgrading of servers Proposal for expansion of spatial data handling capacity of the DENR, including purchase of ArcGIS licenses Plans for hardware and other back-end infrastructure procurement, maintenance and upgrading Assessing hardware, network and software assets available for use	Additional hardware for data store of compiled accounts ● Server ● Workstations ● Gadgets for data collection ● GPS units for location ● Drone for imagery ● Photography equipment ● Other requirements Expansion of software for NCA Continuing assessment and updating. Procurement Maintenance and upgrading Establishment of Local ENR database for data production locations / field offices	Hardware, equipment and tools maintenance Additional hardware provisioning for expansion of accounts Use of ArcGis as platform for spatial analysis and mapping ecosystems Continuing assessment and updating Procurement Maintenance and procurement/upgrading of assets Maintenance, updating, upgrading and expansion Connection to DENR Portal includes uploading, viewing and updating of spatial data	Hardware, equipment and tools maintenance Additional hardware provisioning for expansion of accounts Spatial analysis is incorporated to all ecosystem account. Data submission is coursed through the DENR Portal Continuing assessment and updating Procurement Maintenance and procurement of new assets Maintenance, updating, upgrading and expansion

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	**2023-2028**	**2029-2034**	**2035-2040**
			Design and development of database and information systems for data compilation and dataflow and process based on identified account components	Establishment of process flow for submission of produced data Pilot links to the Central DENR Portal through network services Setting-up account compilation protocols and policies	Design for automation of data generation and compilation (use of digital platforms)	Full connectivity to DENR Portal
	● **4.2 Data production, governance, and sharing protocol**					
		DENR/PSA	Development of standards, production guidelines, forms, data structures Submission of produced data, including metadata and spatial attributes Institutionalize account creation, and compilation among PSS agencies and PSA members and other government units and SUCs producing/using NCA data Development of data handling protocols, policies, procedures, security and privacy for compilation of accounts, both at the central and in local sites/field offices	Use of internet and technology-based communication to submit data	Full data production is linked to Central database for automatic data transfers and updating Maintenance, updating, upgrading and expansion	Continuous updating and upgrading in data processing and governance Data production makes full use of technology for data production and sharing

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	2023-2028	2029-2034	2035-2040
	• 4.3. Data Interoperability					
		DENR, DOST, DICT	Development of algorithm for data interoperability and protocol for common data input/output; Development of information system to manage data integration at the front-end for users and policy developers;	Beta-test of information system for data interoperability and sharing	Cloud-hosted database of interoperable data established and maintained through API and appropriate access/sharing protocol	Maintenance of data system
	• Component 5. Capacity Development					
		DENR, PSA, NEDA	Development of training program and conduct of basic training on NCA and UN SEEA frameworks Development of Technical Note to provide standard set of Ecosystem Typology (ET) or NCA terminologies (PSA)	Follow-up training and other special training courses (e.g., GIS, wealth accounting, policy analysis) Establishment of local pool of experts and trainers Regular development, review and updating of training kits and manuals	Follow-up training and other special training courses (e.g., GIS, wealth accounting, policy analysis) Strengthening of local pool of experts and trainers Updating of training kits/manuals	Follow-up training and other special training courses (e.g., GIS, wealth accounting, policy analysis) Strengthening of local pool of experts and trainers
		DENR, PSA, NEDA	Competency Development and Human Resource Complement for NCA	Roll out trainers' training for personnel who will be involved in expansion of NCA	Training expansion	Training expansion and re-training for updated capacity development for all involved personnel
		DENR, PSA, NEDA	Identification, designation and setting up of NCA units and personnel for initial data production and compilation of accounts, training and competency development, and other NCA activities through agency policy issuance (DENR/NEDA and other relevant agencies) .	Updating skills and competency of personnel and units assigned to perform related functions (DENR) Proposal for creation of an additional unit at the central office (DENR)	Full operational unit created at the central office for data compilation, database maintenance and data management (PSA/DENR)	Upgrading of NCA skills/expertise (PSA/DENR)

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	**2023-2028**	**2029-2034**	**2035-2040**
				Proposal for hiring additional personnel in data gathering units/field offices (DENR)		
●	**Component 6. Dissemination**					
		DENR, PSA, NEDA	Establishment of NCA Community of Practice (NEDA)

Release/uploading of NCA implementation annual report (PSA/DENR)

Publication of initial results to the DENR e-library (DENR) | Crafting of NCA Communication Plan (PSA)

Establishing coordination, collaboration and feedback mechanisms and platforms among the NCA players (PSA/DENR)

Public awareness activities

Release/uploading of NCA implementation annual report on the website (PSA/DENR)

Publication of reports and curated ecosystems accounts summary data on the DENR website (DENR)

Publication of State of the Philippine Environment and Natural Resources, (SOPENR) (DENR)

Production of audiovisual and multimedia materials for NCA (PSA/DENR) | Continuing public awareness activities, updating and implementation of Communication Plan, publication of reports and ecosystems accounts summary (PSA/DENR)

SOPENR published every 2 or 3 years with an online version at the DENR and PSA websites (DENR)

Production of audiovisual and multimedia materials for NCA (PSA/DENR) | Continuing public awareness activities, updating and implementation of Communication Plan, publication of reports and ecosystems accounts summary (PSA/DENR)

SOPENR published every 2 or 3 years with an online version at the DENR and PSA websites (DENR)

Production of audiovisual and multimedia materials for NCA (PSA/DENR) |

No.	Components/ Activities	Focal Agency	Period (years)			
			2022	**2023-2028**	**2029-2034**	**2035-2040**
•	**Review, monitoring, and updating of roadmap activities**					
		PSA	Annual review and reporting (PSA)	Annual review and reporting (PSA) Discussion on updating the activities (2023) (PSA)	Annual review and reporting (PSA) Discussion on updating the activities (2029) (PSA)	Annual review and reporting (PSA) Discussion on updating the activities (2035) (PSA)
•	**Budget Support**					
		DENR, PSA (from 2022-2028) DENR, PSA, other stakeholders (2029-2040)	Planning and budgeting for NCA activities within the DENR, including data management, e.g., ISSP inclusion.	Continuing budget support for PSA and DENR	Continuing budget support for PSA and DENR	Continuing budget support and other stakeholders

05

GENERAL NCA IMPLEMENTATION STRUCTURE

5.0 General NCA Implementation Structure

The proposed implementation structure for NCA institutionalization is illustrated in **Figure 5.**
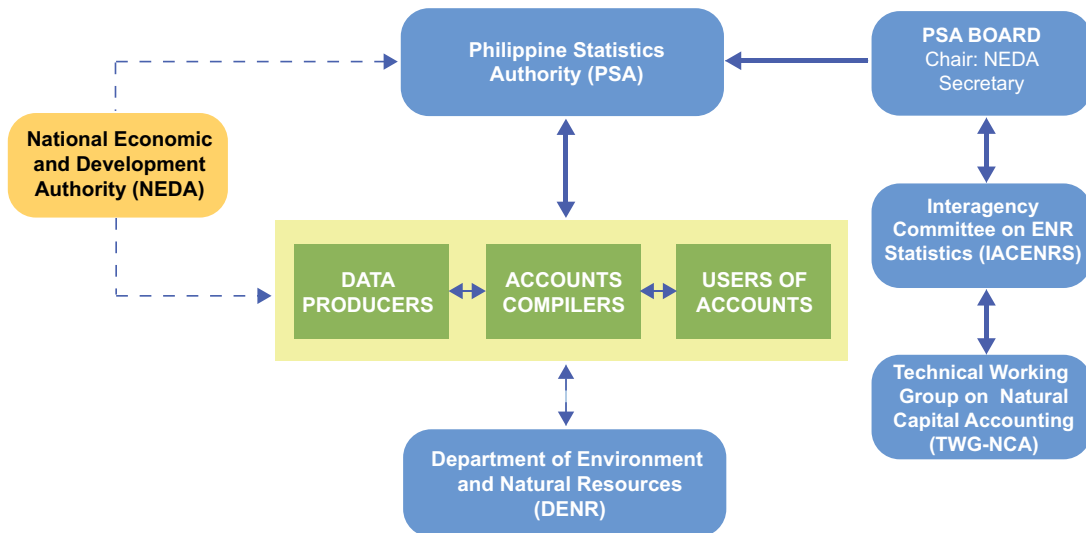

Figure 5. Proposed Implementation Structure for NCA Institutionalization

Box 2. Major players in NCA	
Data Producers:	DENR bureaus and attached agencies (MGB, FMB, LMB, BMB, ERDB, EMB, regional offices, LLDA, PCSD, NAMRIA, NWRB)
	DA bureaus (Agricultural and Fishery Standards, Fisheries and Aquatic Resources, Soils and Water Management)
	DOST (PCAARRD, PAGASA)
	DOE, PSALM, NPC, N TC, NGCP, NEA, ERC, WESM, distribution utilities
	DTI, DOF, DOT, DOTr, DHSUD, DILG, PSA, NCIP, BSP, NEDA, LGUs
	Non-government bodies, academic and research institutions
Accounts Compilers	PSA – lead agency
Users of Accounts agencies	PSA – lead agency
	Executive Branch – NEDA, DENR, DA, DOE, DILG, DOF, CHED PIDS, other government
	Legislative Branch – Senate, House of Representatives
	Local governments
	Civil society and NGOs
	Private business sector
	International agencies
	Academic and research institutions

5.1 Roles and Responsibilities of Major NCA Players

PSA Board. Strategic direction and guidance shall be provided by the PSA Board, which is chaired by the Secretary of Socioeconomic Planning. This includes matters on: (a) designation of natural capital accounts to be developed based on policy issues and priorities; (b) localization of the UN SEEA frameworks for the improvement of statistical coordination; and (c) harmonization of government statistical operations, standards, and classifications related to NCA. Further details on the implementation structures within NEDA, PSA, and DENR are provided in **Appendix D.**

PSA. The Philippine Statistics Authority shall have the overall responsibility for the institutionalization and implementation of NCA. As the primary statistical agency, the PSA shall be responsible for the compilation of national and subnational accounts and provision of technical support to other government agencies on (a) data systems and management and (b) account compilation to ensure consistency with the UN SEEA frameworks. The PSA has primary responsibility over national censuses and surveys, sectoral statistics, community-based statistics, consolidation of selected administrative recording systems, and compilation of national accounts. As such, the PSA can create a pool of technical staff with expertise and/or background on statistics, economics, and environmental science, among others.

NEDA. The National Economic and Development Authority shall ensure that NCA is included in the development priorities of the government based on the usefulness of the accounts in policy analysis, planning, and investment programming processes. In the interim, NEDA will support institutionalization by linking accounts to policies to respond to the demand on NCA in the Philippines and enabling evidence-based decision-making. In the long run, as chair of the PSA Board, NEDA's role will focus on providing strategic guidance to improve the uptake on policy use and application, enhance institutional capacity, and raise awareness and transparency of NCA work. NEDA will also support the policy instruments/legislation that will strengthen the implementation of NCA and ensure budget support in the government.

DENR. The Department of Environment and Natural Resources will construct site-specific ecosystem accounts and be a major data producer as well as user of the accounts. In parallel, the PPS will have overall responsibility for NCA within the DENR, with KISS as the PSA counterpart in the DENR, responsible for the compilation of ecosystem accounts and providing the major data support service for NCA. Within the DENR, a technical working group (TWG) is created under Special Order No. 2021-315 for the institutionalization of NCA. The Directors of PPS and KISS serve as the chairs of the TWG with members from various DENR bureaus and attached agencies.

Interagency Committees. The Interagency Committee on Environment and Natural Resources Statistics (IACENRS) shall assist the PSA in addressing agency and sectoral concerns that may arise in the development of the NC accounts, particularly on the: (a) techniques and methodologies in generating ENR statistics; (b) areas of duplication, discrepancies, and gaps; and (c) workable schemes for the improvement of data systems of accounts including production, dissemination, and archiving of data and information. The IACENRS shall provide support in ensuring that all concerned agencies are generating the data requirements of the NCA. The Technical Working Group on NCA (TWG-NCA)

under the IACENRS shall serve as a dedicated body acting as entry point for all NCA initiatives in the country and provide immediate support to achieve the priority activities across all components of the Roadmap (e.g., securing budget/ financial and technical support and collaborating with development partners for project preparation and implementation).

Data producers. The agencies that produce relevant data to develop NC accounts are expected to know the data requirements (i.e., types of information, frequency of collection, and data format and parameters) of the NCA to ensure that the generated information could feed into the national statistical system. Data producers continuously discuss standards and classifications of statistical information to facilitate timely compilation of accounts. Key data producers are the DENR bureaus and attached agencies (e.g., MGB, FMB, LMB, BMB, EMB, ERDB, regional offices, LLDA, PCSD, NAMRIA, NWRD), DA bureaus (e.g., Agricultural and Fishery Standards, Fisheries and Aquatic Resources, Soils and Water Management), DOST (e.g., PCAARRD, PAGASA), DOE, PSALM, NPC, NTC, NGCP, NEA, ERC, WESM, distribution utilities, DTI, DOF, DOT, DOTr, DHSUD, DILG, PSA, NCIP, BSP, NEDA, LGUs, non-government bodies, and academic institutions.

Accounts compiler. The PSA as the lead in the compilation of national and subnational accounts facilitates all the processes in the account development – from the designation of the priority accounts to the release of final estimates and dissemination. In the interim, the ecosystem accounts can be developed by the DENR, LLDA, PCSD, and other stakeholders for site-specific and area-based ecosystem accounts, particularly in their priority ecosystem sites. The development of these ecosystem accounts should be closely consulted and coordinated with PSA. In the long term, PSA is envisioned to handle the development of ecosystem accounts on a national scale.

Users of accounts. Policymakers, planners, and decision-makers can utilize NC accounts, particularly on using relevant information on the stocks and flows of natural capital, to identify strategies and needed reforms for a particular sector. This may involve policy analysis to come up with policy decisions and recommendations to better manage the country's natural resources and understand the contribution of the natural capital to economic growth. The intended users of accounts include the executive branch such as NEDA, DENR, DA, DOE, DILG, DOF, and other government agencies, which can use said accounts in the development of their plans and programs. The legislative branch (i.e., senate, house of representatives) are also potential users of these accounts for policy and other legislative instruments. Other key users include LGUs, especially in planning and development, CSOs, business sector, international organizations, and the academe.

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Appendices

Appendix A. Phil-WAVES Project

Appendix Table A1. Components of the Philippines WAVES Project

	Component	Objectives	Expected Outputs	Focal Agency For Compilation of Accounts
1	Macroeconomic indicators	To develop macroeconomic indicators that for natural capital values to measure the sustainability of economic development	Enhanced macroeconomic indicators such as adjusted net national income (ANNI), adjusted net national savings (ANNS), produced capital (PC), and comprehensive wealth (CW); policy analysis	Former NSCB – Integrated Accounts Division (currently PSA-ENRAD), NEDA-ANRES, and NPPS - policy analysis
2	**National satellite account for priority sectors**			
2.1	Mineral accounts	To develop physical and monetary mineral asset accounts using the 2012 SEEA Central Framework	National asset accounts for minerals (physical and monetary) for gold, copper, nickel and chromium; policy analysis	PSA–ENRAD, NEDA-ANRES, and NPPS; DENR-MGB -policy analysis
2.2	Mangrove accounts	To develop physical and monetary mangrove ecosystem accounts	National accounts (area/extent, biomass, carbon sequestration) and pilot site in Pagbilao (fish production enhancement, ecotourism, protective services, area/extent, biomass, carbon sequestration); policy analysis	PSA – ENRAD, NEDA-ANRES. and NPPS; DENR-PPSO - policy analysis
3	**Ecosystem accounts for pilot sites**			
3.1	Southern Palawan	To compile pilot ecosystem accounts using the 2012 SEEA Experimental Ecosystem Accounting Framework	Ecosystem accounts (Physical and monetary) Policy analysis Ecosystem accounts (land, carbon, ecosystem condition, ecosystem service use and supply, ecosystem asset)	PCSD, DENR
3.2	Laguna de Bay		Ecosystem accounts (land, water, ecosystem condition, ecosystem service use and supply, ecosystem asset)	LLDA

Appendix B. Priority Ecosystem Sites for Ecosystem Accounting in the Philippines

Appendix Table A2. Priority Ecosystem Sites for Ecosystem Accounting in the Philippines

Sites	Description
Priority sites for 2022	
1. Masinloc-Oyon Bay Protected Landscape and Seascape (MOBPLS) in Zambales	The MOBPLS, a 7,558-hectare ecosystem, is the first and only marine protected area in Central Luzon under the Expanded National Integrated Protected Area System (ENIPAS) Act. It is known for its distinctive characteristic of being a self-seeding area, which is home to unique species of giant clam or *taklobo (Tridacna gigas)*, mesophotic corals, large fishes, and the threatened Blue-spotted rabbitfish *(Siganus corallinus)*.[36]
2. Mt. Mantalingahan Protected Landscape (MMPL)	Situated on the highest peak of Palawan at 2,086 meters above sea level, the MMPL is a key biodiversity area (KBA) where new species are still being discovered. This mountain covers around 120,457 hectares of forests with a rich contribution to biodiversity and endangered wildlife, such as the Philippine cockatoo, the talking mynah, the blue-naped parrot, and the Philippine pangolin.[37] With around 200,000 people that depend upon it, including some 3,000 families of indigenous Palawans who have lived on this land for thousands of years, it is important to ensure that forest ecosystems sustain its water services for their agriculture, drinking water, and livelihoods as well as its carbon sequestration services.[38]
Priority sites for 2023-2028	
3. Laguna de Bay (LdB)	In 2016, the ecosystem accounts for LdB were developed under the Philippines Wealth Accounting and Valuation of Ecosystem Services (Phil-WAVES) Project. The spatial coverage includes LdB region and watershed levels. The full suite of accounts include: (a) land account containing land cover and changes from 2003 to 2015; (b) water account using modelled water use by all sectors; (c) ecosystem condition account indicating various terrestrial and water quality indicators, changes in lake bathymetry, and sediment loading; and (d) ecosystem service accounts focusing on fish production, sediment control, and flood regulation.[39] With the latest 2020 land cover map, the accounts can be updated and expanded to cover other ecosystem services.
4. Southern Palawan	Similar to LdB, pilot ecosystem accounts in Southern Palawan was completed in 2016, which comprised (a) land account focusing on the extent and changes in land cover from 2003 to 2015, (b) forest carbon storage and sequestration accounts in Pulot watershed and in the entire Southern Palawan, (c) ecosystem condition covering terrestrial and coastal ecosystems, (d) ecosystem services account (e.g.,

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[36] Department of Environment and Natural Resources – Region 3, "Masinloc-Oyon Bay Safe for Recreation Activities," Press Release, May 10, 2021 https://r3.denr.gov.ph/index.php/news-events/press-releases/1357-masinloc-oyon-bay-safe-for-recreation-activities

[37] United States Agency for International Development (USAID), *Protect Wildlife Annual Report* (Manila: USAID, August 2019) https://pdf.usaid.gov/pdf_docs/PA00WDQC.pdf

[38] Conservation International, "Program in Focus: Mt Mantalingahan Protected Landscape," (Quezon City: CI, 2019) https://www.thegef.org/sites/default/files/publications/Philippines%20MMPL%20Factsheet%20Final%20v3.pdf

[39] Laguna de Bay Technical Working Group, *Pilot Ecosystem Account for Laguna de Bay Basin* (WAVES, 2016) https://www.wavespartnership.org/sites/waves/files/kc/LdeBay%20FINAL%20LowRes%20Dec15%202016.pdf

Sites	Description
	water regulation, crop production, and fisheries), and ecosystem asset accounts (crop production).[40] These ecosystem accounts should be updated accordingly.
5. Puerto Princesa Subterranean River National Park (PPSRNP)	The PPSNRP is one of the world's most impressive ecosystems with its extensive underground river system. Consisting of more than 20,000 hectares of flat to steep slopes and 647 hectares of marine areas, the PPSNRP is a globally significant habitat for biodiversity conservation.[41] While its cave system and natural landscape interfacing between the sea and the underground river are well preserved, there is an increasing impact from the growing number in visitors and tourism developments.[42] The demand for better decision-making makes it an ideal ecosystem site for NCA.
6. Cleopatra's Needle Critical Habitat (CNCH)	The CNCH represents the largest watershed in Puerto Princesa City, Palawan and the country's biggest critical habitat with an area of more than 41,000 hectares representing some of the country's remaining primary forests. Around 85 percent of Palawan's endemic mammals and birds can be found in CNCH together with the PPSRNP. It covers both upland indigenous communities and coastal communities which directly depend on the ecosystem services such as production of non-timber forest products and water supply.[43]
7. Siargao Island Protected Landscape and Seascape (SIPLAS)	Located within the Mindanao Biogeographic Zone, SIPLAS is among the country's 128 KBAs and 117 Important Bird Areas (IBAs). It is the largest marine protected area in the Philippines with an estimated area of about 280,000 hectares as protected landscape and seascape. It is also one of the 206 Conservation Priority Areas (CPAs) identified through the Philippine Biodiversity Conservation Priority-setting Program. The 2011 land cover reveals that 12 percent of Siargao Islands' total land cover are natural broadleaved forests and another 12 percent mangrove forests. However, croplands occupy around 64 percent of the land cover with mostly coconut plantations. With the recent available information on land cover, it is important to analyze the changes and trends on land cover and its implication on the capacity of the ecosystem to sustain its services and benefits.[44]
8. Mt. Hamiguitan Range Wildlife Sanctuary (MHRWS)	The MHRWS was inscribed as a UNESCO World Heritage site and as an ASEAN Heritage Park in 2014. This sanctuary exhibits segmentation of terrestrial habitats with varying elevation and traverses across different agroecosystems. Some remnants of dipterocarp forests house around 246 plant species including significant numbers of endemic trees and globally threatened dipterocarps. At higher elevations, there are montane forest ecosystems with numerous species of mosses, lichens, and epiphytes and around 105 animal species. It is important to protect and conserve MHRWS since it serves as habitat for the Philippine pygmy fruit bat, (*Haplonycteris fischeri*) and the threatened Pointed-snouted tree frog (*Philautus acutirostris*).[45]

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[40] Southern Palawan Technical Working Group, *Pilot Ecosystem Account for Southern Palawan* (WAVES, 2016) https://www.wavespartnership.org/sites/waves/files/kc/LdeBay%20FINAL%20LowRes%20Dec15%202016.pdf

[41] UNESCO World Heritage Centre, "Puerto-Princesa Subterranean River National Park," UNESCO, 2018, https://whc.unesco.org/en/list/652/

[42] IUCN, "Puerto-Princesa Subterranean River National Park | World Heritage Outlook," worldheritageoutlook.iucn.org, 2020, https://worldheritageoutlook.iucn.org/explore-sites/wdpaid/198299

[43] Center for Sustainability PH, *Cleopatra's Needle Critical Habitat Primer v.1* (Puerto Princesa City: CS, 2019) https://img1.wsimg.com/blob by/go/0cc91b49-02bf-4834-8cac-195fb6a138e9/downloads/20180517%20CNCH%20Primer_CS%20version.pdf?ver=1647875313979

[44] Department of Environment and Natural Resources. *SIPLAS Management Plan*. Quezon City: DENR, November 2015. https://faspselib.denr.gov.ph/sites/default/files//Publication%20Files/C2.4%20SIPLAS%20Management%20Plan.pdf

[45] UNESCO World Heritage Centre, "Mount Hamiguitan Range Wildlife Sanctuary," UNESCO, 2014, https://whc.unesco.org/en/list/1403/.

Sites	Description
9. Victoria-Anepahan Mountain Range (VAMR)	The VAMR is a 165,000-hectare key biodiversity area straddling the municipalities of Narra, Quezon, and Aborlan and the city of Puerto Princesa in Palawan. The Philippine pangolin *(Manis culionensis)* or *balintong* can only be found in the VAMR and other areas in Palawan province. The increasing trends in wildlife trafficking prompted the International Union for Conservation of Nature to raise its Red List classification for the Philippine pangolin from Endangered to Critically Endangered. The rampant poaching and trafficking need significant measures to protect and conserve the habitats.[46]
10. Calamianes Group of Islands	The Calamianes Group of Islands Seascape occupies the northernmost section of Palawan Province. It consists of three main islands (Busuanga, Culion, and Coron) and a host of smaller satellite islands covering an area of approximately 220,000 hectares or 10 percent of the province. The Calamianes Islands support some of the most extensive and relatively intact marine environments in the Philippines. While the area has relatively low population density, there has been an intense fishing pressure in the area, particularly in Coron Bay, which includes extensive use of illegal fishing methods (e.g., use of explosives, *muro-ami,* and cyanide).[47]
Priority sites for 2029-2034	
11. Chico River Basin (CRB) and Mt. Pulag National Park (MPNP)	The CRB is among the major river systems in Cordillera Administrative Region (CAR). It is an important river network because of its potentials for electric power, irrigation and domestic purposes, recreation, and other significant uses. However, the CRB has been experiencing issues on unregulated land conversion of its mossy forest, declining water discharge, siltation, soil erosion, pollution, and declining biodiversity, among others,[48] The MPNP is prominently located in the northeastern part of Benguet Province. It covers about 11,550 hectares comprising the administrative jurisdictions of the provinces of Benguet (5,550 hectares) on the western side, Ifugao (3,377 hectares) on the eastern side, and Nueva Vizcaya (2,624 hectares) on the southeastern side. The MPNP, which is situated in the rugged and steep slopes of the Philippine Cordillera Mountain Range has a large diversity of flora and fauna with many endemic species thriving in the area. Some of the wildlife found in the area are threatened mammals such as the Philippine Brown Deer, Northern Luzon Giant Cloud Rat, and the Luzon Pygmy Fruit Bat.[49]
12. Laur in Pantabangan, Nueva Ecija	Laur is predominantly flat, with rolling hills and mountain lands and a wide range of vegetation. In 2003, majority (45.33%) of the vegetative cover had been composed of natural grassland. By 2010, land cover comprised wooded grassland (31.66%), open forest (28.23), and cultivated lands utilized for crops annually (18.97%). The major watersheds in the municipality are Cabu-Aulo Watershed, Calaanan Watershed, and Coronel Watershed and there are nine subwatersheds identified: Alintutuan, Antipas,

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[46] United States Agency for International Development (USAID), *Protect Wildlife Quarterly Progress Report 14* (Manila: USAID, January 2021) https://pdf.usaid.gov/pdf_docs/PA00XWXW.pdf

[47] Global Environment Facility, *Natural Capital Accounting and Assessment: Informing development planning, sustainable tourism development and other incentives for improved conservation and sustainable landscapes* (GEF, 2019) https://www.thegef.org/sites/default/files/web-documents/10386_BD_PIF.pdf

[48] Department of Environment and Natural Resources, "Project Site | Upper Chico River Basin," forestry.denr.gov.ph, https://forestry.denr.gov.ph/inremp/upper_chico.html

[49] UNESCO World Heritage Centre, "Mt. Pulag National Park," UNESCO, 2006 https://whc.unesco.org/en/tentativelists/5030/.

Sites	Description
	Bateria, Calaanan, Macalao, Marinat, Mekaliki, Palanas, and Talictic. Coronel River is the major river system and serves as the main source of water in the municipality for irrigation. The main drainage outlet of the community is the Pampanga River, which is the converging point of intermittent and permanent streams and creeks flowing from the higher area. Most of these streams and creeks flow north to the Pampanga River.[50]
13. Sierra Madre in Nueva Ecija	Sierra Madre is considered a backbone of Luzon since it covers the largest remaining tract of old-growth tropical rainforest and the longest mountain range in the Philippines. Some portions of Sierra Madre are key biodiversity areas noted for having the largest block of species such as the Northern Sierra Madre Natural Park (NSMNP). Over the years, the NSMNP has been recognized as among the important habitats for significant faunal species in the country such as the Philippine Eagle *(Pithecophaga jefferyi)*, Golden Crowned Flying Fox *(Acerodon jubatus)*, Philippine Eagle-Owl (*Bubo philippensis*), Isabela Oriole *(Oriolus isabellae)*, Green Sea Turtle *(Chelonia mydas)*, Loggerhead Turtle (*Caretta caretta*), Hawksbill Turtle *(Erethmochelys imbricata),* Philippine Crocodile *(Crocodylus mindorensis)* and Dugong *(Dugong dugon)*.[51]
14. Sierra Madre in Cagayan	Relatedly, Sierra Madre is protected not only because it is a globally important mountain range for biodiversity but also due to the wide-ranging ecosystem services that support agriculture and food security especially in Cagayan. It also provides a steady water supply and other economic benefits to Cagayan and other provinces, including Metro Manila.[52]
15. Iloilo	The Province of Iloilo covers a total land area of 471,941 hectares or 23 percent of the total land area of Western Visayas (Region 6). Hundreds of rivers and creeks traverse the entire province. These water bodies serving as the area's reservoir are important in providing water for irrigation and other agricultural uses. For instance, the Jalaur Riverbasin, which is situated in the province, records the highest annual flow and is considered as the major source of irrigation water. The province also possesses potential underground water supply that is mostly tapped for domestic use.[53]
16. Apayao	Apayao hosts the 180-kilometer long Apayao River, the largest and most important water body in the province. The river serves as the primary source of irrigation water for the lowland areas of Apayao and the adjacent province of Cagayan. The National Power Corporation also estimates the river's potential to contribute around 700 megawatts of energy from hydro-power, which could be used to provide electricity for remote Barangays through mini and micro-hydro structures and facilities.[54]

[50] Municipality of Laur, *Forest Land Use Plan* (Laur: 2016)

[51] UNESCO World Heritage Centre, "Northern Sierra Madre Natural Park and Outlying Areas Inclusive of the Buffer Zone," UNESCO, 2006 https://whc.unesco.org/en/tentativelists/5037/

[52] Eileen Bernardo, Andres B. Masipiqueña, and Jan van der Ploeg, eds. *The Sierra Madre Mountain Range: Global Relevance, Local Realities*. (Echague, Isabela: CVPED, 2003) https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1017.6437&rep=rep1&type=pdf

[53] Department of Environment and Natural Resources – Region 6, *Iloilo ENR Medium Term Plan for 2020-2022* (Iloilo City: DENR R6, 2019)

[54] Department of Environment and Natural Resources – River Basin Control Office, *Final Report Executive Summary: Formulation of IRBMDMP for Apayao-Abulug River Basin* (Quezon City: DENR-RBCO, October 2014) https://rbco.denr.gov.ph/masterplans/apayaoabulogexecutivesummary.pdf

Sites	Description
	Apayao's 170,000 hectare lowland forest is also listed as a Conservation Priority Area, where the first Philippine Eagles' nest in Luzon Island was confirmed in 2015. Local indigenous groups contribute to the protection of these forests through the practice of "lapat" system which considers logging, mining, farming, and wildlife hunting as taboo in forest habitats declared as spiritual sites.[55]
17. Zambales	Zambales covers 364,384.22 hectares with around 70 percent classified as forestlands and the remaining 30 percent alienable and disposable (A&D). It is a mineral-rich province, producing both metallic and non-metallic minerals including copper, chromite, magnetite sand, and nickel. Its refractory-grade chrome resource is considered as one of the largest in the world. The province is endowed with numerous bays, coves, and islands, and its coastline stretches to about 232.6 kilometers.[56]
18. Northern Samar	The Province of Northern Samar has three major watershed systems: Pambujan, Catubig, and Catarman Watershed. These provide water to major irrigation systems that serve hectares of lowland agricultural areas, thus needing rehabilitation, reforestation, and protection. There are two protected areas covered by the NIPAS Act (RA 7586). One is the Samar Island Natural Park through Presidential Proclamation 442 and the other is Biri-Larosa Protected Landscape/ Seascapes under Proclamation 291 covering the coastal areas of the municipalities of Biri, Lavezares, Rosario, San Jose, and neighboring islands and its surrounding reef.
19. Eastern Samar	Eastern Samar has important ecosystems such as the Guiuan Marine Reserve Protected Landscape and Seascape (GMRPLS), which is notable for its rich marine resources being utilized by local residents. The province also demonstrates the presence of marine plants and algae and mangrove ecosystems.[57] The province is drained by numerous rivers, streams, and creeks, with the principal ones serving as main arteries of transportation to the interior areas not presently served by a road network. There are eight major river basins in Oras, Dolores, Taft, Can-avid, Borongan, Llorente, and Balangiga. The province of Eastern Samar has two watershed areas that account for 11.74 percent of the total watershed area in the region.
20. Zamboanga Del Norte	Around 57.4 percent (358,648.74 ha) of Zamboanga del Norte's land is classified as forestland or timberland. However, only 19 percent (68,629.20 ha) is allocated for protection forest from the total land area of the forestland while 80.9 percent (290,019.54 ha) is production forest which is used as a key source for the economic development of the province. One of the province's forest resource reserves is in Siocon – declared as Watershed Forest Reserve and further declared as "Siocon Resource Reserve." It serves as the head source of Pangian, Liupan, and Kalayuhan

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[55] JM Agreda, "First active Philippine Eagle nest in Luzon found in Apayao.," *CNN Philippines*, July 15, 2015 https://www.cnnphilippines.com/regional/2015/07/15/first-active-philippine-eagle-nest-luzon-apayao.html

[56] Department of Environment and Natural Resources – Region 3, *Zambales ENR Medium Term Plan for Fiscal Year 2020-2022* (San Fernando City: DENR R3, 2019)

[57] Desamarie Antonette P. Fernandez et al., "Fauna and Flora of Forests over Limestone in Calicoan Island, Guiuan Marine Reserve Protected Landscape and Seascape (GMRPLS), Eastern Samar, Philippines," *Journal of Marine and Island Cultures* 9, no. 2 (December 21, 2020) https://doi.org/10.21463/jmic.2020.09.2.07

Sites	Description
	creeks. This forest reserve's vegetation cover is characterized predominantly by naturally-growing trees with patches of brushlands and plantation and is the only remaining naturally vegetated area in the province.[58]
Priority sites for 2035-2040	
21. Kaliwa Watershed in Marikina and Sierra Madre	The Kaliwa Watershed Forest Reserve (KWFR) has a total land area of 27,613 hectares, which was established through Presidential Proclamation 573 in 1969. This ecosystem site plays an important role in regulating the flow of water towards the highly urbanized National Capital Region. The KWFR is home to Dumagat comprising 96 percent of the total IP population in the area and serves as a biodiversity corridor for some threatened, endangered, and endemic species such as the Antipolo tree, Red Lauan, Yakal, Luzon Bleeding Heart, Rufous Hornbill, and the Northern Luzon Cloud Rat.[59]
22. Sorsogon	Sorsogon lies on the southern tip of Luzon in the Bicol Region. The two major land classifications are the Certified Alienable & Disposable (A&D) and Forest Lands with 178,571 hectares and 35,586 hectares, respectively. A&D constitutes about 83 percent of the total land area of the province.[60] Sorsogon has rich natural resources with huge potential for ecotourism. The combination of white sandy beaches, mountains, and hills and their forests, lakes, caves, waterfalls, springs, and islets provide recreational and climate regulation ecosystem services. Since the province depends on these critical ecosystems for livelihood, education, and recreation, it is important to ensure environmental management and sustainability.[61]
23. Samar (formerly named Western Samar)	The province of Samar, which constitutes around 41 percent of the Island of Samar, is the largest of the three provinces in the island. Samar is rich in natural resources with five major rivers: Basey River, Calbiga River, Ulot River, Gandara River, and the Oquendo Left/Right River, which are tapped for irrigation and as a means of transportation. In the upland areas, the province has a total forest area of 167,300 hectares with more than 10,000 hectares of watershed reserves. In terms of coastal and marine resources, the province has a relatively long coastline suitable for fishing areas.[62]
24. Cebu	Cebu province is part of Central Visayas (Region 7) covering 6 cities and 47 municipalities. It has a total land area of 534,905 ha, which is around 33.7 percent of the region's total land area.[63] Among the provinces in Central Visayas, Cebu province has the largest population (63% of the region's) and a growth rate of 2.14

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[58] Department of Environment and Natural Resources – Region 9., *Zamboanga del Norte ENR Medium Term Plan for 2020-2022* (Pagadian City: DENR R9, 2019)

[59] Biodiversity and Watersheds Improved for Stronger Economy and Ecosystem Resilience (B+WISER) Program, "Upper Marikina River Basin Protected Landscape & Kaliwa Watershed Forest Reserve," denr.gov.ph, 2013 https://forestry.denr.gov.ph/b+wiser/index.php/sites/umrb/8-b-wiser-sites

[60] Department of Environment and Natural Resources – Region 5, *Sorsogon ENR Medium Term Plan for 2020-2022* (Legazpi City: DENR R5, 2019)

[61] United Nations Human Settlements Program, *Climate Change Assessment for Sorsogon, Philippines: A Summary* (Nairobi: UN-Habitat, 2008) https://unfccc.int/files/adaptation/knowledge_resources/databases/partners_action_pledges/application/pdf/un-habitat_furtherinfo4_060511.pdf

[62] Samar News Network, "Samar Natural Resources," samar.lgu-ph.com https://samar.lgu-ph.com/natural.htm.

[63] National Economic and Development Authority – Central Visayas, *Regional Development Plan of Central Visayas 2017-2022 Midterm Update* (Cebu City: NEDA, 2017) https://neda.gov.ph/wp-content/uploads/2018/02/7-Central-Visayas-RDP-2017-2022.pdf

Sites	Description
	percent.[64] The province also serves as one of the region's centers for economic activity, such as export market and industry and services.[65] There are four watersheds in Cebu which have been declared as protected areas: Kotkot-Lusaran Watershed Forest Reserve (14,121 ha), located within the cities of Cebu and Danao and the municipalities of Balamban, Compostela, and Consolacion; Mananga Watershed Forest Reserve (6,823 ha) which covers Talisay and Cebu City, including the municipality of Minglanilla; Argao Watershed Forest Reserve (7,250 ha) located within the municipalities of Argao and Dalaguete; and the Buhisan Watershed Forest Reserve, located within the area of Cebu City (630.89 ha).
25. Kalinga	Kalinga is a landlocked mountainous province and ancestral domain in the northernmost section of Cordillera Administrative Region (CAR). Composed of seven municipalities and one component city, the province's land area as of 2015 is 328,204 hectares, constituting 17 percent of the CAR's land area.[66] The province is also home to many indigenous tribes and considered as a top producer of rice and coffee in CAR, next to Ifugao.[67]
26. Ifugao	Ifugao is a landlocked watershed province located in Northern Luzon, with a total land area of 261,801 hectares.[68] The province is home to many indigenous peoples that are able to maintain and protect their cultural resources, practices, traditions, and other indigenous knowledge systems.[69] It is characterized by several mountain ranges that reach as high as 2,525 meters above sea level (masl). Moreover, around 82 percent of the province's territory is classified as public forest areas, forest reserves, and watershed reservations, which are not suitable for agricultural use.[70]
27. Catanduanes	Catanduanes is an island province with a total land area of 149,216 hectares, comprising eight percent of the region's total land area.[71] Among the provinces in Bicol Region (Region 5), Catanduanes recorded the smallest population with 261,000 (4.5%) in 2015 and growth rate of 1.11 percent from 2011-2015[72] It covers 11 municipalities, with 315 barangays.[73] Characterized by several mountain ranges,

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[64] Ibid.

[65] Ibid.

[66] National Economic and Development Authority – CAR, *Regional Development Plan of Cordillera Administrative Region (CAR) 2017-2022 Midterm Update* (Baguio City: NEDA, 2017)
https://onedrive.live.com/embed?cid=C944D7C8E5469E07&resid=C944D7C8E5469E07%211867&authkey=APea-dYS29l4cAs&em=2

[67] Karen Bouchard, "Thirsting for Recognition: A Comparative Ethnographic Case Study of Water Governance and Security in the Highlands of Kalinga, Philippines" (Master's Thesis, Laval University, Quebec, 2017)
https://corpus.ulaval.ca/jspui/bitstream/20.500.11794/28224/1/33965.pdf

[68] NEDA CAR, RDP 2017-2022

[69] Leni D. Camacho et al., "Indigenous Knowledge and Practices for the Sustainable Management of Ifugao Forests in Cordillera, Philippines," *International Journal of Biodiversity Science, Ecosystem Services & Management* 12, no. 1-2 (December 28, 2015): 5–13,
https://doi.org/10.1080/21513732.2015.1124453

[70] UNESCO. *Impacts: the effects of tourism on culture and the environment in Asia and the Pacific: sustainable tourism and the preservation of the World Heritage sites of Ifugao Rice Terraces, Philippines.* Bangkok: UNESCO Bangkok, 2008
https://unesdoc.unesco.org/ark:/48223/pf0000182647

[71] National Economic and Development Authority – Bicol Region, *Regional Development Plan of Bicol Region 2017-2022.* (Legazpi City: NEDA, 2017) https://drive.google.com/file/d/1xNSVoI_YtHcnZZPCvVj30jpzhMopXebc/view

[72] Ibid

[73] Philippine Statistics Authority, *Countryside in Figures: Catanduanes* (Virac: PSA, 2017)
http://rsso05.psa.gov.ph/sites/default/files/content/Countryside%20in%20Figures-Catanduanes%202018.pdf

Sites	Description
	stretches of coastal areas, waterfalls, and other natural scenery, Catanduanes serves as one of the tourist destinations in the region.[74] Its climate pattern falls under the Type II climate pattern, which experiences pronounced rainfall from November to January.[75] The province is also known as the abaca capital of the Philippines and the top producer of abaca in Bicol region, with a total share of 89.3 percent in 2015.[76]
28. Surigao Del Sur	Surigao del Sur is part of Caraga region (Region 13), which comprises 2 cities and 17 municipalities, with a total of 309 barangays.[77] The province has a total land area of 513,770 hectares representing 24 percent of the total land area of Caraga Administrative Region and constituting about 1.71 percent of the country's total land area.[78] Its forestland stretches to around 345,226 hectares,[79] endowed with prominent river systems, such as the Tago and Carac-an. The province experiences Type II climate patterns which has pronounced rainfall from November to January.[80]
29. Southern Leyte	Southern Leyte is one of the six provinces of Eastern Visayas (Region 8), situated in the Pacific "ring of fire," and is considered to be a multi-hazard province. Eleven major water bodies in the province have numerous small rivers that help drain excess water from the land toward the sea. The province has one proclaimed watershed, the Hinabian Lawigan Watershed Reserve under Proclamation Number 107 dated November 23, 1992 with an area of 4,536.30 hectares located in St. Bernard, Hinunangan, and Silago where the Lawigan River belongs.
30. Bukidnon	Bukidnon is a landlocked and highland province located in the north-central portion of Mindanao Island particularly in Northern Mindanao (Region 10). It occupies the largest land area in the region, constituting more than half (52%) of its total land area Out of six proclaimed areas under NIPAS in the region, two areas belong to Bukidnon – Mt. Kitanglad Natural Park and Mt. Kalatungan Range Natural Park. Out of 42 watersheds in the region, 13 are situated in Bukidnon Province, with 3 of these watersheds classified as critical, namely Muleta-Kulaman River Watershed, Manupali River, and Roxas-Kuya River Watershed. Primarily, water is drained by deeply-incised Cagayan, Pulangi, and Tagoloan rivers and ravines. These river systems cut across several parts of the province's territory providing water for domestic, agricultural, industrial, and power generation[81] Developing ecosystem accounts in the area will help in managing competing use of resources.

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[74] Ibid

[75] NEDA-Bicol Region, *RDP 2017-2022*

[76] PSA, Catanduanes

[77] Provincial Government of Surigao, "Surigao Del Sur - Official Website," www.surigaodelsur.ph, 2020, http://www.surigaodelsur.ph/profile/geographic-location.

[78] National Economic and Development Authority – Caraga Region, *Caraga Regional Development Plan 2017-2022* (Butuan City: NEDA, 2017) https://nro13.neda.gov.ph/wp-content/uploads/2021/06/Caraga-Regional-Development-Plan-2017-2022.pdf

[79] Ibid

[80] Philippine Institute for Development Studies. "Basics on Philippine Climatology." *Economic Issue of the Day Vol 5, No. 2.* Makati City: PIDS, July 2005 https://dirp4.pids.gov.ph/ris/eid/pidseid0502.pdf

[81] Provincial Planning and Development Office of Bukidnon, *Bukidnon Provincial Development and Physical Framework Plan 2013-2018* (Malaybalay City: PPDO, 2014) https://jesrelmangubat.weebly.com/uploads/4/1/2/1/41215107/bukidnon_pdpfp_2014-2019.pdf

Appendix C. Indicative Training Program on NCA

Appendix Table A3. Indicative training program on NCA

Topic	Description
Module 1: Refresher Course on Natural Capital Accounting (NCA)	
Session 1: Overview of NCA	• Definition of natural capital and its contribution to the country's total wealth • Introduction to ecosystem services • NCA as a tool including its principles, policy use and applications • Past and present initiatives on NCA globally and in the Philippines
Session 2: System of National Accounts (SNA) and its Linkage with the SEEA	• Brief introduction of the 2008 SNA framework, its uses (e.g., measures of level of economic development, economic, growth, change in consumption, etc.) and accounts (e.g., production and income accounts). • Overview of 2012 UN SEEA Frameworks (Central Framework and Ecosystem Accounting Framework)
Session 3: SEEA Central Framework and Ecosystem Accounting	• Key concepts on: (a) environmental assets (e.g., water, energy, and forest) under the UN SEEA CF; and (b) ecosystem extent, ecosystem condition, and ecosystem services under UN SEEA EA. • Sample applications
Module 2: Training on Ecosystem Accounting using the SEEA Ecosystem Accounting Framework	
Session 1: Overview of UN SEEA Ecosystem Accounting Framework	• Basic concepts of the ecosystem accounting framework including its scope and coverage, and updates in the development of technical guidelines. • Tools and data requirements • Linkage of physical and monetary accounting • Use and applications of ecosystem accounts
Session 2: Introduction to Ecosystem Accounts	• Basic concepts and tools in the development of ecosystem accounts
Ecosystem extent account	• This account serves as a common starting point for ecosystem accounting. It organizes information on the extent of different ecosystem types (e.g., forests, wetlands, agricultural areas, marine areas) within a country in terms of area.
Ecosystem condition account	• This account organizes biophysical information on the condition of different ecosystem types. The ecosystem condition account organizes data on selected ecosystem characteristics and the distance to a reference condition to provide insight into the ecological integrity of ecosystems.
Ecosystem services flow account (physical and monetary terms)	• This set of ecosystem accounts measures the supply of ecosystem services and the use of those services by economic units, including households, enterprises, and government.
Monetary ecosystem asset account	• This account records information on stocks and changes in stocks (additions and reductions) of assets. The ecosystem monetary asset account records this information in monetary terms for ecosystem assets based on the monetary valuation of ecosystem services and applying the net present value approach to obtain opening and closing values in monetary terms for ecosystem assets at the beginning and end of each accounting period.
Thematic accounts	• These accounts organize data on themes of specific policy relevance. Examples of relevant themes include biodiversity, climate change, oceans, and urban areas.

Topic	Description
***Session 3:** National accounting approach to ecosystem measurement*	• Key features of a national accounting approach to ecosystem measurement and mainstreaming of environmental information into economic measures.
Module 3: Training on Valuation of Ecosystem Services	
***Session 1:** Review of Ecosystems and Ecosystem Services and Benefits*	• Overview on concepts of ecosystems, ecosystem services, and framework of ecosystem accounting
***Session 2:** Methods and Tools for Measuring Ecosystem Services*	• Physical accounting of ecosystem services, including biophysical assessment
***Session 3:** Overview of Economic Theory, Resource Allocation, and Concept of Value and Cost*	• Brief discussion on demand and supply, producer surplus, consumer surplus, resource rent, marginal benefits, and costs
***Session 4:** Valuation of ecosystem services*	• Methods and tools applied to valuing ecosystem services prescribed by UN SEEA
Group exercises	• Identifying ecosystem services, benefits, and costs • Determining the most appropriate tool for valuing ecosystem services
***Session 5:** Application of Valuation Methods to Ecosystem Accounting*	Case Studies: • Valuation of ecosystem services conducted in Laguna Lake Basin and Southern Palawan. • Creating tables and maps of monetary accounts of ecosystem services for Laguna Lake Basin and Southern Palawan.
***Session 6:** Synthesis of ecosystem valuation concepts, tools, methods and valuation work*	• Conclusion and sharing of learning experience
Module 4: Training on UN SEEA Central Framework	
• *Overview of the System of National Accounts* • *Introduction to Environmental Accounting – the SEEA 2012 Central Framework and its Subsystem including the Stock Accounts, Flow Accounts and Activity/Purpose Accounts, including modules for the different natural resources (minerals, water, energy, etc.).*	
Module 5: Training on NCA into Policy Use and Applications	
• *Overview of Policy and Institutional Context for NCA* • *Challenges and Opportunities on NCA implementation* • *Global and Philippines experience: from accounts into policy* • *Linking NCA and development policy*	
Other special training courses	
• GIS training • Sediment modelling • InVEST (Integrated Valuation of Ecosystem Services and Trade-offs) • ARIES (ARtificial Intelligence for Environment & Sustainability) Integrated Modelling • Wealth accounting (including incorporation of ecosystem account) • Others	

Appendix D. Long List of Key Ecosystem Sites and Vulnerable Areas in the Philippines

Appendix Table A4. Sustainable Integrated Area Development (SIAD) and Risk Resiliency Program (RRP) Sites

Sustainable Integrated Area Development (SIAD) sites	
1	Chico River and Mt. Pulag in the Cordillera Administrative Region
2	Zambales
3	Laur in Pantabangan, Nueva Ecija
4	Sierra Madre in Cagayan
5	Sierra Madre in Nueva Ecija
6	Kaliwa Watershed in Marikina and Sierra Madre
7	Batangas Coastline and Verde Passage
8	Laguna Lake
9	Palawan
10	Sibuyan Island
11	Romblon
12	Occidental and Oriental Mindoro
13	Sorsogon
14	Guimaras
15	Antique
16	Samar
17	Bohol
18	Cebu
19	Iloilo (city)
20	Saranggani
21	Caraga-Cantilan
22	South Upi
23	Marilog
24	Mt. Hamiguitan/Mati
25	Talaingog in Davao del Norte
26	Rajah Buayan
27	Dinagat Island
28	Tawi-Tawi
29	Lanao del Sur
Risk Resiliency Program (RRP) sites	
30	Apayao
31	Bukidnon
32	Catanduanes
33	Dinagat Islands
34	Eastern Samar

35	Ifugao
36	Kalinga
37	Lanao del Sur
38	Maguindanao
39	Masbate
40	Metro Manila
41	Metro Iloilo
42	Metro Cebu
43	Metro Davao
44	Mountain Province
45	Negros Oriental
46	North Cotabato
47	Northern Samar
48	Saranggani
49	Siquijor
50	Sorsogon
51	Surigao del Norte
52	Surigao del Sur
53	Sulu
54	Southern Leyte
55	Sultan Kudarat
56	Western Samar
57	Zamboanga del Norte

Appendix E. Implementation Structures within NEDA, PSA, and DENR

1. NEDA implementation structure

The National Economic and Development Authority (NEDA) is the country's premier social and economic development planning and policy coordinating body. Its key responsibilities include the coordination of activities such as the formulation of policies, plans, and programs to efficiently set the broad parameters for national and sub-national (area-wide, regional, and local) development. It is then well-positioned to take a lead role in the policy analysis and formulation incorporating natural capital accounting to support development planning. The Socioeconomic Planning Secretary and Director-General of NEDA chairs the PSA Board. Through the Secretary, it is expected that NEDA can greatly influence the direction and implementation of NCA by the PSA.

The offices within NEDA that are most relevant to NCA activities are indicated in **Appendix Figure E1**, which illustrates the proposed implementation structure within NEDA. The focal office at the NEDA can be Regional Development Group (RDG) with the monitoring and coordination function with respect to policy use of the natural capital accounts performed by its Agriculture, Natural Resources, and Environment Staff (ANRES). Drawing support from other Staffs under RDG and Policy and Planning Group (PPG), the ANRES is expected to play a strong role in incorporating NCA in policy analysis.

Since environmental and natural resource issues tend to be local in nature, especially in site-specific ecosystem analysis, it is also important to engage the NEDA Regional Offices. It is also possible that compiled natural capital accounts – either asset or ecosystem – can be used as inputs in project design and project evaluation of public investments in areas such as flood control, irrigation systems, energy (transmission lines), forest rehabilitation, protected areas, and the like. Hence, the Investment Programming Group (IPG) can also provide support in the institutionalization of NCA in the investment appraisal process of NEDA.
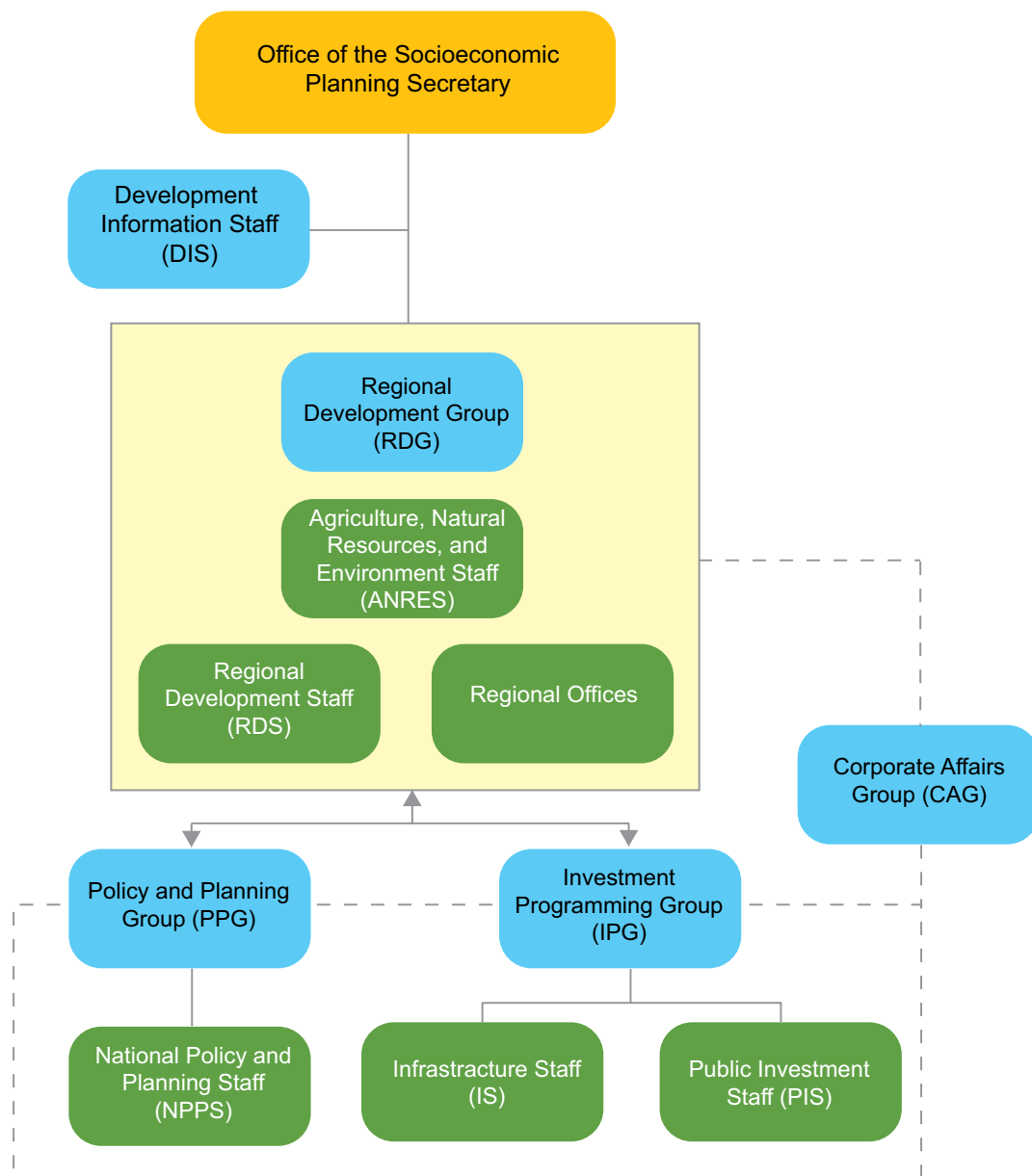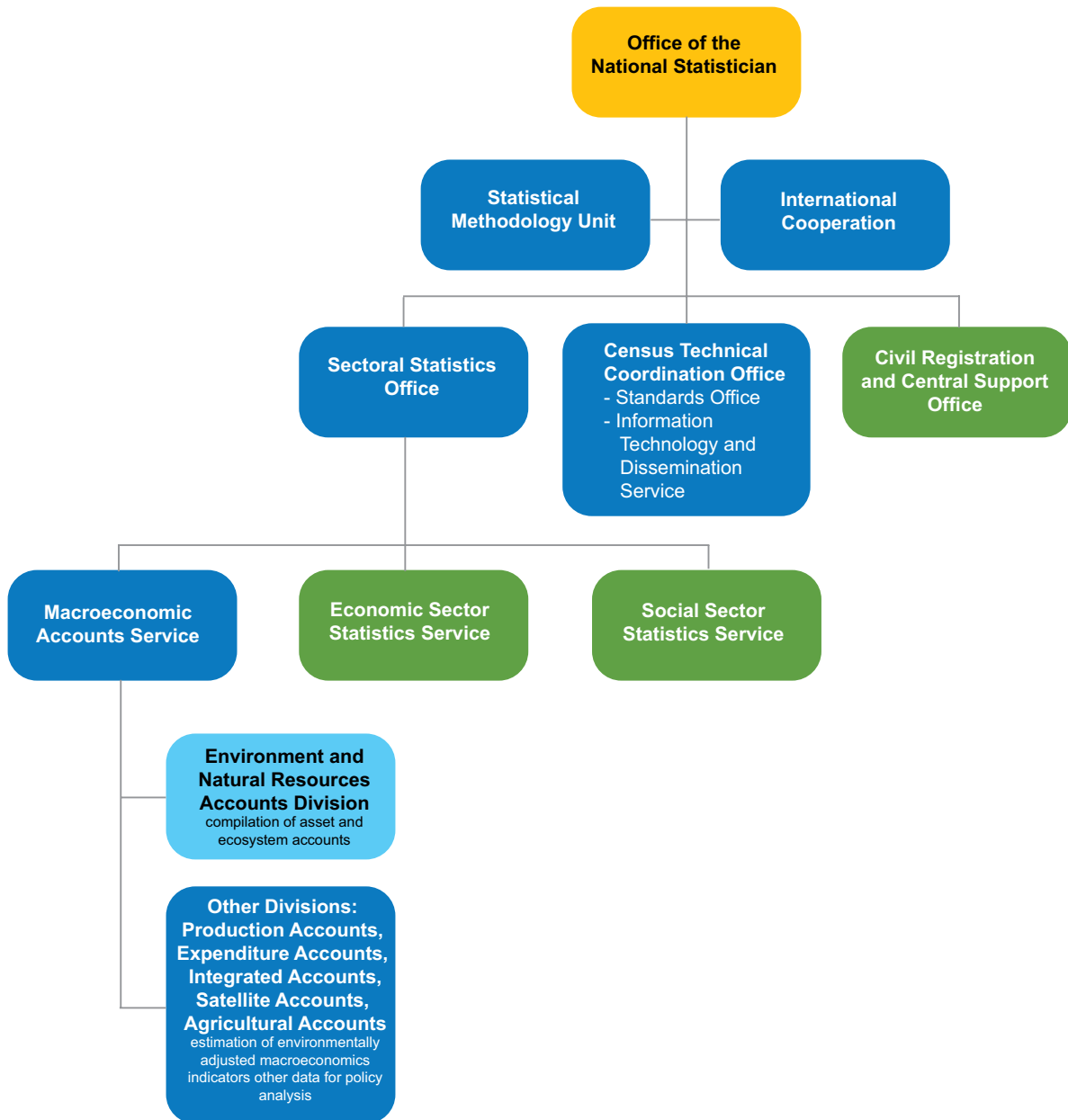
Appendix Figure E1. NCA-Relevant Offices within the NEDA Organizational Structure

2. PSA implementation structure

The proposed implementation structure for NCA accounting within PSA is illustrated in **Appendix Figure E2**. The primary unit at PSA involved in NCA is the Environment and Natural Resources Accounts Division (ENRAD). The Macroeconomic Accounts Service (MAS), under the Sectoral Statistics Office and the higher-level Office of the National Statistician is the focal unit for NCA activities. ENRAD compiles the asset and ecosystem accounts. It also works on the natural capital-adjusted macroeconomic indicators with support from the other division of MAS such as provision of data (other than the asset and ecosystem accounts) needed for policy analysis. Support services can also be provided by the Statistical Methodology Unit and International Cooperation Unit on improvement of methodologies and international exchanges and coordination, respectively. The NCA activities can also draw support from the Census and Technical Coordination Office through its

Standards Service and Information Technology and Dissemination Service. The Community-Based Management System (CBMS) of PSA may also provide more disaggregated data towards the subnational implementation of NCA. Moving towards the institutionalization of NCA in the country, PSA may need additional staff and/or plantilla positions to focus on NCA.

Appendix Figure E2. NCA-Relevant Offices within the PSA Organizational Structure

3. DENR implementation structure

The proposed implementation structure within the DENR for NCA activities envisages a greater role for the various DENR offices compared to their involvement in the WAVES project. This is in line with the thrust of regularizing or institutionalizing NCA activities as opposed to NCA simply being a project-based endeavor. The proposed implementation structure within the DENR for NCA institutionalization is illustrated in **Appendix Figure E3.**
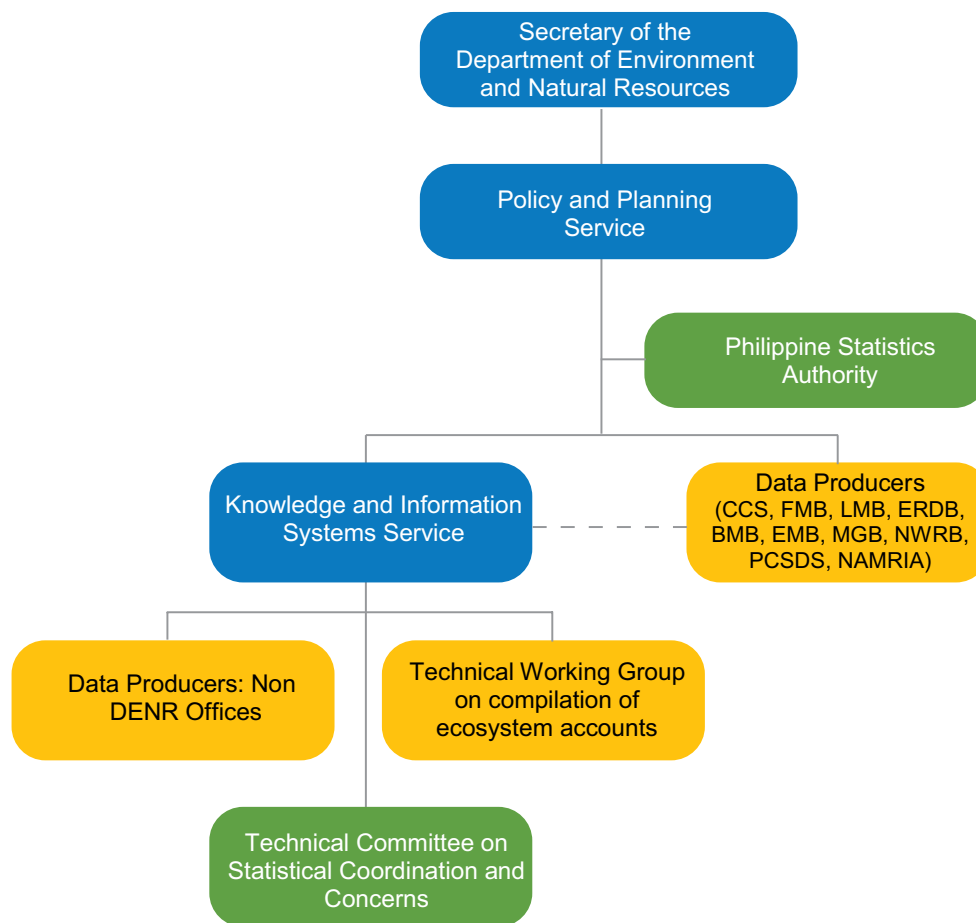
Appendix Figure E3. NCA-Relevant Offices within the DENR Organizational Structure

With a role similar to NEDA's in the general implementation structure, the Policy and Planning Service (PPS) of the DENR would have overall responsibility for the implementation of NCA activities within the DENR. This is to ensure that the NCA activities will be driven by policy demands and needs. Hence, their major roles also include the identification of ecosystem accounts to be compiled and validation of the compiled ecosystem accounts before recommending to the DENR Secretary. The technical support of the PSA on data systems and account compilation is necessary to ensure compatibility and consistency of data and accounting frameworks across government agencies.

Within the DENR, the focal office in the actual compilation of ecosystem accounts would be the Knowledge and Information Systems Service (KISS), which can be considered the PSA counterpart within the Department. The compilation of the ecosystem accounts is considered by DENR as part of its more general NCA Program. It also covers the implementation of UNSD's Framework for the Development of Environmental Statistics, OECD's Framework on Green Growth Indicators, and the SDG Indicators.

- For the compilation of ecosystem accounts, KISS has to work with data producers both from within DENR and its attached agencies and non-DENR offices and form technical working groups or teams to do the actual account compilation.

- The Ecosystems Research and Development Bureau (ERDB), a research unit of the DENR with strong orientation that is science-based and an ecosystem perspective, is expected to provide

inputs to KISS on the biophysical and ecological aspect of ecosystems. The technical working groups on ecosystem accounts can have members from ERDB.

- An option also is for specific ecosystem subaccounts to be done by the relevant bureaus (e.g., FMB for forest-related accounts, NAMRIA for land accounts, etc.) as was done for some of the subaccounts for the Southern Palawan ecosystem accounts.

DENR-KISS is expected to perform the following NCA-related roles and responsibilities:

- Provide data for input to the compilation of accounts and having responsibility for data systems development and upgrading within DENR. The improvement of the data system on environmental statistics can have significant spillover effects – the data system can be considered a public good that will benefit general discussion of environmental issues, not just through the use of environmental asset and ecosystem accounts.

- Provide technical advice on statistical matters such as data definitions, coverage, and classifications, in collaboration with PSA. A good data system will enable earlier and faster compilation of accounts. Currently, a significant amount of time is devoted to data collection and preparation prior to actual account compilation.

- Coordinate with data producers and consolidate data needed by PSA for the compilation of asset and ecosystem accounts, and of the PPS in the compilation of ecosystem accounts. Though most of the data producers are offices of the DENR, there are also data from non-DENR offices, government, or possibly private sector, which can be used in ecosystem accounting.[82]

- Coordinate with PSA for technical guidance on the compilation of ecosystem accounts, if needed.

The schematic diagram of the coordinative mechanism for the NCA Program within DENR is provided in **Appendix Figure E4**. The key group in the actual compilation and review of the ecosystem accounts for recommendation to PPS shall be the Technical Committee on Statistical Concerns and Coordination under the Statistics and Data Resource Management Division of KISS. The existing Technical Committee is composed of representatives of the bureaus, attached agencies, and offices within the Central Office. Its membership can be reconstituted to ensure that technical and statistical matters are well represented. The Technical committee can form a technical working group/task force for each area-specific ecosystem account. **Appendix Figures E5a and E5b** describe the summary of process flow for ecosystem accounts compilation within DENR.

The Technical Committee would have to work with the data producers – both DENR and non-DENR sources. The technical working groups for specific area-based ecosystem accounts may include staff from the various DENR bureaus and attached agencies, the DENR regional offices, the relevant local government units, representatives from local areas, and other government agencies. Their composition can depend on the assets being considered in the accounts and the capacity of local

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[82] Data producers within the DENR are its bureaus (Environmental Management, Mines and Geosciences, Forest Management, Land Management, Biodiversity Management) and attached agencies (National Mapping and Resource Information Authority, National Water Resources Board, Laguna Lake Development Authority, Palawan Council for Sustainable Development). Some of the non-DENR government data producers are the Department of Agriculture (e.g., Bureau of Fisheries and Aquatic Resources, Bureau of Soils and Water Management) and Department of Science and Technology (e.g., Diwata mapping information, PAGASA).

resources. The technical reports for the ecosystem accounts must be prepared by the technical working groups, with oversight by the Technical Committee, and should be released as DENR publications.

Some policy prescriptions may be easily inferred at the technical working group level. Further policy analysis using the compiled accounts for resource management can be done by the PPS, with final policy decision-making by the DENR Executive Committee.

The next steps proposed by the DENR on the institutionalization of its NCA Program, including ecosystem accounting, are as follows:

- Finalization of the terms of reference of the different bureaus and offices,

- Finalization of the short-term and long-term plans,

- Development of a competency-based system for the ENRA system and to determine the human resource requirement and capacity building needs, and

- Drafting and approval of a DENR administrative order on the institutionalization of the NCA in the DENR.
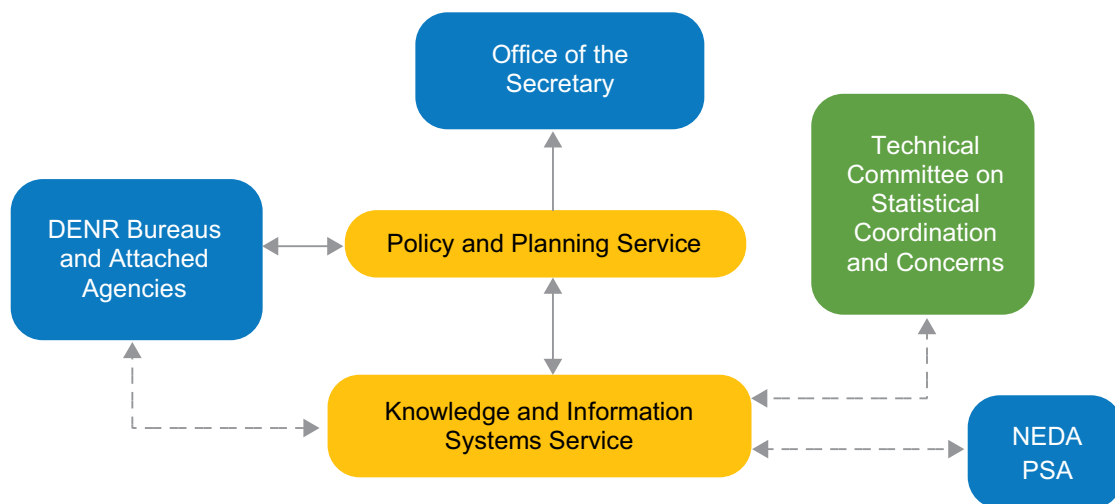
Appendix Figure E4. Schematic Diagram of the Coordinative Mechanism for the NCA Program within DENR
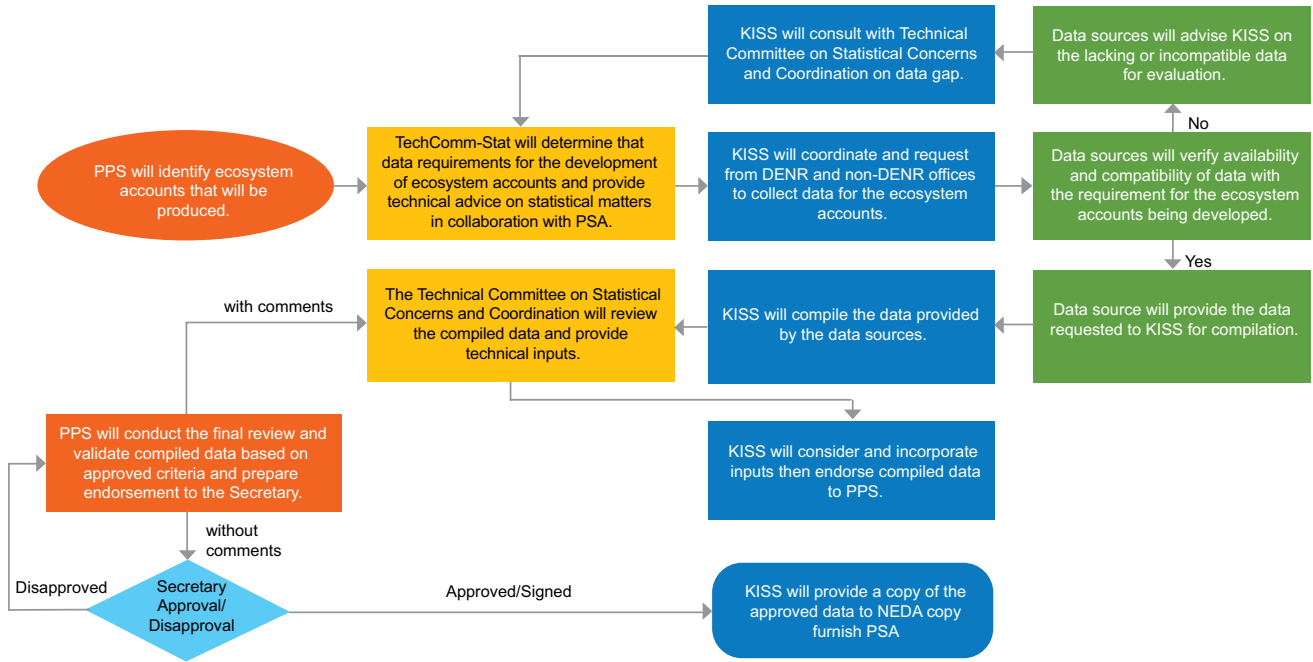
Appendix Figure E5a. Summary of Process Flow for Ecosystem Accounts Compilation within DENR
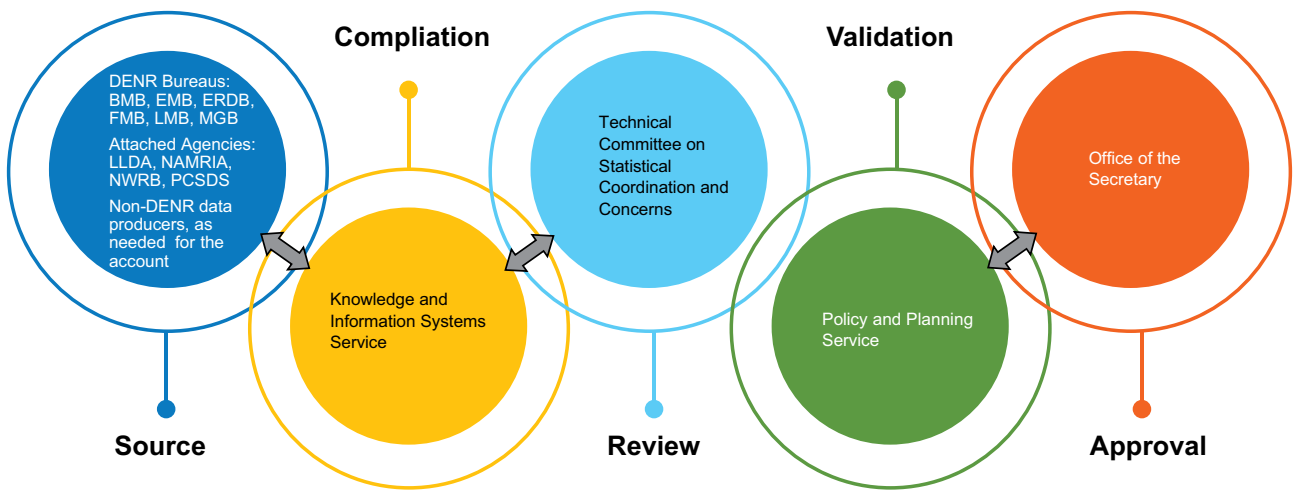
Appendix Figure E5b. Summary of Process Flow for Ecosystem Accounts Compilation within DENR

Contact Us

National Economic and Development Authority - Agriculture, Natural Resources, and Environment Staff (NEDA-ANRES)

- NEDA Building, #12 Escriva Drive, Ortigas Center, Pasig City, Philippines
- Tel. No: (+632) 8631 3714
- &anres-ed@neda.gov.ph
- https://neda.gov.ph

Department of Environment and Natural Resources (DENR)

- Visayas Avenue, Diliman, Quezon City
- https://denr.gov.ph/index.php

  DENR Policy and Planning Service (PPS)

- Tel. No. 8928-7327
  Trunkline No. 8929-6626 Local 2043
- ppdppso@yahoo.com

  DENR Knowledge and Information Systems Services (KISS)

- Tel. No. 8925-8278
  Trunkline No. 8249-3367, 8248-3367 Local 1196, 1158
- denrsdrmd@gmail.com

Philippine Statistics Authority (PSA) Environment and Natural Resources Accounts Division (ENRAD)

- 16th Floor, Three Cyberpod Eton Centris, EDSA cor Quezon Avenue, Quezon City
- Tel No. 8376-2041
- enrad.staff@psa.gov.ph
  enrad.staff@gmail.com
- https://psa.gov.ph/