Sukat ng Kalikasan: High Conservation Value Areas (HCVA)-Natural Capital Accounting (NCA) Framework for the Philippines

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1. Introduction

1.1 The High Conservation Value Areas (HCVA) Concept

High Conservation Value Area (HCVA) refers to areas with biological, ecological, social, or cultural value of outstanding importance present in a natural habitat. The HCVA concept was first developed as Principal 9 of the Forest Stewardship Council (FSC) for FSC forest management certification purposes, thereby helping forest managers to enhance the social and environmental sustainability of wood production. It is now widely utilized and adapted for various purposes, including land-use planning, conservation planning, and for making responsible investment policies (Stewart *et al.,* 2008; Brown *et al.,* 2013). After gaining popularity as a planning tool, other countries such as Indonesia, Malaysia, Papua New Guinea, Romania, Bolivia, Bulgaria, and Australia, have used HCV as a spatial planning tool and later developed their own national interpretation of HCVAs and HCVA Framework as a tool for providing a standard protocol at the national or provincial level.

Sustaining, improving, and promoting the importance of HCVA will require effective assessment and management of these values. This will require: a) careful identification of these values; b) understanding to whom these values are essential; and c) finding the location of the areas possessing these values. Having a common interpretation of the HCV definitions is also important when identifying HCVs within a specific potential area, management unit (MU), or landscape (Brown *et al.,* 2013).

1.2 The Philippines Sustainable Interventions for Biodiversity, Oceans, and Landscapes (SIBOL) Innovation

The Philippines Sustainable Intervention for Biodiversity, Oceans, and Landscapes (SIBOL) is a USAID biodiversity conservation activity, in partnership with the Department of Environment and Natural Resources (DENR), Department of Agriculture's Bureau of Fisheries and Aquatic Resources (BFAR), and Palawan Council for Sustainable Development (PCSD). The project is implemented by a consortium of natural resource management experts led by RTI International, Center for Conservation Innovations PH Inc. (CCIPH), Resources, Environment, and Economics Center for Studies Inc. (REECS), Forest Foundation Philippines (FFP), and Zoological Society of London (ZSL). SIBOL's ultimate goal is to develop and implement lasting, sustainable, and conservation-centered solutions to the threats faced by the Philippine's biodiversity. It envisions a resilient Philippines wherein communities, the private sector, and the

government collaboratively protect the country's rich natural resources in terrestrial and marine landscapes from exploitation, over-use, and climate change.

One of its strategic approaches for improving natural resource governance is strengthening science-driven decision-making which can be done by employing the HCVA Framework in management planning. Through its partnership with the DENR, BFAR, and PCSD, SIBOL has integrated HCVAs in both terrestrial and marine ecosystems into the HCVA Framework, leading to the development of a holistic National Interpretation of HCVAs in the Philippines. This is an innovative and integrated management strategy that will direct conservation efforts towards managing and protecting natural resources in its entirety, from ridge to reef. One of SIBOL's key innovative highlights is the incorporation of a 4-level Standard into the HCV Framework. Each Level of Standard contains specifications based upon specific data requirements, and the level of analysis required (*See Section 1.7.2 Bronze, Silver, Gold, and Platinum Standards*)

1.3 How the Philippine HCVA Framework was developed

The HCVA Framework for the Philippines was developed through collaborative efforts involving a series of consultative processes, meetings, and peer reviews. This was accomplished through technical working groups composed of specialists in the field, and other stakeholders representing xxx, xxx.. (see Table xx.)

Table xx.

Period/Date	Task Process	People Involved
Month, day, year	E.g inception?	E.g. biologists, ecologists, etc. from CCIPH, REECS, etc...
	E.g. preliminary first draft developed through a drafting workshop...	

This Framework was developed in the context of the Global HCV Framework, HCV Resource Network, while drawing inspiration from the HCV Frameworks for Indonesia, Malaysia, Romania, and Papua New Guinea.

1.4 High Conservation Values in the Philippines

The Philippine HCVA Framework identifies six (6) HCV categories composed of 28 sub-categories that are divided into two (2) classifications:

(1) Species, Habitats, and Ecosystems	HCV 1, HCV 2, and HCV 3
(2) Ecosystem, Social, and Cultural Services	HCV 4, HCV 5, and HCV 6

Each component (See Box 1) comes with a specific definition for a unified interpretation at a national, provincial, or local level. HCV 1, HCV 2 and HCV 3 focus on important species of concern, and the areas containing them at a habitat, ecosystem, and landscape level. HCV 4 draws attention to regulation and maintenance ecosystem services that are critical[1] to the consumption, health, and survival of humans, such that with the interruption or absence of which, adverse impacts are likely to happen. HCVs 5 and 6 provide focus on the social, economic, and cultural values of an area. These include areas that are important for local communities to meet their basic needs, preserve their cultural identities and spiritual beliefs, benefit from enjoyment, and obtain intellectual contributions from.

[1] An ecosystem service is considered "critical" if, when interrupted, can cause a negative impact on the well-being of local communities, on the environment, on HCVs, or on an infrastructure system. (FSC Guidelines for High Conservation Values and Principle 9. Timothy Synnott et al., 2011. FSC Guidelines for High Conservation Values and Principle 9, 96p.).

Box 1. The High Conservation Value Areas Framework for Philippines

HCV 1 Species
- **HCV 1.1 Endemic Species**
- **HCV 1.2 Globally Threatened and Nationally Protected Species**
- **HCV 1.3 Congregatory Species**
- HCV 1.4 Important Marine and Freshwater Species

HCV 2 Landscape-level and Seascape-Level Ecosystems and Ecosystem Mosaics

HCV 3 Threatened Habitats and Ecosystems
- **HCV 3.1 Rare Habitats or Ecosystems**
- **HCV 3.2 Threatened Habitats or Ecosystems**

HCV 4 Regulation and Maintenance Services
- **HCV 4.1 Global Climate Regulation**
- **HCV 4.2 Local Climate Regulation**
- **HCV 4.3 Air Filtration Service**
- **HCV 4.4 Soil Erosion Control Service**
- **HCV 4.5 Landslide Mitigation Service**
- **HCV 4.6 Solid Waste Remediation Service**
- **HCV 4.7 Pollination Service**
- **HCV 4.8 Biological Control: Pest Control Service**
- **HCV 4.9 Disease Control**
- **HCV 4.10 Water Purification Service**
- **HCV 4.11 Water Flow Regulation Service**
- **HCV 4.12 Coastal Protection Service**

HCV 5 Provisioning Services
- **HCV 5.1 Crop Provisioning Service**
- **HCV 5.2 Livestock Provisioning Service**
- **HCV 5.3 Aquaculture Provisioning Service**
- **HCV 5.4 Wood Provisioning Service**
- **HCV 5.5 Wild Fish and Other Natural Aquatic Biomass Provisioning Service**
- **HCV 5.6 Wild Animals, Plants and Other Biomass Provisioning Service**
- **HCV 5.7 Water Supply Provisioning Service**

HCV 6 Cultural Services
- **HCV 6.1 Recreation**
- **HCV 6.2 Visual Amenities**
- **HCV 6.3 Education, Scientific, and Research Service**
- HCV 6.4 Spiritual, Artistic, and Symbolic

1.5 Goal of the Philippine HCVA Framework

The Philippine HCVA Framework was developed to provide science-driven, evidence-based, and standardized practical guidance for the national interpretation of HCVs in the Philippines. Its key innovative goals are to:

(a) Bridge the gaps among existing conservation planning tools by providing a complete practical guidance - from planning, to assessment, management, monitoring, and addressing threats;
(b) Integrate both terrestrial and marine ecosystems into one assessment tool so that conservation practitioners are able to achieve a holistic conservation intervention from ridge to reef;
(c) Implement a 4-level Standard for HCV identification, with technical specifications so that assessments are delivered in a harmonized and consistent manner; and
(d) Make use of economic valuation as a basis of measurement for ecosystem services and spatial analyses for all HCVs, according to the United Nations - System of Environmental Economic Accounting (UN-SEEA) Framework

The scope of this Framework includes a stepwise explanation of the HCV assessment process from Preparation Stage to Identification of HCVs. A practical guidance for the Management, Monitoring, and Reporting of HCVs will be provided in a separate Framework.

Although this Framework will serve as a practical guidance for identifying HCVs within a specific area of concern, it is important to take note that it is not designed to entirely replace existing guidance documents.

1.6 Who the Framework is For

The Philippine HCV Framework will be used by the following conservation practitioners and stakeholders involved in the undertaking conservation interventions:

a. Protected area or forest managers. Mainly involved in the entire HCV assessment process, the results of the HCV assessment will then be integrated into the management plan of their respective protected area or conservation area.

b. Government. As a legal body and stakeholder, they play an important role during the actual assessments, especially when securing permits and recognizing management recommendations.

c. Local communities. As active participants in various stages of the HCV assessment, they may also play an important role as key informants by providing supplemental information related to the HCVs present in their respective area.

d. Non-government organizations (NGOs). NGOs are active partners in conservation efforts and their active participation and overall help is very crucial - from preparation phase, through public consultations and peer reviewing.

e. Spatial planners. Landscape-level plans require maps that can be used to inform and identify priorities for decision-making on land-use and conservation planning.

f. Corporations, investors, donors. xxx

1.7 How to Use the Framework

It is highly recommended that the users of this Framework, especially those involved in HCV assessment, will read the Philippine HCVA Framework completely. Sufficient understanding of the definitions, data needs, expected outputs, methods, and analysis is crucial prior to practical application and actual assessment.

1.7.1 The HCV Framework Structure

ThisFramework is divided into eight (8) Chapters:

- ***Chapter 1 - Introduction.*** Gives an overview of the HCV Concept and brief background about this Framework.
- ***Chapter 2 to 7 - HCV 1 to HCV 6.*** Defines the national interpretation of six HCV categories in the Philippines and their subcategories. Each Chapter for the six HCVs is organized as follows:
    - *Definition* - this subsection defines the HCV category or subcategory in terms of the element or area of to be assessed
    - *Rationale* - this subsection provides a brief explanation on why a particular element is considered of high conservation value in the Philippine context. A brief explanation on the HCV definition is provided based on the evaluation of the Framework's technical working group with reference to the limitations of present science, research, and knowledge.
    - *Outputs, Data Needs, and Data Sources* - this subsection serves as guidance on how to identify potential HCVs in an area at different Levels of Standardization (Bronze, Silver, Gold, and Platinum), depending on the availability of data and level of analysis. It is important to take into account that data sources and the methods used for data collection must be clearly defined and referenced so that they can be incorporated into the HCV report in a logical and organized manner (Brown *et al.,* 2013).

- ***Chapter 8 - HCV Assessment Process.*** Contains a detailed outline of the HCV Assessment Processes from preparation, planning, to identification of HCV. It is aimed at forest managers who need to identify the HCV in the Philippines and includes the different roles and responsibilities of the various stakeholders involved.

The HCV assessment team is expected to give support and transparency in the entirety of the HCV assessment process. It is important to take note that quantitative definitions are not always practicable. For example, setting very high thresholds can result in inefficient protection of forest values, whilst very low thresholds can compromise the application of the HCV concept. Therefore, identifying thresholds or criteria poses a serious challenge and should therefore be adapted according to the actual scenarios on the ground.

1.7.2 Bronze, Silver, Gold, and Platinum Standards

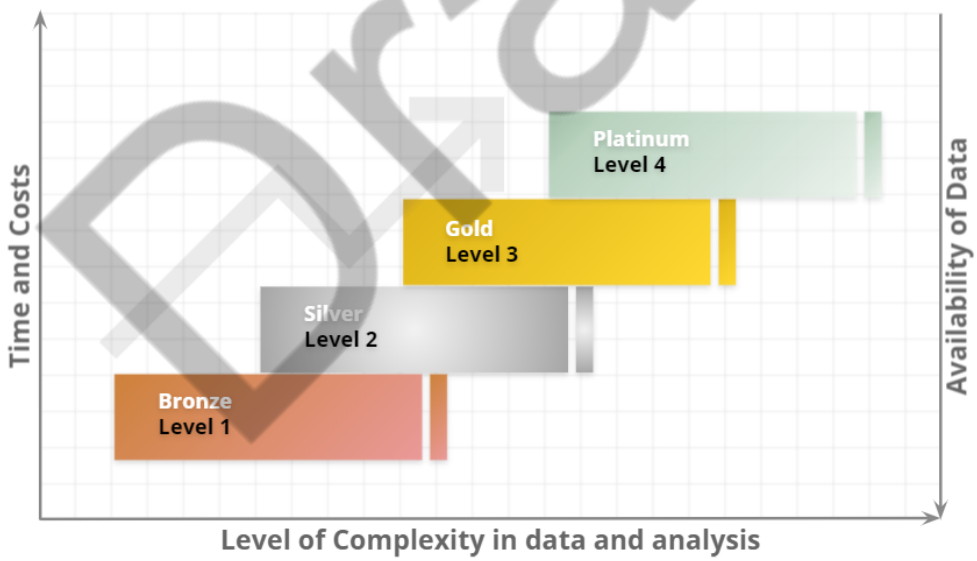

Figure xxx. Four levels of HCV Identification Standards, ie., Bronze, Silver, Gold, and Platinum, based on the hierarchy of data and analysis

2. HCV 1 - Species

Definition

Assemblage of endemic species, threatened and protected species, congregatory species, that are important at global, regional, or national levels.

HCV 1 prioritizes the protection of the aforementioned species and the habitats vital to their survival. Identification of these species and the areas containing them will direct conservation efforts towards ensuring and sustaining the species's survival.

HCV 1.1 Endemic Species

Definition

Species that are endemic or near-endemic are considered as HCV 1.1.

Rationale

The Philippines has very high species endemism (CBD, 2021), hosting at least 3,700 endemic species, of which, 96 are amphibians, 248 are birds, 135 are land mammals, 244 are reptiles, and at least 3,000 are plants (BMB 2019; CEPF, 2021). Endemic and near-endemic species have limited distribution and are vulnerable to threats. Identification of these species and the areas containing them is crucial for conservation management practices to safeguard and sustain their survival.

Output, Data Needs, and Data Sources

Identification of HCV 1.1 requires a checklist, dot map, species distribution model (SDM) and population estimates for endemic and near-endemic species, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, must be detailed, and up-to-date, and as sufficient enough as possible to ensure that informed decisions are made. All of these will satisfy the HCV 1.1 and its different levels of standardization, i.e.,Bronze, Silver, Gold, and Platinum.

Table xx. Outputs required for the identification of HCV 1.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output

Level 1 **Bronze**	**Checklist of Endemic Species** A list of endemic and near-endemic species recorded within the area must be generated. Data on species endemism may be sourced from online databases and published work
Level 2 Silver	**Dot Map for Endemic Species** A dot map showing the location and time (spatial-temporal data) where the endemic or near-endemic species was directly (seen, heard) or indirectly (presence of dung, footprints, etc.) observed is used to show HCV 1.1. Species occurrence records, *i.e,* GPS coordinates, can be obtained from online databases and published works.
Level 3 **Gold**	**Species Distribution Model (SDM) of Endemic Species** A species distribution model (SDM) is to be generated per species to predict suitable habitats of endemic or near-endemic species across the landscape.
Level 4 **Platinum**	**Population Estimates for Endemic Species** The highest standard of information on endemic or near-endemic species within the area comes in the form of species population estimates.

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

Table xx. Data needs for the identification of HCV 1.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Species listings: list of endemic species (primary or secondary data, depending on availability), list of near-endemic species (primary or secondary data, depending on availability) • Habitat types per species, endemism type of each species, references
Level 2 **Silver**	• Species occurrence records: GPS coordinates,recorded sightings, observation Types (direct/indirect), point of observation, locality (smallest unit available) • References
Level 3 **Gold**	• Environmental layers (e.g. bioclimatic layers, biophysical layers, land cover) • Boundary of area of interest • Species occurrence records: GPS coordinates, recorded sightings, observation types (direct/indirect), date and time of observation, locality (smallest unit available)
Level 4 **Platinum**	• Species detection data: perpendicular or radial distance from species to observer, number of individuals detected in a group, type of detection e.g., seen, heard, caught, date and time observation

Table xx. List of recommended data sources that can be used for the identification of HCV 1.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• Published articles, monographs, books • Grey literatures (reports, theses, dissertations) • IUCN RedList (https://www.iucnredlist.org/) • BirdLife International (https://www.birdlife.org/) • eBird (www.ebird.org) • Reptile Database (https://reptile-database.reptarium.cz/) • Amphibia Web Database (https://amphibiaweb.org/) • Synopsis of Philippine Mammals - Field Museum • Philippine Flora Database (https://www.philippineplants.org/) • GEO BON (https://geobon.org/) • Updated Red List of Threatened Philippine Fauna (DAO 2019-09) • Updated Red List of Philippine National Plants (DAO 2017-11) • http://www.plantsoftheworldonline.org/
Level 2 **Silver**	• GBIF (https://www.gbif.org/) • BMS, BAMS, LAWIN Reports • Museum Catalogs, Virtual Herbaria • eBird (www.ebird.org) • iNaturalist (www.inaturalist.org) • Fishbase,
Level 3 **Gold**	• Primary data for species occurrence records • Supplementary data for species occurrence records, e.g. GBIF (https://www.gbif.org/), Map of Life, museum catalogs, virtual herbaria, eBird, iNaturalist, reports from BMS, BAMS and Lawin • LGU data for shapefiles • DENR or PA as source for boundaries • bioclimatic datasets (e.g. www.worldclim.org, www.nodc.noaa.gov) • land cover and environmental datasets, e.g. PhilGIS, NOAA, ESA, Global Forest and Mangrove Watch, UNEP, Earth Explorer, AVHRR
Level 4 **Platinum**	• Primary data for species occurrence records • Supplementary data for species occurrence records, e.g. GBIF (https://www.gbif.org/), Map of Life, museum catalogs, virtual herbaria, eBird, iNaturalist, reports from BMS, BAMS and Lawin

HCV 1.2 Globally Threatened Species and Nationally Protected Species

Definition

Species that are listed in any, or all of the following:

a.) Red List of globally threatened species, i.e., Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) sensu IUCN Red List;

b.) Red List of nationally protected species as per the DENR, DA, or PCSD, or CITES; and
c.) Conservation-dependent species that are categorized as Near Threatened (NT) and Data Deficient (DD) species sensu IUCN Red List

Rationale

Although the Philippines is known to be one of the world's megadiverse countries, continued destruction of the country's natural resources has persisted, leading to a skyrocketing number of threatened species (Ani and Castillo, 2020). A total of 984 plant species and 444 animal species of Philippines are classified as threatened (DAO 17-11; DAO 2019-09), making it one of the top global conservation areas (CBD, 2021).

Individual species that fall under the classification of globally threatened and nationally protected species are important prospective forebears of succeeding generations. The purpose of identifying HCV 1.2 involves protecting threatened and nationally protected species including areas vital to the survival thereof, and based on this, conservation management strategies shall ensure that viable populations within their habitats are sustained or enhanced to the possible maximum extent needed for their survival.

Identification of HCV 1.2 also includes near-threatened and data deficient species to establish forward-looking outcomes on the species' individual and population trends.

Output, Data Needs, and Data Sources

Identification of HCV 1.2 requires a checklist, dot map, SDM, and population estimates for globally threatened and nationally protected species as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 1.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of Globally Threatened Species and Nationally Protected Species** A list of globally threatened species and nationally protected species recorded within the area must be generated. Data on the conservation status of a species and their habitats may be sourced from online species databases, national threatened species lists, and published works.
Level 2	**Dot Map for Globally Threatened Species and Nationally Protected Species** A dot map showing the location and time (spatial-temporal data) where the threatened and

Silver	protected species was directly (seen, heard) or indirectly (presence of dung, footprints, etc.) observed is used to show HCV 1.2. Species occurrence records, *i.e.,* GPS coordinates can be obtained from online databases and published works.
Level 3 **Gold**	**SDM of Globally Threatened Species and Nationally Protected Species** An SDM is to be generated per species to predict suitable habitats of threatened and protected species across the landscape.
Level 4 **Platinum**	**Population Estimates for Globally Threatened Species and Nationally Protected Species** The highest standard of information on threatened and protected species within the area comes in the form of species population estimates.

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

Table xx. Data needs for the identification of HCV 1.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Species listings: list of globally threatened species and nationally protected species (primary or secondary data, depends on availability) • Habitat type per species, conservation status, references
Level 2 **Silver**	• Species occurrence records: GPS coordinates, recorded sightings, observation types (direct/indirect), date and time of observation, locality (smallest unit available)
Level 3 **Gold**	• Environmental layers (bioclimatic layers), shape files of area • GPS coordinates of sightings (data sets)
Level 4 **Platinum**	• Species detection data: perpendicular or radial distance from species to observer, number of individuals detected in a group, type of detection e.g., seen, heard, caught, date and time observation

Table xx. List of recommended data sources that can be used for the identification of HCV 1.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• Published articles, monographs, books • Grey literatures (reports, theses, dissertations) • IUCN RedList (https://www.iucnredlist.org/) • BirdLife International (https://www.birdlife.org/) • eBird (www.ebird.org) • Reptile Database (https://reptile-database.reptarium.cz/) • Amphibia Web Database (https://amphibiaweb.org/) • Synopsis of Philippine Mammals - Field Museum

	• Philippine Flora Database (https://www.philippineplants.org/) • GEO BON (https://geobon.org/) • Updated Red List of Threatened Philippine Fauna (DAO 2019-09) • Updated Red List of Philippine National Plants (DAO 2017-11) • http://www.plantsoftheworldonline.org/
Level 2 **Silver**	• GBIF (https://www.gbif.org/) • BMS, BAMS, LAWIN Reports • Museum Catalogs, Virtual Herbaria • eBird (www.ebird.org) • iNaturalist (www.inaturalist.org)
Level 3 **Gold**	• Primary data for species occurrence records • Supplementary data for species occurrence records, e.g. GBIF (https://www.gbif.org/), Map of Life, museum catalogs, virtual herbaria, eBird, iNaturalist, reports from BMS, BAMS and Lawin • LGU data for shapefiles • DENR or PA as source for boundaries • bioclimatic datasets (e.g. www.worldclim.org, www.nodc.noaa.gov) • land cover and environmental datasets, e.g. PhilGIS, NOAA, ESA, Global Forest and Mangrove Watch, UNEP, Earth Explorer, AVHRR
Level 4 **Platinum**	

HCV 1.3 Congregatory Species

Definition

Species whose individuals constitute:

a.) at least one percent of the global population;

b.) at least one percent of a biogeographic or other distinct population;

c.) at least 20,000 waterbirds, or at least 6,700 pairs of seabirds of one or more species, that gather at a particular site and at a particular time in their life cycle.

Rationale

A decimation in the numbers of congregatory species within an area would result in an unfavorable large-scale impact in biogeographic or global populations of the species. The identification of HCV 1.3 aims to recognize and safeguard congregatory species within an area, including those areas of temporary use by the species and areas along important migration routes.

Effective conservation and management of HCV 1.3 must ensure that the ecological functions of these habitats are sustained and that species's access thereto will persist.

Criteria is based on criteria A4 and B3 used by BirdLife International to establish Important Bird Areas (IBAs) (BirdLife International Data Zone, 2020).

Output, Data Needs, and Data Sources

Identification of HCV 1.3 requires a checklist, dot map, species distribution model (SDM) and population estimates for congregatory species, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 1.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of Congregatory Species** A list of congregatory species recorded within the areas must be generated. These species may be identified through the use of online species databases and published works.
Level 2 **Silver**	**Area of Occurrence Map for Congregatory Species** Upon generating a list of congregatory species, it is recommended that a species' area of occurrence (AOO) map be generated.
Level 3 **Gold**	**Congregatory Species Abundance** Abundance data for each congregatory species present needs to be provided as further evidence and to support HCV 1.3.
Level 4 **Platinum**	**Congregatory Species Population Estimates** The highest standard of information on congregatory species within the area comes in the form of species population estimates in relation to its global and regional population.

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

Table xx . Data needs for the identification of HCV 1.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Species listing • Habitat types per species • References

Level 2 **Silver**	• Area of occurrence records (presence/absence) • GPS coordinates • Date and time of observation

Level 3
Gold
	• Species occurrence records:
	  ○ GPS coordinates
	  ○ Recorded sightings
	  ○ Observation Types (Direct/Indirect)
	  ○ Date and time of observation
	  ○ Locality (smallest unit available)
	• Area of occurrence
	• Estimated count per species

Level 4 **Platinum**	• Count of individuals per species • Observation type (seen, heard) • Date and time of observation • Locality (smallest unit available)

Table xx. List of recommended data sources that can be used for the identification of HCV 1.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• BirdLife International (www.birdlife.org) • eBird • IUCN habitat types • BMS reports • Asian Waterbird Census (DENR) • RAMSAR data resource library for waterbirds
Level 2 **Silver**	• GBIF (www.gbif.org) • IUCN Red List (www.iucnredlist.org) • Asian Waterbird Census (DENR) • BMS, BAMS, LAWIN Reports • Museum Catalogs • eBird (www.ebird.org) • iNaturalist (www.inaturalist.org) • Birdlife (www.birdlife.org) • RAMSAR database (https://rsis.ramsar.org)
Level 3 **Gold**	• Primary data for species occurrence records • Supplementary data for species occurrence records, e.g. GBIF (https://www.gbif.org/), Map of Life, museum catalogs, eBird, iNaturalist, reports from BMS, BAMS and Lawin • LGU data for shapefiles • DENR or PA as source for boundaries • land cover and environmental datasets, e.g. PhilGIS, NOAA, ESA, Global Forest and Mangrove Watch, UNEP, Earth Explorer, AVHRR • Birdlife (www.birdlife.org)

	• RAMSAR database (https://rsis.ramsar.org) • Asian Waterbird Census (DENR)
Level 4 **Platinum**	• Primary data for count of individuals per species • Supplementary data for count of individuals per species records, e.g. GBIF (https://www.gbif.org/), Map of Life, museum catalogs, eBird, iNaturalist, reports from BMS, BAMS and Lawin • Birdlife (www.birdlife.org) • RAMSAR database (https://rsis.ramsar.org) • Asian Waterbird Census (DENR)

HCV 1.4 Migratory Species

Definition

Species that migrate cyclically and predictably into the Philippines, or within its territories, including those that pass through or over the waters.

Rationale

The survival of migratory species may depend on the utilization of resources that are only available in a particular area of temporary use at a certain period of time. Hence, they also play an important role in maintaining seasonal ecosystem functions. The identification of HCV 1.4 prioritizes the protection and management of migratory species, including areas that they temporarily use and areas along important migration routes.

Output, Data Needs, and Data Sources

Table xx.

Level	Output
Level 1 **Bronze**	
Level 2 **Silver**	

Level 3 **Gold**	
Level 4 **Platinum**	

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

3. HCV 2 - Landscape-level Ecosystems and Ecosystem Mosaics

Definition

Areas consisting of natural landscape-level ecosystems and ecosystem mosaics which are globally or nationally important and support viable populations of naturally-occurring wildlife that depend on the ecosystem functions provided. Wildlife populations within these ecosystems or ecosystem mosaics must have natural distribution and abundance patterns.

HCV2 refers to the entire mosaic, *i.e.,* forest landscape, rather than just the actual area comprising the forest. Hence, identifying ecosystem mosaics shall consider the mosaics formed by an ecosystem along with other types of ecosystems (e.g. grasslands, wetlands, etc.), including networks of interconnected natural patches, ecological corridors, migratory routes, and riparian areas.

Rationale

Management of HCV 2 areas includes: (a) maintenance or enhancement of the HCV2 area's extent, natural attributes, connectivity, and the natural ecosystem functions therein; (b) protection of important viable populations of naturally-occurring wildlife; and (c) safeguarding the movement of species and energy within and across ecosystems mosaics.

Output, Data Needs, and Data Sources

Identification of HCV 2 requires a checklist of ecosystems, dot map of ecosystems, map of ecosystems, and multi-layer ecosystem map as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1	**Checklist of Ecosystems** A list of naturally occurring ecosystems present within the areas is required. The types of ecosystems and their characteristics maye be sources from online databases and published

Bronze	works.
Level 2 **Silver**	**Extent of Ecosystems** Upon identifying the ecosystem types present, a map showing their respective locations (i.e., dot map) may be generated. Polygons may be drawn based on existing map information to show the relevant range or extent of each ecosystem type.
Level 3 **Gold**	**Global Map of Ecosystems** A map of ecosystems present in the area will be generated according to IUCN global standards.
Level 4 **Platinum**	**Multi-layer Ecosystems Map** Given sufficient resources, as evidence of HCV 2 in the locality, a multi-layer ecosystems map is to be provided. Each of the ecosystem polygons shown on the map are to be derived from multi-layers of data (e.g., climate type, lithography, soil type, forest type, etc.). It is recommended that each layer would be ground-truthed - either by doing it manually on foot, or via measuring tools (e.g. through devices or drone photography) to check on the validity and presence of biophysical characteristics represented by the data layers.

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

Table xx. Data needs for the identification of HCV 2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• List of ecosystem types • Short description of biophysical characteristics e.g. elevation, vegetation, based from available literatures and reports. • References for the ecosystem types (e.g. IUCN, DENR, Forest Formations)
Level 2 **Silver**	• Ecosystem types • GPS coordinates available • Points pinned on Google Earth • Short description of biophysical characteristics e.g. elevation, vegetation, based from available literatures and reports. • Sources for the ecosystem types (e.g. IUCN, DENR, Forest Formations), PA reports (BMS, LAWIN, and BAMS), reports on baseline inventories
Level 3 **Gold**	• Boundaries (e.g PA, admin, KBA) • GPS coordinates of boundary corners of ecosystems • Global data for ecosystems • IUCN Habitat Classification Scheme

Level 4
Platinum
	• Primary Data
	  ○ GPS coordinates of ecosystem boundaries
	  ○ Drone images
	• Secondary Data
	  ○ Resource maps (eg. community, digital maps from database, ecosystems assets)

	○ Biophysical maps (eg. climate layers, topographic maps)

Table xx. List of recommended data sources that can be used for the identification of HCV 2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Source
Level 1 **Bronze**	• IUCN Habitat Classification Scheme • DENR • IPCC • FAO • Forest Formations (Fernando et al., 2008) • GLCC • FAO GEZ • Mammals of Luzon (book) • Published Literatures and reports
Level 2 **Silver**	• IUCN Habitat Classification Scheme • DENR • IPCC • FAO • Forest Formations (Fernando et al., 2008) • GLCC • FAO GEZ • Mammals of Luzon (book) • Published Literatures and reports (enumerate the bibliography) • BMS, BAMS, LAWIN reports • PA Reports • Fernando *et al*., 2008
Level 3 **Gold**	• IUCN Habitat Classification Scheme • Global data sources
Level 4 **Platinum**	• NAMRIA • DENR • PAG-ASA • BFAR • ERDB • Online Geospatial Data Systems (eg. PhilGIS, EBCO, Global Forest Watch, Hansen, Global Mangrove Watch, Global Climate Data, Global Administrative Map, Google Earth Data Catalogue, ESA Global Data, etc.) • UN GIS data systems (eg. IUCN, UN Stat, UN SDG, FAO, UNEP)

4. HCV 3 - Threatened Habitats and Ecosystems

Definition

Areas containing rare, or anthropogenically threatened ecosystems, or habitats.

Rationale

Identification of HCV3 aims to protect rare or threatened habitats and ecosystems so that further degradation from anthropogenic activities are prevented. Safeguarding these areas is necessary to preserve ecological processes that persist therein.

HCV 3.1 Rare Habitats or Ecosystems

Definition

Habitats or ecosystems that are naturally rare because they rely on restricted locations, soil types, hydrology, or other physical attributes.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 3.1 requires a checklist, dot map, preliminary map, and multi-layer map of rare habitats or ecosystems, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 3.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of Rare Habitats or Ecosystems** A list of rare habitat types and ecosystems present within the area, including their descriptions on topographic features, soil type, forest type, vegetation, and other physical attributes. Online databases, published works, indigenous or local knowledge, and protected area reports may be used as sources of data.
Level 2	**Dot Map of Rare Habitats or Ecosystems** A dot map showing rare habitat types or ecosystems present within the area, including their

Silver	descriptions of topographic features, soil type, forest type, vegetation, and other physical attributes of
Level 3 **Gold**	**Preliminary Map of Rare Habitats or Ecosystems** A polygon map showing the location and extent of rare habitats or ecosystems, including their descriptions of topographic features, soil type, forest type, vegetation, and other physical attributes.
Level 4 **Platinum**	**Multi-layer Map of Rare Habitats or Ecosystems** Map of ground-truthed and validated data showing the extent of rare habitats or ecosystems overlaying the topographic features, soil type, forest type, vegetation, and other physical attributes of a given area.

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

Table xx. Data needs for the identification of HCV 3.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• List of ecosystems types • Threats observed by PA (e.g.,landslide, fire,deforestation,anthropogenic activities,etc.*) • Biophysical attributes of ecosystems
Level 2 **Silver**	• Rare ecosystem types • GPS coordinates available • Points pinned on Google Earth • Short description on biophysical characteristics (e.g. elevation, vegetation, based from available literatures and reports) • Sources for the rare ecosystem types (e.g. IUCN, DENR, forest formations (source: Fernando et al., 2008), PA reports (BMS, LAWIN, and BAMS), reports on baseline inventories)
Level 3 **Gold**	• Boundaries (e.g PA, admin, KBA) • GPS coordinates of boundary corners of rare ecosystems • Global data for rare ecosystems • IUCN Habitat Classification Scheme • Survival envelopes of rare or endangered species
Level 4 **Platinum**	• <u>Primary Data:</u> • GPS coordinates of ecosystem boundaries • Drone images • Field data • Boundaries of HCV identified • Zones showing undisturbed areas (for protection) • Zones showing disturbed areas (for rehabilitation) • HCV 1: Species Survival Envelope (SSE) • <u>Secondary Data:</u> • Resource maps (eg. community, digital maps from database, ecosystems assets)

	• Biophysical maps (eg. climate layers, topographic maps) • Forest formation, succession data • Satellite images

Table xx. List of recommended data sources that can be used for the identification of HCV 3.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Source
Level 1 **Bronze**	• IUCN Habitat Classification Scheme • DENR • IPCC • Forest Formations (Fernando et al., 2008) • GLCC • FAO GEZ • Published Literatures and reports (enumerate the bibliography)
Level 2 **Silver**	• IUCN Habitat Classification Scheme • DENR • IPCC • Forest Formations (Fernando et al., 2008) • GLCC • FAO GEZ • Mammals of Luzon (book) • Published Literatures and reports • BMS, BAMS, LAWIN reports • PA Reports
Level 3 **Gold**	• IUCN Habitat Classification Scheme or IUCN Ecosystem Typology • Global data on rare ecosystem (sources) • HCV 1 Gold Standard • Primary data for rare ecosystem boundary • Supplementary data for rare ecosystems from DENR, PA, and LGU reports
Level 4 **Platinum**	• NAMRIA • DENR • PAG-ASA • BFAR • ERDB • Online Geospatial Data Systems (eg. PhilGIS, GEBCO, Global Forest Watch (Hansen), Global Mangrove Watch, Global Climate Data, Global Administrative Map, Google Earth Data Catalogue, ESA Global Data, etc.) • UN GIS data systems (eg. IUCN, UN Stat, UN SDG, FAO, UNEP) • PA Records

HCV 3.2 Threatened Habitats or Ecosystems

Definition

Habitats or ecosystems that are rapidly declining as a result of anthropogenic disturbances.

Areas that qualify as HCV 3.2 should fall under any or all of the following criteria:

a) An area that is globally, nationally, or regionally identified as priorities for conservation or protection (e.g KBAs, Important Plant Areas, Critical Habitats, Alliance of Zero Extinction (AZE), Environmentally Critical Areas, and/or prioritization processes);
b) An ecosystem that has lost 50% or more of its original extent in the biophysiographical region where it occurs;
c) An ecosystem that will lose 75% or more of its original extent in the biophysiographical region where it occurs, derived from the presumption that all areas currently apportioned for conversion in current spatial plans will be converted; or
d) A natural ecosystem that covers less than 5% of the remaining natural vegetation cover in the biophysiographical region where it occurs

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 3.2 requires a checklist, dot map, preliminary land cover change map, and final land cover change map of threatened habitats or ecosystems as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 3.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of Threatened Habitats or Ecosystems** A list of threatened habitat types and ecosystems present within the area, including the existing potential threats therein. Online databases and published works may be used as sources of data.

Level 2 **Silver**	**Dot Map of Threatened Habitats or Ecosystems** A dot map showing threatened habitat types or ecosystems present within the area, including the existing and potential threats therein.
Level 3 **Gold**	**Preliminary Land Cover Change Map** Identify threatened habitats by reviewing the land cover history of the area using maps from secondary sources or by comparing satellite imagery taken at different time periods. In the event that remote sensing methods are available, it is recommended that a preliminary land cover change analysis be conducted using training data from secondary sources. This will provide a more in depth analysis on the conservation status of the ecosystems and further justify the presence of HCV 3.
Level 4 **Platinum**	**Land Cover Change Map** A land cover change analysis using the minimum IPCC classes will be conducted to visualize and calculate the extent of habitats and ecosystems threatened over time. This will be validated by ground-truth surveys. Overall accuracy of the analysis should be at least 85%. Forest fragmentation analysis superimposed on habitat suitability of indicator species can also be generated to visualize the degree of intrusion into the core areas of the forest and its patchiness, and/or to visualize how intact the core areas of the forest and how patchy their areas are. Data needs will include historical and current forest cover and threat maps.

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

Table xx. Data needs for the identification of HCV 3.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Threatened ecosystems types list ((e.g., includes freshwater ecosystems) • Threats observed by PA (e.g., landslide, fire, deforestation, anthropogenic activities, etc.*) • Biophysical attributes of ecosystems
Level 2 **Silver**	• Threatened ecosystem types • GPS coordinates available • Points pinned on Google Earth • Short description of biophysical characteristics (e.g. elevation, vegetation, based from available literatures and reports). • Sources for the threatened ecosystem types (e.g. IUCN, DENR, forest formations (source: Fernando et al., 2008), PA reports (BMS, LAWIN, and BAMS), reports on baseline inventories)
Level 3 **Gold**	• Boundaries (e.g PA, admin, KBA) • GPS coordinates of boundary corners of threatened ecosystems • Global data for threatened ecosystems • IUCN Habitat Classification Scheme or IUCN Ecosystems Typology • UCN RedList of Ecosystems • Ramsar Sites

	• Survival envelopes of Threatened species • Preliminary Land Cover Change Note: Data preferably with historical reference period of either 5 or 10yrs depending on the analytical requirements
Level 4 **Platinum**	Primary Data • GPS coordinates of ecosystem boundaries • Drone images • Ground-truthed field data • boundaries of HCV identified • ones showing undisturbed areas (for protection) • zones showing disturbed areas (for rehabilitation) • HCV 1: SSE • Secondary Data • Resource maps (eg. community, digital maps from database, ecosystems assets) • Biophysical maps (eg. climate layers, topographic maps) • Forest formation, succession data • Satellite images Note: Data preferably with historical reference period of either 5 or 10yrs depending on the analytical requirements

Table xx. List of recommended data sources that can be used for the identification of HCV 3.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Source
Level 1 **Bronze**	• IUCN Habitat Classification Scheme • IUCN Red List of Ecosystems • DENR • PCC • Forest Formations (Fernando et al., 2008) • GLCC • FAO GEZ • Based from Proclamation No. 2146, s. 1981: Area that is or protection (e.g KBAs, Important Plant Areas, Critical Habitats, Alliance of Zero Extinction (AZE), Enivironmentally Critical Areas, and/or prioritization processes) • Published Literatures and reports (enumerate the bibliography eg. The Global 200: Priority Ecoregions for Global Conservation (Olson and Dinerstein, 2002))
Level 2 **Silver**	• IUCN Habitat Classification Scheme • IUCN Red List of Ecosystems • DENR • IPCC • Forest Formations (Fernando et al., 2008) • GLCC • FAO GEZ

	• Proclamation No. 2146, s. 1981 (for Envirnomentally Critical Areas) • KBAs, Important Plant Areas, Critical Habitats, Alliance of Zero Extinction (AZE), Enivironmentally Critical Areas, and/or prioritization processes) • Published Literatures and reports (enumerate the bibliography) • BMS, BAMS, LAWIN reports • PA Reports
Level 3 **Gold**	• IUCN Habitat Classification Scheme or IUCN Ecosystem Typology • IUCN Red List of Ecosystems • Global data on threatened ecosystem (sources) • HCV 1 Gold Standard • Primary data for threatened ecosystem boundary • Supplementary data for threatened ecosystems from DENR, BFAR, PA, and LGU reports • ESA, NASA, and other satellite image sources • Ramsar Sites • NAMRIA • Online Geospatial Data Systems (eg. PhilGIS, Global Forest Watch (Hansen), Global Mangrove Watch, Global Administrative Map, Google Earth Data Catalogue, ESA Global Data, etc.) • UN GIS data systems (eg. IUCN, UN Stat, UN SDG, FAO, UNEP)
Level 4 **Platinum**	• NAMRIA • DENR • PAGASA • BFAR • ERDB • IUCN Habitat Classification Scheme or IUCN Ecosystem Typology • IUCN Red List of Ecosystems • Global data on threatened ecosystem (sources) • HCV 1Gold Standard • Primary data for threatened ecosystem boundary • Supplementary data for threatened ecosystems from DENR, BFAR, PA, and LGU reports • ESA, NASA, and other satellite image sources • Ramsar Sites • Online Geospatial Data Systems (eg. PhilGIS, GEBCO, Global Forest Watch (Hansen), Global Mangrove Watch, Global Climate Data, Global Administrative Map, Google Earth Data Catalogue, ESA Global Data, etc.) • UN GIS data systems (eg. IUCN, UN Stat, UN SDG, FAO, UNEP) • PA records

Introduction to HCVs 4 to 6

HCVs 4 to 6 are organized according to ES valuation and natural capital accounting protocols consistent with the UN-SEEA Framework for NCA. Data needs take the Philippine context into account, and outputs are made relevant for Philippine PA management purposes. On the other hand, methods for data processing and analysis are consistent with international practice on valuation and natural capital accounting. In particular, the use of ARIES, a web-based application that uses artificial intelligence, is the main tool recommended for estimating the values and accounts. ARIES "*provides a dedicated user interface to easily compile accounts within the UN System of Environmental-Economic Accounting (SEEA)*". (https://aries.integratedmodelling.org/) The Philippine Statistics Authority (PSA), the official compiler and producer of natural capital accounts in the Philippines, requires the use of ARIES for work on ES valuation and NCA to be considered as part of the official accounts of the country. The HCVA Toolkit thus adopts ARIES as the main processing and analytical application software for estimating HCVs 4 to 6. However, it does not limit the methods to ARIES. Other analytical tools are included for flexibility and to account for varying preferences and capabilities of PA managers and other users of the toolkit.

The steps involved in natural capital accounting are shown below:

Data on the ecosystems should therefore be organized to reflect the different outputs needed for the accounts.

Accounts are organized according to the following:

1. **Ecosystem Extent Accounts**[2]

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 discussions related to conversions between different ecosystem types within a country, particularly in the Philippine protected areas. Compilation of these accounts is also relevant in determining the appropriate set of ecosystem types to underpin the structure of other accounts.

[2] Source: *SEEA-EA 2021; p. 32*

In tabular form, the structure of extent accounts can be shown in the following table:

	Selected ecosystem types (based on Level 3 - EFG of the IUCN Global Ecosystem Typology)																		
Realm	Terrestrial												Freshwater			Marine			
Biome	T1 Tropical-subtropical forests				T2 Temperate-boreal forests and woodlands				...		T7		F1	...	FM1	M1	...	MFT1	
Selected Ecosystem Functional Group (EFG)	Tropical-subtropical lowland rainforests	Tropical-subtropical dry forests and scrubs	Tropical-subtropical montane rainforests	Tropical heath forests	Boreal and temperate high montane forests and woodlands	Deciduous temperate forests	...	Temperate pyric sclerophyll forests and woodlands	...	...	...	Derived semi-natural pastures and old fields	Permanent upland streams	...	Intermittently closed and open lakes and lagoons	Seagrass meadows	...	Coastal saltmarshes and reedbeds	TOTAL
	T1.1	T1.2	T1.3	T1.4	T2.1	T2.2	...	T2.6	...	...	...	T7.5	F1.1	...	FM1.3	M1.1	...	MFT1.3	
Opening extent																			
Additions to extent																			
Managed expansion																			
Unmanaged expansion																			
Reductions in extent																			
Managed reductions																			
Unmanaged reductions																			
Net change in extent																			
Closing extent																			

Note: This table provides an indicative structure with respect to the set of ecosystem types. Compilation will require the use of nationally selected ecosystem types.

2. Ecosystem Condition Accounts[3]

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 from a reference condition to provide insight into the integrity of ecosystems. It can also organize data relevant to the measurement of the capacity of an ecosystem to supply different ecosystem services.

[3] Source: *SEEA-EA 2021; p. 33*

In tabular form, the structure of condition accounts can be shown in the following table:

SEEA Ecosystem Condition Typology Class	Variables		Ecosystem type		
	Descriptor	Measurement unit	Opening value	Closing value	Change
Physical state	Variable 1				
	Variable 2				
Chemical state	Variable 3				
Compositional state	Variable 4				
	Variable 5				
Structural state	Variable 6				
Functional state	Variable 7				
Landscape/seascape characteristics	Variable 8				

3. Supply and Use of the ecosystem service in Biophysical Terms[4]

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. Using a supply and use table structure, the ecosystem service flow accounts record the flows of final ecosystem services supplied by ecosystem assets and used by economic units during an accounting period, and also allow for the recording of intermediate service flows between ecosystem assets.

Supply of the ES is presented in tables like such:

[4] Source: *SEEA-EA 2021; p. 33*

SUPPLY			UNITS OF MEASURE		Selected ecosystem types (based on Level 3 - EFG of the IUCN Global Ecosystem Typology)																		Total Supply resident ecosystem assets	Supply from non-resident ecosystem assets - Imports	Total Supply ecosystem services	TOTAL SUPPLY
					Terrestrial														Freshwater			Marine					
					T1 Tropical-subtropical forests				T2 Temperate-boreal forests and woodlands				...		T7		F1	...	FM1	M1	...	MFT1				
					Tropical-subtropical lowland rainforests	Tropical-subtropical dry forests and scrubs	Tropical-subtropical montane rainforests	Tropical mangrove forests	Boreal and temperate high montane forests and woodlands	Deciduous temperate forests	...	Temperate pyric sclerophyll forests and woodlands	...	...	...	Derived semi-natural pastures and old fields	Permanent upland streams	...	Intermittently closed and open lakes and lagoons	Seagrass meadows	...	Coastal saltmarshes and reedbeds				
					T1.1	T1.2	T1.3	T1.4	T2.1	T2.2	...	T2.6	...	...	...	T7.5	F1.1	...	FM1.3	M1.1	...	MFT1.3				
Selected ecosystem services (reference list)																										
Provisioning services																										
	Biomass provisioning	Crop provisioning																								
		Grazed biomass provisioning																								
		Livestock provisioning services																								
		Aquaculture provisioning services																								
		Wood provisioning services																								
		Wild fish and other natural aquatic biomass provisioning services																								
		Wild animals, plants and other biomass provisioning services																								
	Genetic material services																									
	Water supply																									
	Other provisioning services																									
Regulating and maintenance services																										
	Global climate regulation services																									
	Rainfall pattern regulation services																									
	Local (micro and meso) climate regulation services																									
	Air filtration services																									
	Soil quality regulation services																									
	Soil and sediment retention services																									
	Solid waste remediation services																									
	Water purification services																									
	Water flow regulation services																									
	Flood control services																									
	Storm mitigation services																									
	Noise attentuation services																									
	Pollination services																									
	Biological control services																									
	Nursery population & habitat maintenance services																									
	Other regulating and maintenance services																									
Cultural services																										
	Recreation-related services																									
	Visual amenity services																									
	Education, scientific and research services																									
	Spiritual, artistic and symbolic services																									
	Other cultural services																									

Meanwhile, use (or demand) of the ES can be presented as such:

				Selected economic units															Selected ecosystem types (based on Level 3 - EFG of the IUCN Global Ecosystem Typology)																					
				Selected industries															Terrestrial												Freshwater			Marine						
																			T1 Tropical-subtropical forests				T2 Temperate-boreal forests and woodlands				...		T7		F1	...	FM1	M1	...	MFT1				
				Agriculture	Forestry	Fisheries	Mining and quarrying	Manufacturing	Electricity, gas, steam and air conditioning supply	Water supply; sewerage, waste management and remediation activities	Services	Other industries	Total Industry	Government consumption	Household consumption	Total use by resident economic units	Exports - final ecosystem services	Total Use by economic units	Tropical-subtropical lowland rainforests	Tropical-subtropical dry forests and scrubs	Tropical-subtropical montane rainforests	Tropical heath forests	Boreal and temperate high montane forests and woodlands	Deciduous temperate forests	...	Temperate pyric sclerophyll forests and woodlands	...	...	...	Derived semi-natural pastures and old fields	Permanent upland streams	...	Intermittently closed and open lakes and lagoons	Seagrass meadows	...	Coastal saltmarshes and reedbeds	Total use by resident ecosystem assets	Exports - intermediate services	Total Use by ecosystem assets	TOTAL USE
USE			UNITS OF MEASURE																T1.1	T1.2	T1.3	T1.4	T2.1	T2.2	...	T2.6	...	...	...	T7.5	F1.1	...	FM1.3	M1.1	...	MFT1.3				
Selected ecosystem services (reference list)																																								
Provisioning services																																								
	Biomass provisioning	Crop provisioning																																						
		Grazed biomass provisioning																																						
		Livestock provisioning services																																						
		Aquaculture provisioning services																																						
		Wood provisioning services																																						
		Wild fish and other natural aquatic biomass provisioning services																																						
		Wild animals, plants and other biomass provisioning services																																						
	Genetic material services																																							
	Water supply																																							
	Other provisioning services																																							
Regulating and maintenance services																																								
	Global climate regulation services																																							
	Rainfall pattern regulation services																																							
	Local (micro and meso) climate regulation services																																							
	Air filtration services																																							
	Soil quality regulation services																																							
	Soil and sediment retention services																																							
	Solid waste remediation services																																							
	Water purification services																																							
	Water flow regulation services																																							
	Flood control services																																							
	Storm mitigation services																																							
	Noise attenuation services																																							
	Pollination services																																							
	Biological control services																																							
	Nursery population & habitat maintenance services																																							
	Other regulating and maintenance services																																							
Cultural services																																								
	Recreation-related services																																							
	Visual amenity services																																							
	Education, scientific and research services																																							
	Spiritual, artistic and symbolic services																																							
	Other cultural services																																							

4. Supply and Use of the ES in Monetary Terms

In completing the accounts, the biophysical values above are converted into monetary values. In doing so, the recorded monetary values underpin the compilation of two accounts: the ecosystem services flow account and the monetary ecosystem asset account.

Monetary valuation depends on two factors in an accounting context, namely:

a. The definition and scope of goods, services and assets being considered; and

b. The valuation concept being used.

In the context of ecosystem accounting under the UN-SEEA framework, values are always based on "exchange values". However, research and policy have usually focused on non-market valuation methods to measure changes in welfare more accurately. For purposes of this toolkit, non-market valuation methods are included in the options for some ecosystem services, particularly for HCV4 and HCV6, to make it more useful for government to plan and manage PAs across the country.

Monetary ES flow accounts are useful for the following purposes:

a. To help us understand the relative significance of different ecosystem services

b. Support aggregation of ecosystem services to allow us to compare the roles of ecosystem assets with each other

c. To assess the changes in monetary values over time

d. To allow us to compare inputs of different ecosystem services to different users

e. Support understanding the role of ecosystem services in different locations.

A summary of the flow of activities for NCA is shown in the flowcharts below:

ARIES Summary

Description

ARIES is an artificial intelligent modeller rather than a single model or collection of models. ARIES chooses ecological process models where appropriate, and turns to simpler models where process models do not exist or are inadequate. Based on a simple user query, ARIES builds all the agents involved in the nature/society interaction, connects them into a flow

network, and creates the best possible models for each agent and connection. The result is a detailed, adaptive, and dynamic assessment of how nature provides benefits to people.

ARIES is based on the radically novel k.LAB technology, which allows models and data to be contributed by independent researchers, hosted on a network, and automatically assembled into model workflows following a user's simple. The technology, which can be applied beyond the field of ecosystem services, is the first operational example of semantically integrated, distributed, collaborative modeling. As an international network of scientific collaborators contribute data and models, the ARIES system grows by itself, and each new assessment automatically adopts the best data and models available. In the next year, users will be able to not only develop, but also run models directly from the world wide web, enabling a simple, two-step modeling workflow suitable for non-technical users, such as decision makers and their staff.

Input

I. Extent
- Extent account: Net balance
- Extent account: Additions and reductions
- Ecosystem type: Change matrix
- Land account: net balance
- Land account: additions and reductions
- Land cover type: change matrix

II. Condition
- Condition variable account
- Condition indicator account
- Condition index account

III. Ecosystem services account (physical terms)
- Crop provisioning: ecosystem contribution
- Crop provisioning: pollination contribution
- Global climate regulation: C storage
- Sediment regulation: soil erosion control
- Recreation: nature-based tourism

IV. Ecosystem services account (monetary terms)
- Crop provisioning: value of ecosystem contribution
- Crop provisioning: value of pollination contribution
- Global climate regulation: value of change in C storage

Output
- A general introduction to the model(s);
- Information on the SEEA framework or any other more general modeling frameworks (when part of a larger set of models);
- The methods applied;

- A summary of the main results;
- Caveats or other considerations in interpreting model results, as part of the discussion; and
- Reference(s) for data and method(s) used.

5. HCV 4 - Regulating and Maintenance Services[5]

Definition

Regulating and maintenance services are those ecosystem services resulting from the ability of ecosystems to regulate biological processes and to influence climate, hydrological and biochemical cycles, and thereby maintain environmental conditions beneficial to individuals and society.

Rationale[6]

The quantification of the supply of regulating and maintenance services generally depends directly and strongly upon knowledge of the ecosystem type and its key characteristics since the role of the ecosystem in supplying services will vary as the type and characteristics change. Thus, in assessing the extent to which a particular ecosystem provides regulating and maintenance services, it is normal to make an assumption as to what services would be supplied if the ecosystem type or its characteristics were different. For example, forests are better at capturing air pollutants than grasslands, and wetlands with well-structured and diverse vegetation are better at purifying water of pollutants compared to wetlands with little vegetation.

Methodology

HCV Sub-category/Methods	Bronze	Silver	Gold	Platinum
Secondary data collection	✔	✔		
Review of literature	✔	✔		
Review of existing data	✔	✔		

[5] All definitions of HCV 4 Regulating and Maintenance Services are from: Department of Economic and Social Affairs, Statistics Division, United Nations, Version 5 February 2021. System of Environmental-Economic Accounting- Ecosystem Accounting, Final Draft.

[6] Source: *SEEA-EA 2021; p. 173*

Request readily available maps from concerned institution/agency and websites				
Allen Coral Atlas	✔	✔		
Google Earth Pro/Engine	✔	✔		
Maps from management plans	✔	✔		
Global Forest Watch	✔	✔		
Mapping agencies		✔		
Global Mangroves Watch		✔		
Seagrass Watch		✔		
Physical quantification of the ES based on secondary data		✔		
Ground validation of the collected secondary data (esp. maps)			✔	
Biophysical modeling and mapping using				
For extent accounting				
Remote sensing			✔	✔
InVEST			✔	✔
ArcGIS			✔	✔
DELFT3D			✔	✔
SWAN			✔	✔
SWAT			✔	✔
K-Means Clustering			✔	✔
ARIES			✔	✔
SedNet			✔	✔
AFOLU		✔		
EXACT			✔	✔
Heat modeling			✔	✔
For condition accounting				
Production function models			✔	✔
Diversity indices			✔	✔
Underwater assessments			✔	✔
"Quec-Quec" Model			✔	✔
Sources and sinks/Connectivity model			✔	✔
Canopy cover assessment			✔	✔
Normalized Difference Vegetation Index (NDVI)			✔	✔
Net Primary Production (NPP)			✔	✔
Fish visual census			✔	✔

Photo transect			✔	✔
Quadrate method			✔	✔
RUSLE			✔	✔
Survey methods				
Key informant interviews			✔	✔
Focus Group Discussion (FGD)			✔	✔
Household surveys (E-SEAMS, etc.)			✔	✔
Online survey			✔	✔
Data Analysis and Database Management using				
STATA			✔	✔
R			✔	✔
SPSS			✔	✔
MS Excel			✔	✔
ArcGIS			✔	✔
Valuation Methods				
Contingent valuation method				✔
Hedonic pricing				✔
Cost-based valuation method				✔
Choice experiment				✔

HCV 4.1 Global Climate Regulation

Definition

Global Climate Regulation Services are the ecosystem contributions to the regulation of the chemical composition of the atmosphere and oceans that affect global climate through the accumulation and retention of carbon and other GHG (e.g., methane) in ecosystems and the ability of ecosystems to remove carbon from the atmosphere. This is a final ecosystem service.

Supply factors will measure ecosystem conditions and physical ecosystem service flows and will include costs of management. Demand factors will measure ecosystem benefits/ values including damages avoided.

Rationale

XXX

Output, Data Needs, and Data Sources

Identification of HCV 4.1 will determine sources and sinks of carbon and carbon equivalents in the PA by ecosystem, land cover, and land use practices. Carbon emission, sequestration, and net emission need to be quantified using global and national standards. From these, estimation and valuation studies will be conducted using carbon monitoring plots with social cost and carbon market price. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Identification of sources and sinks of carbon and carbon equivalents in the PA by ecosystem (including marine ecosystems) and land cover (for terrestrial ecosystems), and land use practices**
Level 2 **Silver**	**Quantification of the carbon emission and sequestration and net emission/ sequestration using global and national standards**
Level 3 **Gold**	**Estimation and valuation of net carbon emission/sequestration of the PA using carbon monitoring plots with social cost and market price of carbon**
Level 4 **Platinum**	**Valuation of net carbon emission/sequestration using social cost and market price of carbon (with more monitoring plots)**

Table xx. Data needs for the identification of HCV 4.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	*Supply:* Carbon sinks: • Land cover (includes mangroves, peatlands and other inland wetlands) • Seagrass cover • Coral reef cover Carbon sources: • Presence/Absence and location of livestock raised within the PA • Presence/Absence and location of agricultural activities emitting carbon and other GHGs • Presence/Absence and location of economic activities that emit carbon and other GHGs • Presence/Absence and location of kaingin activities in the PA

	• List of transportation emitting GHGs • Land cover (peatlands and other land cover that emit GHGs) • Coral reef cover
Level 2 **Silver**	*Supply:* Carbon sinks: • Hectarage by ecosystem and land cover that sequester CO_2 and other GHGs • Carbon content per hectare for two-time period using standard global/national coefficients *Terrestrial Ecosystems:* • Amount of CO_2 and other GHGs sequestered by existing land cover (includes mangroves, peatlands and other inland wetlands) in the area *Coastal Ecosystems:* • Amount of CO_2 and other GHGs sequestered by the seagrass cover • Amount of CO_2 and other GHGs sequestered by the coral reef cover Carbon sources: *Terrestrial Ecosystems* • Amount of CO_2 emitted by some land cover types (peatlands and other land cover that emit GHGs) *Coastal Ecosystems* • Amount of CO_2 emitted by coral reefs and other coastal ecosystems *Semi-Urban Settlements* • Hectarage by land use/cover allocated to the economic activities • Emission coefficients of all economic activities (e.g., livestock, fishing, agriculture, etc.) • Amount of CO_2 emitted by the livestock within the PA • Amount of CO_2 and other GHGs emitted by the economic activities within and near the PA • Amount of CO_2 and other GHGs emitted by kaingin activities • Emission coefficients of human settlements • Amount of CO_2 emitted by the population within the PA • Emission coefficients of transportations • Number of transportations that emit GHGs within the PA • Amount of GHGs emitted by transportations and road networks within the PA
Level 3 **Gold**	*Supply:* • Establishment of carbon monitoring plots with greater than 15% uncertainty (less than 85% accuracy) to measure the biomass within the PA • Hectarage by ecosystem and land cover that sequester CO_2 and other GHGs • Carbon content per hectare for two-time period using standard global/national coefficients

	Terrestrial Ecosystems: • Amount of CO_2 and other GHGs sequestered by existing land cover (includes mangroves, peatlands and other inland wetlands) in the area *Coastal Ecosystems:* • Amount of CO_2 and other GHGs sequestered by the seagrass cover • Amount of CO_2 and other GHGs sequestered by the coral reef cover <u>Carbon sources:</u> • Hectarage by land use/cover allocated to the economic activities • Emission coefficients of all economic activities (e.g., livestock, fishing, agriculture, etc.) • Amount of CO_2 emitted by the livestock within the PA • Amount of CO_2 and other GHGs emitted by the economic activities within and near the PA • Amount of CO_2 and other GHGs emitted by kaingin activities • Amount of CO_2 emitted by the population and their economic activities within and near the area • Amount of CO_2 emitted by some land cover types (peatlands and other land cover that emit GHGs) • Number of transportations that emit GHGs within the PA • Amount of GHGs emitted by transportations and road networks within the PA *Demand:* · Social cost of carbon · Market price of carbon
Level 4 **Platinum**	*Supply:* • Establishment of carbon monitoring plots with less than 15% uncertainty (more than 85% accuracy) to measure the biomass within the PA • Hectarage by ecosystem and land cover that sequester CO_2 and other GHGs • Carbon content per hectare for two-time period using standard global/national coefficients *Terrestrial Ecosystems:* • Amount of CO_2 and other GHGs sequestered by existing land cover (includes mangroves, peatlands and other inland wetlands) in the area *Coastal Ecosystems:* • Amount of CO_2 and other GHGs sequestered by the seagrass cover • Amount of CO_2 and other GHGs sequestered by the coral reef cover <u>Carbon sources:</u> • Hectarage by land use/cover allocated to the economic activities • Emission coefficients of all economic activities (e.g., livestock, fishing, agriculture, etc.) • Amount of CO_2 emitted by the livestock within the PA • Amount of CO_2 and other GHGs emitted by the economic activities within and near the PA • Amount of CO_2 and other GHGs emitted by kaingin activities

	• Amount of CO_2 emitted by the population and their economic activities within and near the area • Amount of CO_2 emitted by some land cover types (peatlands and other land cover that emit GHGs) • Number of transportations that emit GHGs within the PA • Amount of GHGs emitted by transportations and road networks within the PA *Demand:* · Social cost of carbon · Market price of carbon

Table xx. List of recommended data sources that can be used for the identification of HCV 4.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• Secondary source of PA land cover (NAMRIA, Global data sources) • Lookup table for biomass from existing literature • Lookup table for carbon content estimates (ecosystem types, coefficients/ standards of carbon content per hectare by land cover and ecosystem type) • Attribute table (A database or tabular file containing information about a set of geographic features (e.g. a map layer), usually arranged so that each row represents a feature and each column represents one feature attribute • WB, IPCC for social cost of carbon and carbon prices • Local publications for carbon content standards; IPCC if not available locally • Standard formula for above-ground and below-ground CO^2 content
Level 2 **Silver**	• Field-validated land cover either by consultation with on-site individuals through FGDs and site visits • Lookup table for biomass from existing literature • Lookup table for carbon content estimates (ecosystem types, coefficients/ standards of carbon content per hectare by land cover and ecosystem type) • Attribute table • WB, IPCC for social cost of carbon and carbon prices • Local publications for carbon content standards; IPCC if not available locally • Standard formula for above-ground and below-ground CO^2 content
Level 3 **Gold**	• Lookup table for vegetation data • Lookup table for carbon content estimates • Primary surveys for forest inventory and above-ground biomass
Level 4 **Platinum**	• Lookup table for the vegetation data • Lookup table for carbon content estimates • Primary surveys for forest inventory and above-ground biomass • Primary surveys of Carbon monitoring plots

HCV 4.2 Local Climate Regulation

Definition

Local Climate Regulation Services are the ecosystem contributions to the regulation of ambient atmospheric conditions (including micro and mesoscale climates) through the presence of vegetation that improves the living conditions for people and supports economic production. Examples include the evaporative cooling provided by urban trees ('green space'), the role of urban water bodies ('blue space') and the contribution of trees in providing shade for humans and livestock. This may be a final or intermediate service.

Rationale

Xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.2 will require a narrative description of the local climate regulation service's transmission pathway. Xxx

An economic valuation will be done based on the impacts of productivity and defensive expenditures/ energy savings. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative description of the transmission pathway of the ES (based on science and local/site characteristics e.g., vegetation type, wind flow, elevation, and weather conditions) and potential Area of Influence of ES (defined by settlements within 5-10 km. radius from the PA boundary)** ***Note: Temperature and moisture impact on agriculture***
Level 2 **Silver**	**Quantification of/Data collection on local/site characteristics and of Potential Impact on Agriculture and housing settlements and industrial districts of ES (based on secondary data)**

Level 3 **Gold**	**Physical estimation of the ES impact on housing and industrial cooling, and agricultural productivity using production function analysis or biophysical modeling (e.g., wind modeling)**
Level 4 **Platinum**	**Economic Value of Local Climate Regulation ES based on productivity impact and defensive expenditures/energy savings**

*The IUCN defines habitats according to the Convention on Biological Diversity: the place or type of site where an organism or population naturally occurs (CBD, Art. 2, 1992).

Table xx. Data needs for the identification of HCV 4.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Published studies/articles on local climate regulation services *Supply:* <u>Extent</u> • Area of the PA in hectares • Existing land cover (includes inland wetlands) • River systems <u>Condition</u> • Presence/absence of fragmentation • Presence/absence of economic activities within the PA • Weather/Climate information based on anecdotal accounts of occurrences of rainfall and typhoon events • Elevation description • Wind description in terms of direction, intensity and duration • Canopy cover description • Forest structure description *Demand:* • Location and approximate distance of settlement areas relative to the ES provider/source, and indicator of density • Location and approximate distance of agricultural areas relative to the ES provider/source, and indicator of density
Level 2 **Silver**	*Supply:* <u>Extent</u> • Area (in hectares) by land cover • Land cover (includes inland wetlands) • Length (in km) of river systems and tributaries <u>Condition</u> • Degree of fragmentation • Number and location of economic activities within the PA • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Temperature • Frequency of extreme events (i.e.,typhoons) • Elevation map

	• Wind map • River systems • Aspect • Canopy cover estimates • Forest structure *Demand:* • Characteristics of the surrounding communities • Population size • Population density • Number of households • Agricultural production • Area (in ha) • Crop yield
Level 3 **Gold**	*Supply:* <u>Extent</u> • Area (in hectares) by land cover • Land cover (includes inland wetlands) • Length (in km) of river systems and tributaries <u>Condition</u> • Vegetation data • Species-level identification of trees • Diameter at breast height (DBH) of trees • Height of trees • Volume of trees • Lookup table for the vegetation data • Degree of fragmentation • Number and location of economic activities within the PA • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Temperature • Frequency of extreme events (i.e.,typhoons) • Elevation map • Wind map • River systems • Aspect • Canopy cover estimates • Forest structure *Demand:* • Household characteristics of the communities nearby the area of influence • Population size • Population density • Number of households • GPS Data of the households (geotagged) • Ownership of air conditioning units and electric fans • Number of household members • Number of working members • House-based business establishment • Housing characteristics

	• Type of building materials • House size • Number of windows • Lot area and floor area • Number of trees within the lot • Number of trees near the house • Agricultural production • Area (in ha) • Crop yield • Quantity of crops sold by type of crop
Level 4 **Platinum**	*Note: Results of the modeling in Gold level will be used in Platinum level (valuation).* <u>Extent</u> • Area (in hectares) by land cover • Land cover (includes inland wetlands) • Length (in km) of river systems and tributaries <u>Condition</u> • Vegetation data • Species-level identification of trees • Diameter at breast height (DBH) of trees • Height of trees • Volume of trees • Lookup table for the vegetation data • Degree of fragmentation • Number and location of economic activities within the PA • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Temperature • Frequency of extreme events (i.e.,typhoons) • Elevation map • Wind map • River systems • Aspect • Canopy cover estimates • Forest structure *Demand:* • Household characteristics of the communities nearby the area of influence • Population size • Population density • Number of households • GPS Data of the households (geotagged) • Household expenditure on electricity • Ownership of air conditioning units and electric fans • Number of household members • Number of working members • House-based business establishment • Housing characteristics • Type of building materials • House size • Number of windows

	• Lot area and floor area • Number of trees within the lot • Number of trees near the house • Agricultural production • Area (in ha) • Crop yield • Quantity of crops sold by type of crop *Costs and returns data* • Price by type of crop • Quantity of crops sold • Labor costs • Costs of inputs

Table xx. List of recommended data sources that can be used for the identification of HCV 4.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• DENR • CLUPs • PSA • NAMRIA • PAG ASA • Local Weather Stations
Level 2 **Silver**	• LGU Agricultural Data • BAS/PSA data on AgriculturalProduction
Level 3 **Gold**	• Primary surveys • Econometric modeling using the production function approach
Level 4 **Platinum**	• Primary surveys • Heat island modeling

HCV 4.3 Air Filtration Services

Definition

Air filtration services are the ecosystem contributions to the filtering of air- borne pollutants through the deposition, uptake, fixing and storage of pollutants by ecosystem components, particularly plants, that mitigates the harmful effects of the pollutants. This is most commonly a final ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.3 will require a narrative or physical estimate of potential air filtration impacts, xxx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative account/physical estimate of potential air filtration Impact based on the identification of sources of pollution, characteristics of forests and other biophysical characteristics, and potential impact zone** (based on wind flow and characteristics of pollutants)
Level 2 **Silver**	**Quantification of pollution by source and characteristics of local biophysical and climatic conditions and potential impacts on health and infrastructure and vegetation damage** (material damage: damage on roofings and crop losses) **based on secondary data**
Level 3 **Gold**	**Estimation of the relationship between air filtration ES and impacts on health, infrastructure and vegetation**
Level 4 **Platinum**	**Valuation of the ES impacts on health** (using cost of illness/defensive expenditures) **and other damages** (using replacement cost and mitigation costs)

Table xx. Data needs for the identification of HCV 4.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	Studies/articles on air filtration services and characteristics of pollutants *Supply:* Biophysical characteristics of the PA: Extent • Area of the PA in hectares • Existing land cover (including built-up areas) Condition • Presence/absence of fragmentation

	• Wind description Sources of pollutants/threats: • List of air pollutants • Area of the built-up areas • Presence/Absence of road networks within the PA • List of economic activities generating air pollution *Demand:* • Location and distance of settlement areas relative to the ES provider/source, and indicator of density • Location and distance of agricultural areas relative to the ES provider/source, and indicator of density • List and location economic activities that will be affected by air pollution and their distance from the ES source
Level 2 **Silver**	*Supply:* Biophysical characteristics of the PA: Extent • Existing land cover (including built-up areas) • Area of the PA by land cover (including built-up areas) in hectares Condition • Degree of fragmentation • Air quality monitoring data (if available) • Wind map Sources of pollutants/threats: • Characteristics of air pollutants • List and location of economic activities generating air pollution, and their distance from the PA • Length of road networks within the PA • Road density • List and location of economic activities generating air pollution, and their distance from the PA *Demand:* • Characteristics of the surrounding communities ○ Population size ○ Population density ○ Number of households • Data on mortality and morbidity (Upper Respiratory Tract diseases) in the identified potential areas of influence • Location and distance of settlement areas relative to the ES provider/source, and indicator of density • Location and distance of agricultural areas relative to the ES provider/source, and indicator of density • List and location economic activities that will be affected by air pollution and their distance from the ES source
Level 3 **Gold**	*Supply:* Biophysical characteristics of the PA: Extent • Existing land cover (including built-up areas) • Area of the PA in by land cover (including built-up areas) in hectares

	Condition • Vegetation data, leaf & trunk characterization o Species-level identification of trees o Diameter at breast height (DBH) of trees o Height of trees o Volume of trees o Lookup table for the vegetation data • Degree of fragmentation • Air quality monitoring data • Wind map Sources of pollutants/threats: • Characteristics of air pollutants • List and location of economic activities generating air pollution, and their distance from the PA • Size, location, start year of operation, operating hours per day, days of operation per year, and scale (inferred by the number of employees and/or production output in tons per year) of the economic activities • Operations and pollutants mitigation measures • Environmental protection measures • Technology adapted • Length of road networks within the PA • Road density *Demand:* • Characteristics of the surrounding communities o Population size o Population density o Number of households • Data on mortality and morbidity (Upper Respiratory Tract diseases) and cancer in the identified potential areas of influence over time • Age of affected family members • Frequency of occurrence within a year over 5 years • Location and distance of settlement areas relative to the ES provider/source, and indicator of density • Location and distance of agricultural areas relative to the ES provider/source, and indicator of density • List and location economic activities affected by air pollution and their distance from the ES source • Identification of cases of roofing damages potentially caused by air pollutants • Identification of cases of crop loss potentially caused by air pollutants
Level 4 **Platinum**	*Note: Results of the modeling in Gold level will be used in Platinum level (valuation).* **Data Needs:** *Supply:* Biophysical characteristics of the PA: Extent • Existing land cover (including built-up areas) • Area of the PA in by land cover (including built-up areas) in hectares Condition

	• Vegetation data, leaf & trunk characterization o Species-level identification of trees o Diameter at breast height (DBH) of trees o Height of trees o Volume of trees o Lookup table for the vegetation data • Degree of fragmentation • Air quality monitoring data (if available) • Wind map <u>Sources of pollutants/threats:</u> • Characteristics of air pollutants • List and location of economic activities generating air pollution, and their distance from the PA • Size, location, start year of operation, operating hours per day, days of operation per year, and scale (inferred by the number of employees and/or production output in tons per year) of the economic activities • Operations and pollutants mitigation measures • Environmental protection measures • Technology adapted • Length of road networks within the PA • Road density *Demand:* • Characteristics of the surrounding communities o Population size o Population density o Number of households • Data on mortality and morbidity (Upper Respiratory Tract diseases) and cancer in the identified potential areas of influence over time • Age of affected family members • Frequency of occurrence within a year over 5 years • Cost of treatment • Work loss days • Location and distance of settlement areas relative to the ES provider/source, and indicator of density • Location and distance of agricultural areas relative to the ES provider/source, and indicator of density • List and location economic activities affected by air pollution and their distance from the ES source • Expenditures to protect their HH from air pollution • Costs on the roofing damages (replacement or re/painting) • Defensive costs to mitigate corrosion/damages on roofing materials • Crop losses due to air pollutants by type of crop • Defensive costs to mitigate damages/crop losses due to air pollutants

Table xx. List of recommended data sources that can be used for the identification of HCV 4.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources

Level 1 **Bronze**	• NAMRIA • PSA • Secondary data/published studies • DPWH
Level 2 **Silver**	• NAMRIA • PSA • Secondary data/published studies • DPWH • DOH • Rural Health Units • DENR EMB
Level 3 **Gold**	• NAMRIA • PSA • Secondary data/published studies • DPWH • DOH • Rural Health Units • Primary data gathering i.e., surveys, KIIs, FGDs, etc. • DENR EMB
Level 4 **Platinum**	• NAMRIA • PSA • Secondary data/published studies • DPWH • DOH • Rural Health Units • Primary data gathering i.e., surveys, KIIs, FGDs, etc. • DENR EMB

HCV 4.4 Soil Erosion Control Service

Definition

Soil erosion control services are the ecosystem contributions, particularly the stabilizing effects of vegetation, that reduce the loss of soil (and sediment) and support use of the environment (e.g., agricultural activity, water supply). This may be recorded as a final or intermediate service.

Rationale

Xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.4 will require a narrative description of the sources of soil loss, its transmission pathway, and impacted areas. Xxx

Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative description of the sources of soil loss by land use/cover and transmission pathway, and impacted areas along the way**
Level 2 **Silver**	**Detailed description and quantification of the characteristics of soil conditions at the source, land use and terrain conditions of the sediment pathway, and potential on-site and off-site impact areas**
Level 3 **Gold**	**Estimation of the impact on crop production from soil erosion on-site and sedimentation off-site, and fishery and recreation losses from siltation of water bodies based on survey data** (farm, fisheries, and recreation)
Level 4 **Platinum**	**Valuation of monetary impact using production function analysis** (for crop and fishery losses) **and foregone recreation and tourism revenues** (reduced visitation values)

Table xx. Data needs for the identification of HCV 4.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	Published studies on soil loss by land use/land cover type *Supply:* Extent • Area of the PA in hectares • Existing land cover • River systems Condition • Presence/absence of fragmentation • Geology and soil type description • Vegetation type description • Slope description • Existing land use practices • Weather/Climate information based on anecdotal accounts of occurrences of rainfall and typhoon events

	Demand: • Presence/Absence and location of agricultural (Upstream and downstream) production areas • Presence/Absence and location of downstream water bodies, dams, hydroelectric plants • Presence/Absence of recreational use of water bodies (resorts) • Description of agricultural practices (e.g., kaingin, plantation, agroforestry, etc.)
Level 2 **Silver**	*Supply:* <u>Extent</u> • Existing land cover • Area of the PA by land cover (in hectares) <u>Condition</u> • Degree of fragmentation • Land cover/use data • Geology and soil maps • Soil structure • Erosion class (soil erodibility factor) • Rainfall patterns (frequency and intensity) • Vegetation type • Slope maps • Digital Elevation Model (DEM) • Geomorphological data • Soil and water conservation practices in the PAs based on secondary data • Soil erosion coefficients from existing land use plans and hydrologic models • Soil loss and water quality monitoring data (if available) • Extent of cultivation within the area and type of crops grown • Volume of water coming from watershed (if available) • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Frequency of extreme events (i.e.,typhoons) *Demand:* • Characteristics of the surrounding communities • Population size • Population density • Number of households • Number and location of agricultural (Upstream and downstream) production areas, and their distance from the ES sources • Data on irrigated and non-irrigated farms in potential impact areas • Number and location of downstream water bodies, dams, hydroelectric plants, and their distance from the ES sources • Number and location recreational use of water bodies (resorts) , and their distance from the ES sources
Level 3 **Gold**	*Note: Physical modeling: hydrologic (supply), production function analysis (agri), where recreational (downstream recreational activities) impact is significant, do recreational modeling* *Supply:* <u>Extent</u> • Existing land cover • Area of the PA by land cover (in hectares) <u>Condition</u>

	• Land cover/use data • Geology and soil maps • Soil structure • Slope • Digital Elevation Model (DEM) • Geomorphological data • Soil erosion coefficients from existing land use plans and hydrologic models • Erosivity of crops (obtained from vegetational analysis) • Extent of fragmentation of forest cover to determine the sediment delivery ratio • Watershed geomorphological characteristics using GIS • Stream density • Sediment delivery ratio inferred from soil erosion rate (irrigated vs. non-irrigated) • Nutrient analysis at the PA level • Volume of water emanating from the PA • Topographic characteristics • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Frequency of extreme events (i.e.,typhoons) • Extent of cultivation within the area and type of crops grown • Soil and water conservation practices in the PAs based primary surveys and KIIs *Demand:* *Agricultural Impact through reduced water supply and sedimentation (farm level survey)* • Upstream production impact (in volume/quantity of agricultural products): inferred from the comparison of productivity of cultivated area with soil conservation measures vs without soil conservation measures (costs and returns data of irrigated vs non-irrigated) • Downstream production impact (in volume/quantity of agricultural products): based on the value of lost irrigation potential of downstream water bodies because of sedimentation of water bodies. • Loss of production area because of siltation, loss of production area because of low water supply, low productivity because of low water supply *Recreation (based on secondary data & KI survey)* • Reduced recreational value of water bodies affected by excessive nutrients from soil (turbidity). If this can be established based on KII of residents nearby the area • Once established, we can infer loss in recreational value due poor water quality (for inland waters and beach areas) • Increase/Decrease of the number of visits to the site *Fisheries (based on secondary data & KI survey)* • Reduced fisheries productivity of nutrient-polluted water bodies • Fish catch data (volume) • Water quality data Additional Data Needs: • Counterfactuals in the absence of land use/ cover changes • Farm-level surveys for agricultural impacts; KIIs for recreation and fisheries impacts
Level 4 **Platinum**	*Note: Results of the modeling in Gold level will be used in Platinum level (valuation).* *Supply:* • Land cover/use data • Geology and soil maps • Soil structure • Slope

- Digital Elevation Model (DEM)
- Geomorphological data
- Soil erosion coefficients from existing land use plans and hydrologic models
- Erosivity of crops (obtained from vegetational analysis)
- Extent of fragmentation of forest cover to determine the sediment delivery ratio
- Watershed geomorphological characteristics using GIS
- Stream density
- Sediment delivery ratio inferred from soil erosion rate (irrigated vs. non-irrigated)
- Nutrient analysis at the PA level
- Volume of water emanating from the PA
- Topographic characteristics
- Weather/Climate data
- Frequency of rainfall event
- Rainfall intensity
- Frequency of extreme events (i.e.,typhoons)
- Extent of cultivation within the area and type of crops grown
- Soil and water conservation practices in the PAs based primary surveys and KIIs

Demand:
Agricultural Impact through reduced water supply and sedimentation (farm level survey)
- Upstream production impact (in revenue terms by type of crops): inferred from the comparison of Productivity of cultivated area with soil conservation measures vs without soil conservation measures (costs and returns data of irrigated vs non-irrigated)
- Downstream production impact (in revenue terms by type of crops): based on the value of lost irrigation potential of downstream water bodies because of sedimentation of water bodies. (costs and returns data of irrigated vs non-irrigated)
- Loss of production area (by type of crops) because of siltation, loss of production area because of low water supply, low productivity because of low water supply

Recreation (based on secondary data & KI survey)
- Reduced recreational value of water bodies affected by excessive nutrients from soil (turbidity). If this can be established based on KII of residents nearby the area
- Once established, we can infer loss in recreational value due poor water quality (for inland waters and beach areas)
- Increase/Decrease of the number of visits to the site (can't be attributed to the siltation/sedimentation of the site)
- Increase/Decrease in the revenue generated from recreational facilities affected by poor water quality using costs and returns data

Fisheries (based on secondary data & KI survey)
- Reduced fisheries productivity of nutrient-polluted water bodies
- Fish catch data (volume)
- Cost and returns data
- Water quality data

Additional data needs:
- Counterfactuals
- Production function to measure productivity impacts
- TCM surveys for recreation over time
- Primary survey of fishers over time
- Valuation of water quality

Table xx. List of recommended data sources that can be used for the identification of HCV 4.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• MGB • PHIVOLCS • NAMRIA • BSWM* • PAGASA • Water districts • PSA (for Agricultural Statistics) • Secondary data/published studies (e.g., DOST, etc.)
Level 2 **Silver**	• MGB • PHIVOLCS • NAMRIA • BSWM • PAGASA/local weather stations • Water districts • Secondary data/published studies • LGU data • Local water districts • Communal irrigation associations • Dam management
Level 3 **Gold**	• MGB • PHIVOLCS • NAMRIA • BSWM • PAGASA/local weather stations • Water districts • Secondary data/published studies • LGU data • Local water districts • Communal irrigation associations • Dam management • Primary data gathering
Level 4 **Platinum**	• MGB, • PHIVOLCS • NAMRIA • BSWM • PAGASA/local weather stations • Water districts • Secondary data/published studies • LGU data • Local water districts • Communal irrigation associations • Dam management • Primary data gathering

HCV 4.5 Landslide Mitigation Service

Definition

Landslide mitigation services are the ecosystem contributions, particularly the stabilizing effects of vegetation, that mitigates or prevents potential damage to human health and safety and damaging effects to buildings and infrastructure that arise from the mass movement (wasting) of soil and rock. This is a final ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.5 will require a narrative description and quantification of landslide-prone areas, quantification of areas at risk, xxxx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

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Table xx. Outputs required for the identification of HCV 4.5 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative description of identified landslide-prone areas based on biophysical, characteristics** (vegetation type, slope, soil) **and land uses, and identification of potential impact zone** (population and economic activities at risk)
Level 2 **Silver**	**Quantification of landslide-prone areas and their biophysical, geomorphological, and climatological characteristics;** **Quantification of areas at risk** (population and economic activities)
Level 3 **Gold**	**Physical estimation of landslide mitigation service of the vegetation/land cover on properties and livelihood (houses, industries agricultural land, and others) based on primary data collection/surveys in areas at risk and probabilistic modeling using biophysical and geomorphological data**
Level 4 **Platinum**	**Monetary estimation of landslide mitigation value using avoided/actual damage based on presence/absence of vegetation and land cover, and predicted economic activities and properties affected**

Table xx. Data needs for the identification of HCV 4.5 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	Published studies/articles on landslide mitigation service of ES by land use/land cover type *Supply:* Extent • Area of the PA in hectares • Existing land cover Condition • Presence/absence of fragmentation • Geology and soil type description • Vegetation type description • Slope description • Existing land use practices • Weather/Climate information based on anecdotal accounts of accourences of rainfall and typhoon events • Earthquake occurences (historical) • Landslide occurences (historical) • Presence of streams *Demand:* • Agricultural areas within landslide-prone areas • Recreational use of water bodies (resorts) within landslide-prone areas • Settlement areas within landslide-prone areas • Infrastructure within landslide-prone areas
Level 2 **Silver**	Extent • Existing land cover • Area of the PA by land cover (in hectares) Condition • Degree of fragmentation • Land cover/use maps • Geology and soil maps • Soil structure • Faultline and seismicity maps • Erosion class (soil erodibility factor) • Vegetation type • Slope maps • Digital Elevation Model (DEM) • Geomorphological data • Soil and water conservation practices in the PAs • Extent of cultivation within the area and type of crops grown • Volume of water coming from watershed (if available) • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Frequency of extreme events (i.e.,typhoons)

	• Coefficients on effectivity of vegetative cover in reducing landslide from existing land use plans, hydrologic models (if available), published studies *Demand:* • Characteristics of the surrounding communities • Population size • Population density • Number of households • Number and location of agricultural (Upstream and downstream) production areas, and their distance from the ES sources • Data on irrigated and non-irrigated farms in potential impact areas • Number and location of downstream water bodies, dams, hydroelectric plants, and their distance from the ES sources • Number and location recreational use of water bodies (resorts) , and their distance from the ES sources
Level 3 **Gold**	*Notes: Probability of landslide occurrence as a function of land use, holding other factors (climate and soil condition (including water holding capacity)) constant using coefficients of land cover/vegetation* *y (dependent) = landslide occurrence* *x (independent) = factors; typhoons (probability), land use and soil conditions (actual values)* *Supply:* <u>Extent</u> • Existing land cover • Area of the PA by land cover (in hectares) <u>Condition</u> • Land cover/use data • Geology and soil maps • Soil structure • Slope • Digital Elevation Model (DEM) • Geomorphological data • Soil erosion coefficients from existing land use plans and hydrologic models • Faultline and seismicity maps • Erosivity of crops and trees (obtained from vegetational analysis) • Extent of fragmentation of forest cover to determine the sediment delivery ratio • Watershed geomorphological characteristics using GIS • Stream density • Volume of water emanating from the PA • Topographic characteristics • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Frequency of extreme events (i.e.,typhoons) • Extent of cultivation within the area and type of crops grown • Soil and water conservation practices in the PAs based primary surveys and KIIs *Demand:* • Agricultural losses (in volume) by type of crops grown • Housing losses/damages by type of housing materials

	• Structural/infrastructural losses by local estimates of damages • Population in the areas at risk • Landslide mitigation measures of areas at risk Additional Data Needs and Processes: • Counterfactuals in the absence of land use/ cover changes (depends on whether regression analysis can be done/in the absence of landslide hazard model) • Farm-level surveys for agricultural impacts; household-level surveys for population impact • Landslide risk modeling • Vulnerability and risk assessment to estimate the probability of landslide occurrence given varying land uses/land cover • Land use/land cover analysis and their potential to reduce landslide risks based on consultation with hydrogeologists (goal is to link PA cover with landslide risk) • Thorough literature and news search on landslide occurrences and corresponding damages in the Philippines, and site-specific data. • Collect information of site characteristics in areas where landslide events had taken place and correlate these with site-specific characteristics of the PA of study
Level 4 **Platinum**	*Note: Results of the modeling in Gold level will be used in Platinum level (valuation).* *Supply:* <u>Extent</u> • Existing land cover • Area of the PA by land cover (in hectares) <u>Condition</u> • Land cover/use data • Geology and soil maps • Soil structure • Slope • Digital Elevation Model (DEM) • Geomorphological data • Soil erosion coefficients from existing land use plans and hydrologic models • Faultline and seismicity maps • Erosivity of crops (obtained from vegetational analysis) • Extent of fragmentation of forest cover to determine the sediment delivery ratio • Watershed geomorphological characteristics using GIS • Stream density • Volume of water emanating from the PA • Topographic characteristics • Weather/Climate data • Frequency of rainfall event • Rainfall intensity • Frequency of extreme events (i.e.,typhoons) • Extent of cultivation within the area and type of crops grown • Soil and water conservation practices in the PAs based primary surveys and KIIs *Demand:* • Estimates of damages avoided • Agricultural losses (in revenue terms) by type of crops grown

	• Value of housing losses/damages by type of housing materials • Value of structural/infrastructural losses by local estimates of damages • Population in the areas at risk • Costs of landslide mitigation measures of areas at risk • Historical data (in the PA and other areas) • Landslide defensive/protection practices (relocation, engineering solutions, NBS, or combination) and costs Additional Data Needs and Processes: • Counterfactuals in the absence of land use/ cover changes • Farm-level surveys for agricultural impacts; household-level surveys for population impact • Landslide risk modeling • Vulnerability and risk assessment to estimate the probability of landslide occurrence given varying land uses/land cover • Land use/land cover analysis and their potential to reduce landslide risks based on consultation with hydrogeologists (goal is to link PA cover with landslide risk) • Thorough literature and news search on landslide occurrences and corresponding damages in the Philippines, and site-specific data. • Collect information of site characteristics in areas where landslide events had taken place and correlate these with site-specific characteristics of the PA of study

Table xx. List of recommended data sources that can be used for the identification of HCV 4.5 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• MGB • PHIVOLCS • NAMRIA • BSWM • PAGASA • Water districts • Secondary data/published studies
Level 2 **Silver**	• MGB • PHIVOLCS • NAMRIA • BSWM • PAGASA/local weather stations • Water districts • Secondary data/published studies • LGU data • Local water districts • Communal irrigation associations • Dam management
Level 3	• MGB

Gold	• PHIVOLCS • NAMRIA • BSWM • PAGASA/local weather stations • Water districts • Secondary data/published studies • LGU data • Local water districts • Communal irrigation associations • Dam management • Primary data gathering
Level 4 **Platinum**	• MGB • PHIVOLCS • NAMRIA • BSWM • PAGASA/local weather stations • Water districts • Secondary data/published studies • LGU data • Local water districts • Communal irrigation associations • Dam management • Primary data gathering (SEAMS, CBMS, etc.)

HCV 4.6 Solid Waste Remediation Service

Definition

Solid waste remediation services are the ecosystem contributions to the transformation of organic or inorganic substances, through the action of microorganisms, algae, plants and animals that mitigates their harmful effects. This may be recorded as a final or intermediate service.

Rationale

PAs provide this ecosystem service through the following processes:

1. Solid waste pollutants impact health through leachates into water bodies (surface and groundwater). PA vegetation reduces leachate discharge through the action of microorganisms, algae, plants and animals at the site, thereby reducing its toxicity or damage to aesthetics and property value. Vegetation absorbs hazardous chemical discharges from solid wastes.
2. Solid wastes emit an obnoxious smell during their decomposition process that affects property value. PA vegetation absorbs the obnoxious smell.

3. Solid wastes impair tourism in the area because of the aesthetic damage. PA vegetation traps solid wastes thereby controlling the aesthetic damage.

Protecting and managing this ecosystem service is necessary for the well-being and survival of the surrounding communities in the area.

Output, Data Needs, and Data Sources

Identification of HCV 4.6 will require a narrative description, xxxxx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.6 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative Description of the sources and location of pollution from solid wastes/leachates and transmission pathway, and potential affected areas**
Level 2 **Silver**	**Quantification of the solid wastes (in tons) and leachates, pollution by location and characterization of solid waste pollutants based on secondary data from LGUs; Estimation of the extent of the ES; Quantification of the extent of potential impact area**
Level 3 **Gold**	**Measurement of the ES flow (assimilative capacity of the forests and other affected ecosystems) to determine the net impact on the affected areas; Detailed characterization of the ES conditions**
Level 4 **Platinum**	**Monetary valuation of health, property, and recreational impacts of the ES in the affected areas**

Table xx. Data needs for the identification of HCV 4.6 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply*** · Area of the PA in hectares · Area (ha) allocated or used for solid waste disposal within PA · LGUs dumping wastes within the PA · List of solid wastes (e.g., biodegradable, non-biodegradable, special or hazardous

	wastes, and residual wastes) from LGU SWM Plans · Land cover adjacent or near the dumping site ***Demand*** · Identify water bodies near the solid waste disposal facilities · List of ecosystems (lakes, ponds, rivers) that might be choked or silted because of too much solid wastes or polluted by leachates from solid wastes (example: algal bloom) · Settlement areas around the solid waste disposal area · Recreational sites within the PA that might be affected by the presence of solid waste disposal facilities
Level 2 **Silver**	***Supply*** · Area (ha) allocated or used for solid waste disposal within PA · Land cover types adjacent or near the dumping site, and their distance from the solid waste disposal facilities · LGUs dumping wastes within the PA, and their distance from the solid waste disposal facilities · Solid waste management practices of the said LGUs · Characteristics and quantity of solid wastes (e.g., biodegradable, non-biodegradable, special or hazardous wastes, and residual wastes) from LGU SWM Plans ***Demand*** · Characteristics of the surrounding communities o Population size o Population density o Number of households · Number and location of water bodies affected/impacted and determine other sources of pollutants to these water bodies. · Number of ecosystems (lakes, ponds, rivers) that might be choked or silted because of too much solid wastes or polluted by leachates from solid wastes (example: algal bloom) · Area and location of settlement areas and their distance from the solid waste disposal area · Number and location of recreational sites within the PA and their distance from the solid waste disposal facilities · Area and location of agricultural lands and their distance from the solid waste disposal area
Level 3 **Gold**	*Note: Survey on health, property, and recreational impacts in the affected areas* ***Supply*** · Area (ha) allocated or used for solid waste disposal within PA · Characteristics and quantity of solid wastes (e.g., biodegradable, non-biodegradable, special or hazardous wastes, and residual wastes) · Types of pollutants from solid wastes (e.g., leachates, methane, sulfur dioxide, and other heavy metals) and their quantity estimates. · Estimate waste generated by source o Wastes generated by the community within the PA and tourists in the PA o Transported wastes from outside of the PA but disposed in the PA · Solid waste management practices of the PA and LGUs o Extent of effective implementation based on LGU assessment

	· Characteristics of the land cover (vegetation type, structure (monocrop or multistorey) and density) adjacent to and along the pathway of the solid waste leachates. · Other solid waste disposal sites outside of the PA that might be contaminating water bodies of concern · Air quality monitoring data over several years · Water quality data on the affected water bodies (including groundwater) over several years ***Demand*** · Map flow of leachates from solid waste disposal sites to water bodies · Number and location of water bodies affected/impacted and determine other sources of pollutants to these water bodies. · Health incidence of water-borne diseases in the area over several years o Morbidity data of water-borne diseases for downstream area o Morbidity data of air-borne diseases for settlements around solid waste disposal sites · Reduced value of recreational facilities affected by solid wastes. If this can be established based on KII of residents nearby the area o Number of tourists passing through solid waste disposal sites o Increase/Decrease of the number of visits to the site · Number of ecosystems (lakes, ponds, rivers) that might be choked or silted because of too much solid wastes or polluted by leachates from solid wastes (example: algal bloom) · Agricultural losses (in volume) by type of crops grown · Fisheries losses (in volume) by species of fish captured/cultured Processes: · Waste transport modeling · Water toxicity analysis · Soil quality analysis
Level 4 **Platinum**	*Note: Results of the modeling in Gold level will be used in Platinum level (valuation).* ***Supply*** · Area (ha) allocated or used for solid waste disposal within PA · Characteristics and quantity of solid wastes (e.g., biodegradable, non-biodegradable, special or hazardous wastes, and residual wastes) · Types of pollutants from solid wastes (e.g., leachates, methane, sulfur dioxide, and other heavy metals) and their quantity estimates. · Estimate waste generated by source o Wastes generated by the community within the PA and tourists in the PA o Transported wastes from outside of the PA but disposed in the PA · Solid waste management practices of the PA and LGUs o Extent of effective implementation based on LGU assessment o Solid waste management expenditures · Characteristics of the land cover (vegetation type, structure (monocrop or multistorey) and density) adjacent to and along the pathway of the solid waste leachates. · Other solid waste disposal sites outside of the PA that might be contaminating water bodies of concern · Air quality monitoring data over several years · Water quality data on the affected water bodies (including groundwater) over several years

	Demand · Map flow of leachates from solid waste disposal sites to water bodies · Number and location of water bodies affected/impacted and determine other sources of pollutants to these water bodies. · Health incidence of water-borne diseases in the area over several years o Morbidity data of water-borne diseases for downstream area o Morbidity data of air-borne diseases for settlements around solid waste disposal sites · Cost of illness (treatment costs and work loss days) · Reduced value of recreational facilities affected by solid wastes. If this can be established based on KII of residents nearby the area o Number of tourists passing through solid waste disposal sites o Increase/Decrease of the number of visits to the site o Increase/Decrease in the revenue generated from recreational facilities affected by poor water quality using costs and returns data · Number of ecosystems (lakes, ponds, rivers) that might be choked or silted because of too much solid wastes or polluted by leachates from solid wastes (example: algal bloom) · Affected agricultural areas (production costs and returns data) · Fish production data (costs and returns data) in the affected water bodies · WTP of tourists and households for solid waste remediation services of different types of ecosystems · Remediation costs (with vegetation vs. without vegetation) Processes: · Waste transport modeling · Water toxicity analysis · Soil quality analysis

Table xx. List of recommended data sources that can be used for the identification of HCV 4.6 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• Secondary data/published studies • Solid Waste Management Plans • LGUs • PSA
Level 2 **Silver**	• Secondary data/published studies • Solid Waste Management Plans • LGUs • Water districts • PSA • Rural health units
Level 3 **Gold**	• Secondary data/published studies • Solid Waste Management Plans • LGUs

	• Water districts • PSA • Rural health units • BSWM • MGB • Primary data gathering • EMB
Level 4 **Platinum**	• Secondary data/published studies • Solid Waste Management Plans • LGUs • Water districts • PSA • Rural health units • BSWM • MGB • Primary data gathering • EMB

HCV 4.7 Pollination Service

Definition

Pollination services are the ecosystem contributions by wild pollinators to the fertilization of crops that maintains or increases the abundance and/or diversity of other species that economic units use or enjoy. This may be recorded as a final or intermediate service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.7 will require a checklist of xxxx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.7 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1	**Checklist of ecological and human factors determining the supply and use of**

Bronze	pollination services of ecosystems
Level 2 **Silver**	**Quantification and mapping of population of pollinators and crops pollinated, and description of documented programs to conserve, protect, and monitor major pollinators**
Level 3 **Gold**	**Value of Pollination Services at the Community LevelPhysical estimates (area planted, crops yield, population of major pollinators) of pollination service by major pollinators at PA level**
Level 4 **Platinum**	**Estimates of the monetary value of pollination services for specific crops at the PA level using cost-based methods such as expenditure/damage cost avoided**

Table xx. Data needs for the identification of HCV 4.7 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply*** · Mapping of location of major pollinators (wild honey bee and bats) population based on wild honey gathering statistics · Type of pollinators identified by crop (e.g., honeybees for avocados and mangoes) · Area and percentage distribution of land cover for municipalities/provinces within the PA, in particular, forests including grassland and agricultural land; annual data for the past 5 years; map · Area and percentage distribution of land-uses for municipalities/provinces within the PA, in particular, forests including grassland and agricultural land; annual data for the past 5 years; map ***Demand*** · Number of commercial beekeepers and wild honey gatherers, by province · Market price of beehives, (past 5 years) · Area of pollinated crops planted by type and by province (for provinces included in the PA; annual data for past 5 years · Yield by type of crop; annual data for past 5 years · Total volume of crop produced per year by type of crop and by province for provinces within the PA · Average market price of crops by crop (at constant prices for past 5 years)
Level 2 **Silver**	***Supply*** · Farm management and harvesting practices, particularly those that threatens the habitat and population of pollinators · Spatial distribution of honeybees and bats by municipality within the PA · List of existing programs from DA, UPLB and other POs · Estimated population of pollinators (wild bees and bats) within the PA based on existing studies

	· Profile of programs on conservation and monitoring of pollinators (honey bees, bats, and other pollinators) ***Demand*** · A listing of agricultural crop production practices that poses a threat to pollinators such as the use of pesticides · Wild honey gathering practices that threatens the habitat and population of pollinators such as honey bees and bats · Mapping of location of crops benefitting from wild pollination based on information on production areas of identified pollination-dependent crops and on geographic location of pollinators (e.g., wild honey bees) within 500 m to 1 km radius · Total volume of crop produced per year by type of crop and by municipality for provinces within the PA · Number of colonies/beehive and total number by province · Number of bee hives maintained per beekeeper
Level 3 **Gold**	***Supply*** · An inventory of tree species that support or serve as habitat for bee hives within the PA · An inventory of caves that support or serve as habitat for bats within the PA ***Demand*** · Area planted to crops by type of crop (e.g., coffee, mangoes, etc.) located close (< 1 km) to patches of forests or hedgerows within the PA · Average Yield of crops planted within the PA (past 5 years) · Total volume of crop produced per year by type of crop and by municipality for provinces within the PA for the past 5 years · Number of bee hives by geographic location (or PA); for past 5 years; map · Number of beekeepers by geographic location (or PA); for past 5 years; map · Potential production value loss attributable to lack of pollinators · Mean pollination-driven reduction in yield by type of crop (i.e., the proportion of crop production that depends on pollination)
Level 4 **Platinum**	Cost of programs on conservation and monitoring of pollinators (honey bees, bats, and other pollinators) ***Demand*** · Crop losses or change in productivity under a scenario with and without pollinators · Measures may include agricultural practices intended to conserve or increase the population of natural pollinators or practices to avoid damages. Examples include establishment of hedgerows or preservation of specific areas as habitat for pollinators; planting of tree species that provide suitable habitat for pollinators; and adoption of pollinator friendly agricultural practices. · Cost to farmers may include the cost of agricultural practices intended to conserve or increase the population of natural pollinators or practices to avoid damage including the opportunity costs of preserving specific areas as habitat for pollinators. · Farm-gate price of crops affected by absence of pollinators · Average farm-gate price of crops by crop (at constant prices for past 5 years) · Variable costs related to crop harvest = (Lh x Ch) · Number of man-days required for harvesting (Lh)

	· Cost of labor per man-day (Ch) · Farm-gate price of bee hives (applicable for domesticated pollinators such as honeybees)

Table xx. List of recommended data sources that can be used for the identification of HCV 4.7 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	DA, MAO, Province Agricultural Statistics from DA, MAO, Province, BAS, PSA Existing research for average yield increase/decrease in the presence/absence of pollinators Existing research for list of pollinators by crop and pollination dependency ratio Agricultural Statistics from DA, Municipality/Province AO, BAS, PSA
Level 2 **Silver**	Agricultural Statistics from DA, Municipality/Province AO, BAS, PSA Existing research for average yield increase/decrease in the presence/absence of pollinators Existing research for list of pollinators by crop and pollination dependency ratio DA-ATI; UPLB Bee Program; NARTDI; Honey beekeepers Associations Food industry statistics (DTI), forestry statistics on NTFPs, KIIs, PA-specific data
Level 3 **Gold**	Agricultural Statistics from DA, Municipality/Province AO, BAS, PSA Existing research for average yield increase/decrease in the presence/absence of pollinators Existing research for list of pollinators by crop and pollination dependency ratio DA-ATI; UPLB Bee Program; NARTDI; Honey beekeepers Associations Food industry statistics (DTI), forestry statistics on NTFPs, KIIs, PA-specific data Primary data gathering (Surveys, KIIs, market study) PCSD
Level 4 **Platinum**	Agricultural Statistics from DA, Municipality/Province AO, BAS, PSA Existing research for average yield increase/decrease in the presence/absence of pollinators Existing research for list of pollinators by crop and pollination dependency ratio DA-ATI; UPLB Bee Program; NARTDI; Honey beekeepers Associations Food industry statistics (DTI), forestry statistics on NTFPs, KIIs, PA-specific data Primary data gathering (Surveys, KIIs, market study) PCSD

HCV 4.8 Biological Control: Pest Control Service

Definition

Pest control services are the ecosystem contributions to the reduction in the incidence of species that may prevent or reduce the effects of pests on biomass production processes or other economic and human activity. This may be recorded as a final or intermediate service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.8 will require a species list and map of indigenous trees and industrial trees for plantation, indicating their corresponding major parasitic plants, pests, and disease threats xxxxx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.8 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**List of indigenous and industrial tree plantation species and their corresponding major parasitic plant, pests and disease threats; list of incidence of invasive alien plant species, pests and diseases; and lists of KBAs and of species within these KBAs**
Level 2 **Silver**	**Map of native and industrial tree plantation species and their corresponding major parasitic plant, pests and disease threats; incidence of invasive alien plant species, pests and diseases; forest and agricultural crop production activities affected; and programs to control alien and invasive species (AIS)**
Level 3 **Gold**	**Estimates of damages of forested and agricultural crop areas affected by IAS, pest and, diseases at the PA level**
Level 4 **Platinum**	**Estimates of the economic value of IAS, pest and disease control at the local level using appropriate valuation methods**

Table xx. Data needs for the identification of HCV 4.8 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply*** · A summary of information on IAS present in forest and agricultural crops ecosystems. Details include scientific name, common name, major hosts (tree species), severity of impacts, geographic location (by province and municipality) · Inventory of native forest tree species and the corresponding major insect and disease threats · Inventory of industrial plantation forests and the corresponding major insects and

	disease threats · Details include the name of the program, geographic coverage, year implemented, and cost (total and per hectare) of completed and existing programs to control forest invasive alien species, pests and diseases · Geographic coordinates of forests and agricultural areas affected by IAS, pests and diseases; for forest invasive alien plant species, pest and pathogens causing high impacts; map ***Demand*** · List of preventive or control measures to reduce spread and potential damage from invasive alien tree species, pests and diseases including mechanical, chemical, and biocontrol agents
Level 2 **Silver**	***Supply*** · Area of forests and agricultural crops affected by IAS, pests and diseases; by geographic location for municipalities within the PA · Density of trees (host tree species) in areas affected by invasive alien species, pests and diseases; by geographic location for municipalities within the PA · Number of tree species and agricultural crops affected by IAS, pest, and diseases per unit quantity · Number of tree species infested by pests such as measuring worms, jumping lice and shoot borer per hectare · Number of tree species affected by diseases such as pink disease, gall rust and root rust per hectare ***Demand*** · Inventory of economic activities affected
Level 3 **Gold**	***Supply*** · Number and area of tree species and agricultural crops affected by IAS, pest, and diseases per unit quantity ***Demand*** · Volume of timber and crops damaged by invasive alien species, pest and diseases (Q) by geographic location for municipalities within the PA · Farm-gate price of timber and crops (P) · Volume of timber and crops damaged (Q) x Farm-gate price of timber and crops (P) · Preventive measures and strategies to reduce the spread and potential damage from invasive alien tree species, pests and diseases including mechanical, chemical, and biocontrol agents · Inventory of economic activities affected at the PA level
Level 4 **Platinum**	***Supply*** · Costs (average, marginal, total) of preventive measures; include 1) national government expenditures for research and development, regulation, management, information dissemination); 2) local government expenditures (removal, replacement, treatment of dead or dying trees) ***Demand*** · Costs (average, marginal, total) of preventive measures to reduce the spread and potential damage; include 1) household expenditures (tree removal, replacement,

	treatment); 2) timber value losses to private landowners of ITPs. · Projected economic benefits (economic damages avoided) from implementing preventive measures and strategies to reduce the spread and potential damage caused by forest IAS, pest and disease in terms of crop and timber production, recreation amenities, and carbon sequestration

Table xx. List of recommended data sources that can be used for the identification of HCV 4.8 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	BPI, FPA, BFAR, DA; BMB, DENR, Philippine Rice Research Institute, International Rice Research Institute, Research results of individual researchers, SUCs in agriculture and fishery
Level 2 **Silver**	BPI, FPA, BFAR, DA; BMB, DENR, Philippine Rice Research Institute, International Rice Research Institute, Research results of individual researchers, SUCs in agriculture and fishery PA Office, ERDB, Project level reports Asia-Pacific Forest Invasive Species Network (APFISN)
Level 3 **Gold**	BPI, FPA, BFAR, DA; BMB, DENR, Philippine Rice Research Institute, International Rice Research Institute, Research results of individual researchers, SUCs in agriculture and fishery PA Office, ERDB, Project level reports Asia-Pacific Forest Invasive Species Network (APFISN) Primary data gathering
Level 4 **Platinum**	BPI, FPA, BFAR, DA; BMB, DENR, Philippine Rice Research Institute, International Rice Research Institute, Research results of individual researchers, SUCs in agriculture and fishery PA Office, ERDB, Project level reports Asia-Pacific Forest Invasive Species Network (APFISN) Primary data gathering

HCV 4.9 Disease Control Service

Definition

Disease control services are the ecosystem contributions to the reduction in the incidence of species that may prevent or reduce the effects of species on human health. This is most commonly a final ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.9 will require a profile and inventory of programs on vector-borne diseases (VBD), the ecosystem condition, and economic values of disease control ecosystem service, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.9 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**List of Vector-Borne Diseases (VBDs) by geographic location and mortality associated with VBDs**
Level 2 **Silver**	**Mapping and profiling of VBDs, ecosystem condition, and inventory of programs and resources for disease control at a local level**
Level 3 **Gold**	**Incidence of VBDs and their health impacts, and measures for control and surveillance of VBD**
Level 4 **Platinum**	**Estimate of the economic burden of pest and disease control at the PA level using cost-based method**

Table xx. Data needs for the identification of HCV 4.9 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs

Level 1 **Bronze**	***Supply*** · A checklist of vector-borne diseases (VBDs) by vector, emergence mechanism, anthropogenic drivers, and geographic location (include map of hotspots) · A checklist of vector-borne diseases (VBDs) by vector, by ecosystem, and by geographic location (provincial level) · Inventory of financial and manpower (i.e., number of staff to whom vector control is added to their job description) resources for surveillance and control of vectors and VBDs per year, by geographic location (allocated and actual) ***Demand*** · Annual number of deaths associated with VBDs by type of disease, [age group, gender, social status, ethnicity,] and geographic location; mortality rate; national, regional, and provincial levels · Inventory of financial and manpower (i.e., number of staff to whom vector control is added to their job description) resources for surveillance and control of vectors and VBDs per year, by geographic location (allocated and actual)
Level 2 **Silver**	***Supply*** · Inventory of completed and existing studies on vector control and surveillance of VBDs conducted by ecosystem type and geographic location · Inventory of completed and existing programs or measures to prevent, monitor, control or eradicate VBDs conducted by public institutions and corresponding budgets (allocated vs actual) by ecosystem type and geographic location · Profiling of anthropogenic factors that alters the ecosystem condition thereby reducing its biocontrol services, specifically, disease control · A checklist of anthropogenic factors that alters the ecosystem condition thereby reducing its biocontrol services, specifically, disease control ***Demand*** · Inventory of completed and existing programs or measures to prevent, monitor, control or eradicate VBDs conducted by private institutions and corresponding budgets (allocated vs actual) by ecosystem type and geographic location · Annual number of deaths associated with VBDs by type of disease, [age group, gender, social status, ethnicity,] and geographic location; mortality rate; municipal population; municipal level · Annual number of morbidity cases associated with VBDs by type of disease, [age group, gender, social status, ethnicity,] and geographic location; morbidity rate; municipal population; municipal level · Monthly data on incidence of VBDs for the PAs during a given period (usually a year) by type of disease, [age group, gender, social status, ethnicity,] and geographic location; municipal population; municipal level · Prevalence of VBDs at a particular point in time by type of disease, [age group, gender, social status, ethnicity,] and geographic location; municipal population; municipal level · A summary of cost-effective interventions and alternative approaches for VBDs being applied or with potential for application in the municipality such as those included in the WHO-CHOICE (Choosing Interventions that are Cost-Effective)

Level 3 **Gold**	***Supply*** · Population and geographic distribution of major disease-causing vector species within PAs for periods where data are available; map · Time series data on changes in PA environment (land cover and land use changes through deforestation, reforestation, road construction, dam building, etc.) (5 years) · Time series data on weather variables such as temperature, precipitation, and humidity (5 years) · Details on factors affecting the transmission of VBDs such as geography, climate, time, demographics, income, urbanization, healthcare systems, herd immunity, circulating virus/bacteria strain travel and trade, vector population ***Demand*** · An inventory of disease mitigation and adaptation measures for households and communities to choose from to reduce risk of exposure to VBDs with corresponding estimated cost per capita or per hectare · Time series and cross-section data to look at changes in incidence of disease (5 years) · Provincial/PA/municipal-specific information
Level 4 **Platinum**	***Supply*** · Economic burden of disease include: 1) Cost of vector surveillance, control and eradication activities, case management, and cost of development of new vector-control tools by government ***Demand*** · Economic burden of disease include: 1) household expenditures on personal protective measures and/or treatment and 2) foregone income due to reduced productivity or time off work due to illness or caregiving to sick household members. · Cost of VBD control or interventions and estimate of Disability-Adjusted Life Years (DALYs) averted · Data required for estimating Disability-adjusted life-years (DALYs) lost: costs of control interventions and effects (incidence of disease) data; and disease surveillance data stratified by management (ambulatory vs. hospitalized (or outpatient vs inpatient), by age group

Table xx. List of recommended data sources that can be used for the identification of HCV 4.9 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	DOH, RITM; Phil. Council for Health Research and Development (PCHRD) of DOST; National Institute of Molecular Biology and Biotechnology (BIOTECH -UPLB); College of Public Health of UP Manila; University of San Carlos in Cebu; HERDIN (Health Research and Development Information Network - http://www.herdin.ph/), Specific vector (e.g., dengue, malaria, etc.) control programs of the DOH; existing studies, National Epidemiology Center of the Philippines (NECP) - DOH, WHO
Level 2 **Silver**	DOH, RITM; Phil. Council for Health Research and Development (PCHRD) of DOST; National Institute of Molecular Biology and Biotechnology (BIOTECH -UPLB); College of Public Health of

	UP Manila; University of San Carlos in Cebu; HERDIN (Health Research and Development Information Network - http://www.herdin.ph/), Specific vector (e.g., dengue, malaria, etc.) control programs of the DOH; existing studies, National Epidemiology Center of the Philippines (NECP) - DOH; DOH surveillance system (includes barangay health centers, rural health units, municipal/city health offices); LGU surveillance system (includes local hospitals, private clinics, and human quarantine stations); Field Health Service Information System (FHSIS) Annual Reports, WHO
Level 3 **Gold**	DOH, RITM; Phil. Council for Health Research and Development (PCHRD) of DOST; National Institute of Molecular Biology and Biotechnology (BIOTECH -UPLB); College of Public Health of UP Manila; University of San Carlos in Cebu; HERDIN (Health Research and Development Information Network - http://www.herdin.ph/), Specific vector (e.g., dengue, malaria, etc.) control programs of the DOH; existing studies, National Epidemiology Center of the Philippines (NECP) - DOH; DOH surveillance system (includes barangay health centers, rural health units, municipal/city health offices); LGU surveillance system (includes local hospitals, private clinics, and human quarantine stations); Field Health Service Information System (FHSIS) Annual Reports, WHO, primary data gathering
Level 4 **Platinum**	DOH, RITM; Phil. Council for Health Research and Development (PCHRD) of DOST; National Institute of Molecular Biology and Biotechnology (BIOTECH -UPLB); College of Public Health of UP Manila; University of San Carlos in Cebu; HERDIN (Health Research and Development Information Network - http://www.herdin.ph/), Specific vector (e.g., dengue, malaria, etc.) control programs of the DOH; existing studies, National Epidemiology Center of the Philippines (NECP) - DOH; DOH surveillance system (includes barangay health centers, rural health units, municipal/city health offices); LGU surveillance system (includes local hospitals, private clinics, and human quarantine stations); Field Health Service Information System (FHSIS) Annual Reports, WHO, primary data gathering

HCV 4.10 Water Purification Service

Definition

Water purification services are the ecosystem contributions to the restoration and maintenance of the chemical condition of surface water and groundwater bodies through the breakdown or removal of nutrients and other pollutants by ecosystem components that mitigate the harmful effects of the pollutants on human use or health. This may be recorded as a final or intermediate ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.10 will require characterization of supply and demand, monetary value, and economic value of the water purification ecosystem service, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx

and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.10 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Characterization of Watershed** (in terms of land use, vegetative cover)
Level 2 **Silver**	**Physical Quantification of the Ecosystem Service**
Level 3 **Gold**	**Biophysical modeling of the Ecosystem Service**
Level 4 **Platinum**	**Economic Value of the Ecosystem Service** (using cost functions, and choice experiments)

Table xx. Data needs for the identification of HCV 4.10 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply*** Extent · Point and non-point sources of pollutants (i.e. agricultural and industrial areas) · Watershed boundaries · Geographic coordinates of groundwater and surface water intake points · Sources of drinking water · Description of WQM in the watershed (location/points) Condition · Environmental factors · Land Use (forestland - virgin, logged-over; cropland, urban) · Rainfall pattern · Classification of waterbodies in the watershed (Class A, B, C) · Description of types of water treatment in the PA ***Demand*** · Identification of the impact area · Identification and location (i.e., consumptive/non-consumptive) of water users o Institutional water users o domestic water users o Industrial

	o For wildlife · Description (i.e., consumptive/non-consumptive) of water users o Institutional water users o domestic water users o Industrial o For wildlife
Level 2 **Silver**	***Supply*** <u>Condition</u> · Water table data (e.g. Volume and depth) · Water supply quality of groundwater and surface water · Water Quality Indicators (e.g., natural characteristics, nutrient loads, sediments, heavy metals) · Watershed conservation measures and costs · Water quality monitoring data and activities · Budget on water quality monitoring and engagement of communities ***Demand*** · Sources of drinking water (i.e., Levels 1, 2, 3) · Population served by type of user (e.g. number of HH, industries, farms/irrigated areas, etc.) · Estimated volume of demanded water consumed by various water users · Water harvesting practices and water storage facilities · Water treatment types and costs, volume and % of water treated by type of use (irrigation, domestic, industrial) · Annual water treatment cost · Unit water treatment cost · Wage rate
Level 3 **Gold**	***Supply*** <u>Condition</u> · InVEST modeling using (in addition to the data used in the water provisioning model): o Land use/ cover data o Nutrient loading for land use class o Nutrient runoff o Soil and water conservation measures o Efficiency parameter to retain nutrients o Soil type · Transported nutrients data (from fertilizers, pesticides, etc.) · Quantified watershed conservation measures · Water quality monitoring data and activities in the watershed ***Demand*** · individual users of drinking water · individual users of water for other domestic use · sources of drinking water · Water purification activities and costs by type of users · pollution control measures and costs · Water quality monitoring data and activities in the outlets · Value of water purification service of forests (including avoided costs)
Level 4	***Supply***

Platinum	Extent Condition · Attributes of the PA that determine water quality · Physical estimates from InVEST modeling · Costs of water conservation measures · Budget on water quality monitoring and engagement of communities ***Demand*** · Water purification activities · Water districts (can have primary and secondary treatment costs) · Industries (costs depend on the use of water) · Household (costs depend on the sources of drinking of water i.e., Levels 1, 2 and 3) · Detailed cost and volume of treated water · Input cost and output price · Water purification defensive expenditures · Pollution control measures and costs · Socio-economic characteristics of users · Watershed function attributes (water regulation, water supply, water purification) · Replacement costs

Table xx. List of recommended data sources that can be used for the identification of HCV 4.10 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	BMB, BSWM, CLUP, DENR, DSWD, DPWH, EMB, Existing water use studies, FAO reports, FMB, LGU (Provincial or Municipal), Local universities (PSU & WPU), NAMRIA, NWRB, PAGASA, PAMO, Water district, Watershed management plan, WorldClaim
Level 2 **Silver**	BMB, Brgy Health Unit, BSWM, CLUP, DENR, DOH, DSWD, DPWH, EMB, Existing water use studies, FAO reports, FMB, LGU (Provincial or Municipal), Local universities (PSU & WPU), MGB, NAMRIA, NEA, NIA, NIGS, NWRB, PAGASA, PAMO, PCSD, Water district, Watershed management plan
Level 3 **Gold**	Putting all together the data from Bronze and Silver (local and global data), Journal articles, User's manual (default data), Local validation using primary surveys, E-SEAMS
Level 4 **Platinum**	Putting all together the data from Bronze and Silver (local and global data), Journal articles, User's manual (default data), Local validation using primary surveys, E-SEAMS

HCV 4.11 Water Flow Regulation Service

Definition

Water regulation services are the ecosystem contributions to the regulation of river flows and groundwater and lake water tables. They are derived from the ability of ecosystems to absorb and store water, and (1) gradually release water during dry seasons or periods through evapotranspiration and hence secure a regular flow of water or (2) mitigate the effects of flood and other extreme water-related events and hence will be supplied together with river flood mitigation services in providing the benefit of flood protection. This may be recorded as a final or intermediate ecosystem service.

Note: the values derived for this ES are the same as the values derived for HCV 5.7

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 4.11 will require a narrative description, aggregate supply and demand, economic value, and natural capital accounting (NCA) of the water baseline flow regulation service, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.11 at different levels of standardization: Bronze, Silver, Gold, and Platinum

Level	Output
Level 1 **Bronze**	**Characterization of Watershed** (in terms of land use, vegetative cover)
Level 2 **Silver**	**Physical Quantification of the Ecosystem Service**
Level 3 **Gold**	**Biophysical modeling of the Ecosystem Service**
Level 4 **Platinum**	**Economic Value of ES** (using cost functions, choice experiments, and production function analysis)

Table xx. Data needs for the identification of HCV 4.11 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply*** <u>Extent</u> · Point and non-point sources of pollutants (i.e. agricultural and industrial areas) · Watershed boundaries · Geographic coordinates of groundwater and surface water intake points · Sources of drinking water · Description of WQM in the watershed (location/points) <u>Condition</u> · Environmental factors · Land Use (forestland - virgin, logged-over; cropland, urban) · Rainfall pattern · Classification of waterbodies in the watershed (Class A, B, C) · Description of types of water treatment in the PA ***Demand*** · Identification of the service area/impact area · Identification, location, description (i.e. consumptive/non-consumptive) of water users o Institutional water users o domestic water users o Industrial o For wildlife
Level 2 **Silver**	***Supply*** <u>Condition</u> · Water table data (e.g. Volume and depth) · Water supply quality of groundwater and surface water · Water Quality Indicators (e.g., natural characteristics, nutrient loads, sediments, heavy metals) · Watershed conservation measures and costs · Water quality monitoring data and activities · Budget on water quality monitoring and engagement of communities ***Demand*** · Sources of hydropower · Irrigation, by type (e.g. pumped groundwater, drip irrigation, etc) · Population served by type of user (e.g. farmers, number of HH, industries) · Water harvesting practices and water storage facilities · Estimated volume of demanded water consumed by various water users
Level 3 **Gold**	***Supply*** <u>Condition</u> · InVEST modeling using (in addition to the data used in the water provisioning model): o Land use/ cover data o Nutrient loading for land use class o Nutrient runoff o Soil and water conservation measures

	o Efficiency parameter to retain nutrients o Soil type · Transported nutrients data (from fertilizers, pesticides, etc.) · Quantified watershed conservation measures · Water quality monitoring data and activities in the watershed ***Demand*** · Inundation area · Irrigation area and crop · Type of property affected and area · Type of infrastructure affected (e.g. bridge, road, etc.) · Water quantity monitoring data and activities in the outlets · Hydropower produced · Inventory of shallow tube wells
Level 4 **Platinum**	***Supply*** Extent Condition · Attributes of the PA that determine water quality · Physical estimates from InVEST modeling · Costs of water conservation measures · Budget on water quality monitoring and engagement of communities ***Demand*** · Crop yield, water use intensity · Economic land rent · Scarcity cost of water · Damage avoided · Defensive expenditures (e.g. riprap, dikes, house level elevation, etc.) · Socio-economic characteristics of users · Watershed function attributes at base flow and peak flow regulation · Replacement costs (using other sources of water) · Wage rate

Table xx. List of recommended data sources that can be used for the identification of HCV 4.11 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	BMB, BSWM, CLUP, DENR, DSWD, DPWH, EMB, Existing water use studies, FAO reports, FMB, LGU (Provincial or Municipal), Local universities (PSU & WPU), NAMRIA, NWRB, PAGASA, PAMO, Water district, Watershed management plan, WorldClaim
Level 2 **Silver**	BMB, Brgy Health Unit, BSWM, CLUP, DENR, DOH, DSWD, DPWH, EMB, Existing water use studies, FAO reports, FMB, LGU (Provincial or Municipal), Local universities (PSU & WPU), MGB, NAMRIA, NEA, NIA, NIGS, NWRB, PAGASA, PAMO, PCSD, Water district, Watershed management plan

Level 3 **Gold**	Putting all together the data from Bronze and Silver (local and global data), Journal articles, User's manual (default data), Local validation using primary surveys, E-SEAMS
Level 4 **Platinum**	Putting all together the data from Bronze and Silver (local and global data), Journal articles, User's manual (default data), Local validation using primary surveys, E-SEAMS

Extent

Asset Account	Forest	Cropland	Grassland	Wetland	
Opening Stock					Total Area in Beginning Year
Addition					
Reduction					
Closing Stock					Total Area in Ending Year

Condition

Ecosystem Condition Indicators			Forest	
Indicators	**Description**	**Measurement**	**Opening Value (Year 1)**	**Closing Value (Year n)**
Area		ha		
Soil Fertility		NPK		
Species composition (flora or fauna)		No. of species		
Vegetation (NDVI)				
NPP (data from Remote Sensing)		Index #		
Ecosystem Condition Indicators			Cropland	
			Opening Value (Year 1)	Closing Value (Year n)

Area (/m2)		ha		
Soil fertility		NPK		
Others				

Supply and Use Table - Biophysical

Year	1971-2000	2017	2006-2035	2011-2040	2036-2065
Inflow					
Rainfall					
Outflow					
Total surface runoff					
Evapotranspiration					
Change in storage					

Supply and Use Table - Monetary

Use	2017	2035	2040	2065
Quantity (MCM/yr)				
Agriculture				
Domestic				
Drinking				
Other HH uses				
Total used				
Unused water				
Total including unused water				

Value (Million PhP/yr)				
Agriculture				
Domestic				
Drinking				
Quezon				
Rizal				
Other HH uses				
Quezon				
Rizal				
Total used				
Unused water				
Total including unused water				

HCV 4.12 Coastal Protection Service

Definition

Coastal protection services are the ecosystem contributions of linear elements in the seascape, for instance coral reefs, sandbanks, dunes or mangrove ecosystems along the shore, in protecting the shore and thus mitigating the impacts of tidal surges or storms on local communities. This is a final ecosystem service.

Rationale

XXX

Output, Data Needs, and Data Sources

Identification of HCV 4.12 will require a general description, habitat risk assessment, economic value, and community impacts of the coastal protection service, as shown in

Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 4.12 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	Profiling (tabular form) of Coastal Ecosystems (mangroves, coral reefs, and seagrasses) and description of the Ecosystem Services
Level 2 **Silver**	Mapping of Coastal Characteristics (coastal bathymetry, elevation, storm surge/wave heights, Existing maps of past damages
Level 3 **Gold**	Physical estimates of the impacts of natural hazards that are relevant to coastal protection (with or without ecosystem service) Assessment of damages to communities, and typhoon maps) Mapping of present extent and condition
Level 4 **Platinum**	Estimation of the avoided damage costs (with or without ecosystem service) under several typhoon scenarios

Table xx. Data needs for the identification of HCV 4.12 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs

Level 1 **Bronze**	***Supply***
	· Historical and latest extent of mangroves
	  o Area
	  o Layout of mangrove whether along or perpendicular to the coastline
	  o Width and length of mangrove
	· Historical and latest condition of mangroves
	  o Species of mangroves
	  o Density of mangroves
	  o Total height of mangroves
	  o Diameter of mangroves
	· Historical and latest extent of seagrasses
	· Historical and latest condition of seagrasses
	· Historical and latest extent of coral reef area
	· Historical and latest condition of coral reef area

	· Man-made storm surge/wave barriers · Off-site coastal protection management programs by PA manager ***Demand*** · Historical record of storm occurrence · Storm damage reports · Community maps
Level 2 **Silver**	***Supply*** · Factors that affect the extent and condition, including abiotic factors · Area · Species diversity · Density · Volume · Past typhoons · Windspeed · Storm surge height, · Rainfall · Flood level · Damages in the ecosystems o Erosion impacts o Sedimentation impacts ***Demand*** · Compilation of records affected/damaged by storm surge, o Number of storm events o Damages (from reports) on § Communities § Households § Public facilities § Infrastructure · Coastal flooding events · Coastal protection programs · Man-made storm surge/wave barriers and cost (off-site of the PA) using secondary data · Summary of all storm events from secondary data o Intensity o Duration o Direction of events o Damages o Reduction in GDP per capita o Coastal protection structures o Costs of establishing such structures · Damages on infrastructure and property based on (using secondary data) o zonal value o shoreline changes o life on PAs based on · Damages to economic activities using secondary data · Other LGU defensive expenditures (i.e. retaining walls) using secondary data
Level 3 **Gold**	***Supply*** · Ecosystem extent and characteristics affected by natural hazards related to coastal

	protection determined through primary survey
	
	Demand
	· Exposed population
	· Exposed property
	· Exposed infrastructure
	· Damage assessment
	· Vulnerability assessment
	· Historical maps
	  o bathymetry maps
	  o typhoon maps

Level 4
Platinum
	Supply
	· All of Gold data
	· Ecosystem conditions
	  o rain intensity
	  o elevation
	· Estimate Offshore Waves and water Levels using global datasets
	· Estimate: Nearshore Waves and water Levels using best available data
	· Effect of Ecosystem on Nearshore
	· Climate scenarios (temp)
	· Management scenarios
	· Hydrodynamics
	· Geomorphological risks
	· Wave Attenuation Values of
	  o Coral Reefs
	  o Mangroves
	  o Seagrasses
	  o Rocks
	  o Sand Dune Bars
	· Projections of the following parameters:
	  o wave/storm surge heights by typhoon based on existing global portals
	· Indicators and parameters of Coastal Protection:
	· Seasonal Tidal data
	· Storm surge height based on secondary data or KII
	· Define Extreme Waves and Water Levels along shoreline for 10, 25, 100-year storms
	· Identify land, people and built capital flooded using a global digital elevation model
	· Develop flooding scenario with and without ecosystem presence
	· Climate and sea-level storm surge projections
	· Tropical cyclone tracks and return periods
	· Bathymetry - ETOPO 1:1.6 km resolution (1 arc min) global topo-bathy; SEAWIFS 1km resolution of coral reefs bathymetry worldwide
	· Coastlines – NOAA database GSHH (Global Self-consistent, Hierarchical, and High-resolution Geography Database).
	· Topography - digital terrain model (DTM).
	· Geomorphology
	· Past and current ecosystems (mangrove, seagrasses, coral reefs and cover mapping)
	
	Demand
	· Wave Attenuation Impact Simulation Modeling
	· Household surveys

	· Industry Surveys (using the accepted damage/avoided damage cost models by varying the parameters · **Damage function model** Damage = Functions (characteristics of ecosystem, past and current conditions of ecosystems, socio-economic data, and typhoon characteristics) · Damage costs estimation of affected economic sectors (Agri, infra, real properties, lives (human and animals)) through primary survey · GDP at the municipal level (if available); impact on income and employment · In case no GDP data, we can estimate it based on per capita income · Damage costs or costs of rehab · Maintenance Costs · Protection costs (including M&E costs) · Replacement costs (with and without ecosystems) · Choice experiment or CVM (WTP survey) for ○ Mangroves ○ coral reefs ○ seagrass

Table xx. List of recommended data sources that can be used for the identification of HCV 4.12 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Remote-sensing data United States Geological Survey (USGS) Zoological Society of London (ZSL) National Mapping and Resource Information Authority (NAMRIA) Ecosystems Research and Development Bureau (ERDB) Integrated Coastal Resources Management Project (ICRMP) National Initiative on Climate Resilient Agriculture (NICRA)
Level 2 **Silver**	Remote-sensing data United States Geological Survey (USGS) Zoological Society of London (ZSL) National Mapping and Resource Information Authority (NAMRIA) Ecosystems Research and Development Bureau (ERDB) Integrated Coastal Resources Management Project (ICRMP) National Initiative on Climate Resilient Agriculture (NICRA) Site project reports
Level 3 **Gold**	Remote-sensing data United States Geological Survey (USGS) Zoological Society of London (ZSL) National Mapping and Resource Information Authority (NAMRIA) Ecosystems Research and Development Bureau (ERDB) Integrated Coastal Resources Management Project (ICRMP) National Initiative on Climate Resilient Agriculture (NICRA) Site project reports

	Primary data gathering
Level 4 **Platinum**	Remote-sensing data United States Geological Survey (USGS) Zoological Society of London (ZSL) National Mapping and Resource Information Authority (NAMRIA) Ecosystems Research and Development Bureau (ERDB) Integrated Coastal Resources Management Project (ICRMP) National Initiative on Climate Resilient Agriculture (NICRA) Primary data gathering

Extent

Primary Account Entry	**Secondary Account Entry**	**Coastal Ecosystems**			
		Mangrove	***Coral Reefs***	***Seagrass***	***Others***
		Area Unit in Hectare or Square Kilometer			
Opening Extent (year beginning)					
Additions in Extent:					
	Managed Expansions				
	Unmanaged Expansions				
Reductions in Extent:					
	Managed Reductions				
	Unmanaged Reductions				
Change in Extent					
Closing Extent (year ending)					

Condition

Ecosystem Condition Indicators	**Mangroves**				
Condition Indicators relevant to storm surge protection	*Descriptions*	*Measurement Units*	*Opening Condition (Year Beginning)*	*Closing Condition (Year Ending)*	*Change*

Density of big trees	Higher # big trees, stronger to reduce storm surge	# trees/ha			
Dominant Trees ht	Higher ht than the ht of storm surge.	Average ht			
Forest strip width and length	Wider width lesser chance to penetrate the forest; longer length wider coverage area to protect	M x m			
Ecosystem Condition Indicators	**Coral Reefs**				
Condition Indicators relevant to storm surge protection	*Descriptions*	*Measurement Units*	*Opening Condition (Year Beginning)*	*Closing Condition (Year Ending)*	*Change*
Hard Coral Cover	Reduces under water waves	% Hard Coral/Total Corals			
Coral Diversity Index	Higher density of diverse coral species reduce under water waves	Index #			
Ecosystem Condition Indicators	**Seagrass**				
Condition Indicators relevant to storm surge protection	*Descriptions*	*Measurement Units*	*Opening Condition (Year Beginning)*	*Closing Condition (Year Ending)*	*Change*
Density of seagrasses	Higher density, more reduction to under water wave impacts	# seagrass hills/ha			
Seagrass leaf height	Higher reach near surface water layers.	Average ht			
Seagrass cluster spacing	Closer spacing of seagrass colony has more impact in reducing under water movements than wider spacing of colonies	M x m			

Supply and Use - Physical

A. SUPPLY	Units of measure	Mangrove	Coral Reefs	Seagrass	Total Supply

Mangrove coastal protection services	Area or Ton	To estimate area use existing map or RS/GIS, to estimate tonnage, conduct sampling	
Coral reefs coastal protection services	Area or Ton	To estimate area use existing map or RS/GIS, to estimate tonnage, conduct sampling	
Seagrass coastal protection services	Area or Ton	To estimate area use existing map or RS/GIS, to estimate tonnage, conduct sampling To estimate area use existing map or RS/GIS, to estimate tonnage, conduct sampling	
Total	Total area total tons		

B. USE	UNITS OF MEASURE	Households (population, income)	Agriculture	Fisheries	Manufacturing	Infrastructure	Tourism	Other economic sectors	Total Use
Mangrove coastal protection services	Number/area/facilities affected with storm surge	Physical Damages							
Coral reefs coastal protection services	Number/area/facilities affected with storm surge	Physical Damages							
Seagrass coastal protection services	Number/area/facilities affected with storm surge	Physical Damages							
Total coastal protection		Total Physical Damages							

Supply and Use - Monetary

No supply and use	UNITS OF MEASURE	Households (population, income)	Agriculture	Fisheries	Manufacturing	Infrastructure	Tourism	Other economic sectors	Total Use
No ecosystem coastal protection	Number/area/facility/PhP affected with storm surge (damage cost)	Damage Cost							

A. SUPPLY	UNITS OF MEASURE	Mangrove	Coral Reefs	Seagrass	Total Supply
Mangrove coastal protection services values	Monetary Value	Damage Cost Avoided			
Coral reefs coastal protection Services values	Monetary Value	Damage Cost Avoided			
Seagrass coastal protection services values	Monetary Value	Damage Cost Avoided			
Total	Total Monetary Value	Total Ecosystem Services Value			

6. HCV 5 - Provisioning Services[7]

Definition

Areas critical for meeting the basic needs of local people. These basic needs may be met directly through consumption (e.g., food, medicine, clothing, or shelter sourced directly from the natural habitats), or indirectly through income generated from the sustainable utilization of natural resources. Provisioning services thus represent the contributions to benefits that are extracted or harvested from ecosystems[8]. Determination of sustainable levels of utilization, sometimes referred to as carrying capacity levels, is thus imperative for an area to be considered as HCV 5.

Supply and Use/Demand Classification of Data:

In line with the UN SEEA EA 2021 definition, supply refers to "Ecosystem Assets" by ecosystem type, while Use/Demand refers to the use/s of final ecosystem services by economic units (e.g., farmers, fishers, households, government). In accounting, supply is theoretically equal to demand. In other words, the "total generation of a single ecosystem service should equal the total use of that service".

Supply	Demand/Use
Ecosystem Condition 1. Biophysical indicators 2. Land and soil quality 3. Water quality Slope Water flow/ stream flows	Revenues 1. Production area 2. Types of production 3. Volume of production 4. Value of production Costs 1. Types of production inputs 2. Prices of production inputs 3. Volume of production inputs Technology and management Map of production areas and support infra Land use maps

[7] All definitions of HCV 4 Regulating and Maintenance Services are from: Department of Economic and Social Affairs, Statistics Division, United Nations, Version 5 February 2021. System of Environmental-Economic Accounting- Ecosystem Accounting, Final Draft.

[8] UN SEEA

Rationale

The majority of provisioning services are likely to be generated and used in the same ecosystem, given the necessity for the relevant materials to be harvested in situ.30 Subsequent transactions involving the processing, transportation and sale of harvested materials are the subject of standard economic accounting and hence are not the focus of ecosystem accounting presented here. At the same time, the linking of ecosystem accounts and standard economic accounts is facilitated through the use of the SEEA framework and hence extensions designed to analyse the relationship between ecosystem services and a more complete series of transactions, including international trade flows, may be developed. Provisioning services will generally be measured in units, such as tonnes or cubic metres, that reflect the relevant physical properties of the underlying input. However, they may also be measured in units specific to the type of service. It is provisioning services that should be the most amenable to measurement, as many of the indicators relate to currently measured aspects of economic activity. At the same time, defining the boundary for cultivated crops and other plants means that a range of additional information may be required in order to enable measurement of flows related to these cultivated resources.

Provisioning services relate to goods extracted from, or harvested in, an ecosystem. Generally, the value of production of these goods is included in the SNA production boundary and hence in GDP. The process of harvest or extraction normally involves costs of human inputs (labour, produced assets, etc.), which need to be deducted from the value of production in the course of deriving the valuation of the relevant ecosystem service. There may be a need to consider the significant impacts of taxes and subsidies on production

(Source: *System of Environmental-Economics Accounting 2012 Experimental Ecosystem Accounting.* p. 30, 35, 58, 115)

Methodology:

HCV Sub-category/Methods	Bronze	Silver	Gold	Platinum
Secondary data collection	✔	✔		
Review of literature	✔	✔		
Review of existing data	✔	✔		
Request readily available maps from concerned institution/agency and websites				
Allen Coral Atlas	✔	✔		
Google Earth Pro/Engine	✔	✔		
Maps from management plans	✔	✔		
Mapping agencies		✔		
Seagrass Watch		✔		
NSAP Interctive Atlas	✔	✔		
Physical quantification of the ES based on secondary data		✔		
Ground validation of the collected secondary data (esp. maps)			✔	
Biophysical modeling and mapping using				
For extent accounting				
Remote sensing			✔	✔
InVEST			✔	✔
ArcGIS			✔	✔
SWAT			✔	✔
ARIES			✔	✔
For condition accounting				
Production function models			✔	✔
Diversity indices			✔	✔
Underwater assessments			✔	✔
Sources and sinks/Connectivity model			✔	✔
Canopy cover assessment			✔	✔
Normalized Difference Vegetation Index (NDVI)			✔	✔
Net Primary Production (NPP)			✔	✔
Fish visual census			✔	✔
Photo transect			✔	✔
Transect Quadrate method			✔	✔
ECOPATH			✔	✔
Carrying capacity: fishing, one site each				✔

Survey methods				
Key informant interviews			✔	✔
Focus Group Discussion (FGD)			✔	✔
Household surveys (E-SEAMS, etc.)			✔	✔
Online survey			✔	✔
Data Analysis and Database Management using				
STATA			✔	✔
R and R-Studio			✔	✔
SPSS			✔	✔
MS Excel			✔	✔
ArcGIS			✔	✔
Valuation Methods				
Contingent valuation method				✔
Hedonic pricing				✔
Cost-based valuation method				✔
Choice experiment				✔

HCV 5 consists of the following provisioning services:

1. Crops
2. Livestock
3. Aquaculture
4. Wood
5. Wildfish and other natural aquatic biomass
6. Wild animals, plants and other biomass
7. Water supply

Hierarchy of data needs and analysis:

Level	Output
Level 1 **Bronze**	**Broad Narrative Description of Provisioning Service of the Ecosystem**
Level 2 **Silver**	**Detailed Description of Provisioning Service of the Ecosystem**
Level 3 **Gold**	**Spatial Analysis (movements, expansion of areas, land use changes);**
Level 4 **Platinum**	**Economic Value/ Resource Socio-economic Analysis (e.g. changes in sources of income), Rent Estimates of the Provisioning Service**

Level	Data Needs
Level 1 **Bronze**	*Regional/ provincial data on ES supply and demand* 1. types of production 2. production area 3. volume of prod. 4. value of prod. 5. prices
Level 2 **Silver**	*Municipal/ LGU level data on ES supply and demand* 1. types of production 2. production area 3. volume of prod. 4. value of prod. 5. prices 6. costs and returns for each type (secondary data)
Level 3 **Gold**	*Inventory/ Population estimates of total ES supply* *Inventory/ Population estimates of total ES demand*
Level 4 **Platinum**	*Primary surveys on costs and returns*: 1. production area 2. volume of prod. 3. value of prod. 4. prices 5. prod. Inputs 6. Socio economic profiles

Data sources:

Level	Data Source
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies E-SEAMS

HCV 5.1 Crop Provisioning Services

Definition

Crop provisioning services are the ecosystem contributions to the growth of cultivated plants that are harvested by economic units for various uses including food and fibre production, fodder and energy.

Rationale

Xxx

Output, Data Needs, and Data Sources

Identification of HCV 5.1 will require descriptive statistics, value of production and employment, resource rent estimates, spatial analysis, socio-economic analysis, and special studies on crop provisioning services, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 5.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Descriptive statistics on Croplands**

Level 2 **Silver**	**Value of production and employment information**
Level 3 **Gold**	**Spatial analysis of distribution of the ES**
Level 4 **Platinum**	**Resource Rent Estimates, Socio-economic analysis**

Table xx. Data needs for the identification of HCV 5.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Area planted to crop (n) • Major crops • Volume of production (secondary data-regional and provincial level) • value of production (secondary data-regional and provincial level)
Level 2 **Silver**	• Major crops planted • Volume and value of crops planted • Cost of production (from secondary data, municipal level) • No. of persons employed (direct and indirect labor; self-employed; subsistence) • Wage rate
Level 3 **Gold**	• Resource degradation data (soil quality data, chemical & biological indicators) • Demographic info • Enforcement perceptions
Level 4 **Platinum**	• Cost of production • Volume and value of production • Socioeconomic info

Table xx. List of recommended data sources that can be used for the identification of HCV 5.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps E-SEAMS NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies

Extent

	Major Crops (1, 2,...n)	Other Crops	Total Cropland
Opening stock of environmental assets			
Additions to stock			
Managed expansion			
Natural expansion			
Upward reappraisals			
Reclassifications			
Total additions to the stock			
Reductions of stock			
Managed regression			
Natural regression			
Catastrophic losses			
Downward reappraisals			
Reclassifications			
Total reductions in stock			

Revaluation of the stock a/			
Closing stock of environmental assets			
a/ Only applicable for asset accounts in monetary terms			

Condition

Indicators	Opening Stock	Closing Stock
Water holding capacity		
Soil organic carbon		
Soil nutrient availability		
Insect species richness		
Bird species richness		
Crop diversity		
Share of time or area as fallow land		

Supply and Use Table - Biophysical

Selected key products only	Economic variables				
	Output		Exports	Imports	Employment
	tonnes	Currency units	tonnes	tonnes	000 people
Agricultural products					
Crop products					
Maize					
Rice					
Wheat					
Palm oil					
Sugar					
Potatoes					

Fodder					
Other food crops					
Other non-food crops					
Total					
Livestock products					
Livestock raising					
Eggs					
Raw milk					
Honey					
Other livestock products					
Total					
Other agricultural products					
Total Agricultural					
Forestry products					
Forestry					
Logging					
Other forestry products					
Total Forestry products					
Fisheries products					
Aquaculture					
Capture fisheries					
Total Fisheries					

Supply and Use Table - Monetary

Selected key products only	Household consumption variables			Supply and use variables							Environmental variables (inputs to production)			
	Food consumption/nutrition			Output		Exports	Imports	Intermediate use	Changes in inventories		Land use		Use of irrigated water	Greenhouse gas emissions (CO2 eq.)
	Household final consumption (tonnes)	Of which: food waste (000 tonnes)	Kcal / capita/ day	tonnes	Currency units	tonnes	tonnes	tonnes	tonnes	Of which: post-harvest losses (000 tonnes)	Opening stock (ha)	Net Change (ha)	Cubic meters	Gigagrams
Agricultural products														
Crop products														
Maize														
Rice														
Wheat														
Palm oil														
Sugar														
Potatoes														
Fodder														
Other food crops														
Other non-food crops														
Total														

HCV 5.2 Livestock Provisioning Services

Definition

Livestock provisioning services are the ecosystem contributions to the growth of cultivated livestock and livestock products (e.g., meat, milk, eggs, wool, leather), that are used by economic units for various uses, primarily food production. This is a final ecosystem service. No distinct livestock provisioning services to be recorded if grazed biomass provisioning services are recorded as a final ecosystem service.

Rationale

Xxx

Output, Data Needs, and Data Sources

Identification of HCV 5.2 will require a narrative description, economic value of production, resource rent estimates, socio-economic analysis, and special studies on livestock provisioning services, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 5.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative description of livestock production at the provincial level**
Level 2 **Silver**	**Value of Production at the Municipal and Barangay level; Employment information**
Level 3 **Gold**	**Spatial Analysis of the distribution of the ES**
Level 4 **Platinum**	**Resource Rent Estimates; Socio-economic analysis**

Table xx. Data needs for the identification of HCV 5.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Major types of livestock • Total area occupied • volume (heads) • Price (farm-gate) • Value
Level 2 **Silver**	• No. of persons employed • stocking density of livestock (Raised inside PA) • number of heads of livestock
Level 3 **Gold**	• Resource degradation data (chemical indicators, biological indicators) • Demographic info • Enforcement perception • Area of grazing
Level 4 **Platinum**	• Cost of production • Volume and value of production • Socioeconomic info

Table xx. List of recommended data sources that can be used for the identification of HCV 5.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps E-SEAMS NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies

HCV 5.3 Aquaculture Provisioning Services

Definition

Aquaculture provisioning services are the ecosystem contributions to the growth of animals and plants (e.g. fish, shellfish, seaweed) in aquaculture facilities that are harvested by economic units for various uses. This is a final ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 5.3 will require a narrative description, value of production, resource rent estimates, and special studies on aquaculture provisioning service, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 5.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative Description of Aquaculture**
Level 2 **Silver**	**Value of Production at the Municipal and Barangay level, and Employment Information**
Level 3 **Gold**	**Spatial Analysis of the distribution of the ES**
Level 4 **Platinum**	**Resource Rent Estimates; Socio-economic analysis**

Table xx. Data needs for the identification of HCV 5.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs

Level 1 **Bronze**	• Culture area of species • Volume of production • price • total cost of production
Level 2 **Silver**	• No. of persons employed (direct indirect labor; self-employed; subsistence) • total cost of production • Volume and value of production (secondary data)
Level 3 **Gold**	• Resource degradation data (soil quality data, chemical & biological indicators) • Demographic info • Enforcement perceptions
Level 4 **Platinum**	• Value and Volume of production • Cost of production • Socioeconomic info

Table xx. List of recommended data sources that can be used for the identification of HCV 5.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps E-SEAMS NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies

HCV 5.4 Wood Provisioning Services

Definition

Wood provisioning services are the ecosystem contributions to the growth of trees and other woody biomass in both cultivated (plantation) and uncultivated production contexts that are harvested by economic units for various uses including timber

production and energy. This service excludes contributions to non-wood forest products. This is a final ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 5.4 will require a narrative description, value of production, resource rent estimates, and special studies on wood provisioning services, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 5.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative Description of Wood Provisioning**
Level 2 **Silver**	**Value of Production at the Municipal and Barangay level, Employment Information**
Level 3 **Gold**	**Spatial Analysis of the distribution of the ES**
Level 4 **Platinum**	**Resource Rent Estimates; Socio-economic analysis**

Table xx. Data needs for the identification of HCV 5.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Production area and volume harvested (forest land and plantation) • volume of production • market price
Level 2 **Silver**	• No. of persons employed (incl. Self-employed and subsistence) • area of species (natural and cultivated) • harvest volume • price/species

	• total cost of production
Level 3 **Gold**	• Resource degradation data (chemical & biological indicators) • Demographic info • Fuelwood production area • Enforcement perceptions
Level 4 **Platinum**	• Stumpage price • Volume (inventory of species) • Fuelwood production (vol and price) • Estimate of biomass per species (reflectance value) • Cost of production • Socio economic info

Table xx. List of recommended data sources that can be used for the identification of HCV 5.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps E-SEAMS NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies

HCV 5.5 Wild Fish and Other Natural Aquatic Biomass Provisioning Services

Definition

Wild fish and other natural aquatic biomass provisioning services are the ecosystem contributions to the growth of fish and other aquatic biomass that are captured in uncultivated production contexts by economic units for various uses, primarily food production. This is a final ecosystem service.

Rationale

Xxx

Output, Data Needs, and Data Sources

Identification of HCV 5.5 will require a narrative description, value of production, employment information, resource rent estimates, and special studies on wild fish and other aquatic biomass provisioning services, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 5.5 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative Description of Wildfish and Natural Aquatic Biomass Provisioning**
Level 2 **Silver**	**Value of Production and Employment Information at the Landing Sites**
Level 3 **Gold**	**Spatial Analysis of the distribution of the ES Fishing area**
Level 4 **Platinum**	**Resource Rent Estimates; Socio-economic analysis**

Table xx. Data needs for the identification of HCV 5.5 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Annual fish production volume by species (commercial and municipal) • price and value of production
Level 2 **Silver**	• Volume of fish landed by species • price per species • Value of production • No. employed
Level 3 **Gold**	• Resource degradation data (chemical & biological indicators) • Demographic info • Enforcement perceptions
Level 4	• Value and Volume of production

Platinum	• Cost of production • Socioeconomic info • Volume of fish species landed • Gear used • Price • No. of workers • Wage rates • Cost of Production

Table xx. List of recommended data sources that can be used for the identification of HCV 5.5 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps E-SEAMS NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies

Extent

Asset Account	Mangroves	Seagrass Beds	Coral Reefs	Open Sea	
Opening Stock					Total Area in Year 1
Addition					
Reduction					
Closing Stock					Total Area in Year 2

Condition

Ecosystem Condition Indicators	Mangroves			
Indicators	Description	Measurement	Opening Value (Year 1)	Closing Value (Year n)
Density		(tons/ha)		
Diversity Index		Index #		
Species composition (Flora or fauna)		No. of species		
NDVI (from remote sensing eg. Google Earth engine)		Index #		
NPP (data from Remote Sensing)		Index #		
Ecosystem Condition Indicators	Seagrass Beds			
			Opening Value (Year 1)	Closing Value (Year n)
% cover (/m2)				
Density		(shoots/m2)		
Diversity Index		Index #		
Ecosystem Condition Indicators	Coral Reefs			
			Opening Value (Year 1)	Closing Value (Year n)
Hard Coral Cover		%		
Reef Fish Biomass		(mt/km2)		
Coral Diversity Index		Index #		

Reef Fish Diversity Index		Index #		
Ecosystem Condition Indicators	Open Sea (Sandy Substrate?)			
			Opening Value (Year 1)	Closing Value (Year n)
Water Quality		Turbidity, BOD?		
Bathymetry				

Supply and Use Table - Biophysical

Year 1		Harvest, in kg.			
Fisher 1		Species 1	Species 2	Species N	
	Fishing gear 1				
	Gear 2				
Fisher 2					
Fisher N					XXX Fishers in Year 1
TOTAL CATCH					XXX kgs in Year 1

Supply and Use Table - Monetary

Year 1		Gross Sales (Php x Catch)	Consumption of Fixed Capital (depn)	User Cost of Fixed Capital (10% of Fixed Capital)	Labor Cost	Intermediate Input	Resource Rent
Fisher 1		Species 1	Species 2	Species N			
Gear 1	Species 1						
Gear 2	Species 2						
Fisher 2							
Fisher N							Php in Year 1
							Php/ha (from extent) in Year 1
							Php/kg (from Physical) in Year 1

Supply Table - (kgs. and PhP)

Year 1	Mangrove		Seagrass Beds		Coral Reefs		Open Sea		Total from PA	
Species 1	Y1	Yn	Y1	Yn	Y1	Yn	Y1	Yn	Y1	Yn
Species 2										
Species 3										

Species N										

Use Table - (kgs. and PhP)

Year 1	Own Consumption		Sold to Primary Markets within PA/Province/Island		Sold to Brokers for Exports outside Province/Island		Discarded ByCatch		Total from PA	
Species 1	Y1	Yn	Y1	Yn	Y1	Yn	Y1	Yn	Y1	Yn
Species 2										
Species 3										
Species N										

HCV 5.6 Wild Animals, Plants and Other Biomass Provisioning Services

Definition

Wild animals, plants and other biomass provisioning services are the ecosystem contributions to the growth of wild animals, plants and other biomass that are captured and harvested in uncultivated production contexts by economic units for various uses. The scope includes non-wood forest products (NWFP) 59 and services related to hunting, trapping and bio- prospecting activities; but excludes wild fish and other natural aquatic biomass (included in previous class). This is a final ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 5.6 will require a narrative description, value of production, employment information,resource estimates, and special studies on wild animals, plants, and other biomass provisioning services, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 5.6 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative Description of Wild Animals, Plants and Other Biomass Provisioning**
Level 2 **Silver**	**Value of Production and Employment Information at the Landing Sites**
Level 3 **Gold**	**Spatial Analysis of the distribution of the ES**
Level 4 **Platinum**	**Resource Rent Estimates; Socioeconomic Analysis**

Table xx. Data needs for the identification of HCV 5.6 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Species of wild animals and plants collected • Area planted to/inhabited by species • Volume collected/ harvested • Price
Level 2 **Silver**	• No. of employed • Type of use of species • Volume collected per type of Use • Price per species
Level 3 **Gold**	• Resource degradation data (chemical & biological indicators) • Demographic info • Enforcement perceptions
Level 4 **Platinum**	• Type of use of species • Volume collected per type of use

	• Price per species • Cost of production • Illegally harvested and traded flora and fauna • Value and Volume of production • Socioeconomic info

Table xx. List of recommended data sources that can be used for the identification of HCV 5.6 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps E-SEAMS NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies

Extent

Almaciga Info	Brookes Point		Rizal		Bataraza		Quezon		Sofronio Espanola	
Physical Account	2015	2020	2015	2020	2015	2020	2015	2020	2015	2020
No. of concessions										
Area (hectarage) covered by the concessions										
Annual Allowable Harvest/ha										
Estimated number of almaciga trees/concessions										

Estimated volume of almaciga harvest per year										
Monetary Account										
Estimated Revenue from Almagica harvest (tons)										
Estimated cost of extraction										
Rent per kg of almaciga										
Rent per hectare										
Total value of harvested Almaciga										

Condition

Supply and Use Table - Biophysical and Monetary

Almaciga

Almaciga Resin	Forest lands* from Brookes point		Forest land of Rizal		Forest land of Bataraza		Forest land of Quezon		Forest land of Sofronio Espanola		Total from MMPL	
	Opening	Closing	...	...	...	...	...	...	...	...	...	...
Class A												
Class B												
Class C												
Total Value												

Almaciga Resin	Local use by the household*		Industrial/commercial consumption		Post Harvest Loses		Sold within Palawan		Sold outside Palawan		Total Qty. of Supply (Value in Php)	
Class A												
Class B												
Class C												

Honey

Almaciga Resin	Forest lands* from Brookes point		Forest land of Rizal		Forest land of Bataraza		Forest land of Quezon		Forest land of Sofronio Espanola		Total from MMPL	
	Opening	Closing	...	...	...	...	...	...	...	...	...	...
Honey Comb												
Beeswax												
Squeezed Honey												
Total Value												

Almaciga Resin	Local use by the household*		Industrial/commercial consumption		Post Harvest Loses		Sold within Palawan		Sold outside Palawan		Total Qty. of Supply (Value in Php)	
Honey Comb												

Beeswax												
Squeezed Honey												
Total Value												

HCV 5.7 Water Supply Provisioning Services

Definition

Water supply services reflect the combined ecosystem contributions of water flow regulation, water purification, and other ecosystem services to the supply of water of appropriate quality to users for various uses including household consumption. This is a final ecosystem service.

Rationale

Xxx

Output, Data Needs, and Data Sources

Identification of HCV 5.7 will require a narrative description, aggregate supply and demand, resource rent estimates, and NCA on water supply provisioning service, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 5.7 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Narrative Description**
Level 2 **Silver**	**Aggregate Supply (Based on streamflow) and Demand (based on domestic, industrial, irrigation water use)**
Level 3 **Gold**	**Watershed model, Spatial Analysis of the distribution of the ES**

Level 4 **Platinum**	**Resource rent estimates, water supply and demand analysis**

Table xx. Data needs for the identification of HCV 5.7 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Volume of groundwater and surface water extracted per year by area and type of users • Access to clean water • Groundwater availability Map
Level 2 **Silver**	• Streamflow data • Water use/ consumption data • Water tariffs
Level 3 **Gold**	• Water balance • Water flow rate • Watershed modeling • Upstream and downstream users plotting • Number of users per type of user • Sources of water
Level 4 **Platinum**	• Cost of supply and delivery • Price of water • Demand estimates • Socioeconomic info • Volume of water by use and users (supply)

Table xx. List of recommended data sources that can be used for the identification of HCV 5.7 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	Regular government surveys available online (PSA, BFAR, FMB, etc.)
Level 2 **Silver**	Municipal and Barangay data (CBMS, MAO, CENRO, BFAR, business permits, etc.)
Level 3 **Gold**	Land use maps E-SEAMS

	NSAP-FCMGI Maps of production areas and support infra
Level 4 **Platinum**	Primary studies

Extent

Asset Account	Forest	Cropland	Grassland	Wetland	
Opening Stock					Total Area in Beginning Year
Addition					
Reduction					
Closing Stock					Total Area in Ending Year

Condition

Ecosystem Condition Indicators			Forest	
Indicators	**Description**	**Measurement**	**Opening Value (Year 1)**	**Closing Value (Year n)**
Area		ha		
Soil Fertility		NPK		
Species composition (flora or fauna)		No. of species		
Vegetation (NDVI)				
NPP (data from Remote Sensing)		Index #		
Ecosystem Condition			Cropland	

Indicators				
			Opening Value (Year 1)	Closing Value (Year n)
Area (/m2)		ha		
Soil fertility		NPK		
Others				

Supply and Use Table - Biophysical

Year	1971-2000	2017	2006-2035	2011-2040	2036-2065
Inflow					
Rainfall					
Outflow					
Total surface runoff					
Evapotranspiration					
Change in storage					

Supply and Use Table - Monetary

Use	2017	2035	2040	2065
Quantity (MCM/yr)				
Agriculture				
Domestic				
Drinking				
Other HH uses				
Total used				
Unused water				
Total including unused water				
Value (Million PhP/yr)				
Agriculture				
Domestic				
Drinking				
Quezon				
Rizal				
Other HH uses				
Quezon				
Rizal				
Total used				
Unused water				
Total including unused water				

7. HCV 6 - Cultural Services[9]

Definition

HCV 6 refers to areas with non-material benefits that add to the cultural development and advancement of society. Cultural services are the experiential and intangible services related to the perceived or actual qualities of ecosystems whose existence and functioning contributes to a range of cultural benefits[10].

Rationale

There are important connections between people and ecosystems that are not provisioning or regulating in nature. The label cultural services is used to encompass many of these experiential and non-material connections. This label is a pragmatic choice and reflects its longstanding use in the ecosystem services measurement community. It is not implied that culture itself is a service, rather it is a summary label intended to capture the variety of ways in which people connect to, and identify with, nature and the variety of motivations for these connections.
(System of Environmental-Economic Accounting—Ecosystem Accounting, p.167, 6.116)

Methodology

HCV Sub-category/Methods	Bronze	Silver	Gold	Platinum
Secondary data collection	✔	✔		
Review of literature	✔	✔		
Review of existing data	✔	✔		
Request readily available maps from concerned institution/agency and websites				
Flickr	✔	✔		
TripAdvisor				
Google Earth Pro/Engine	✔	✔		
Maps from management plans	✔	✔		
Mapping agencies		✔		
Physical quantification of the ES based on secondary data		✔		
Ground validation of the collected secondary data (esp. maps)			✔	
For extent accounting				
Remote sensing			✔	✔
InVEST			✔	✔

[9] All definitions of HCV 4 Regulating and Maintenance Services are from: Department of Economic and Social Affairs, Statistics Division, United Nations, Version 5 February 2021. System of Environmental-Economic Accounting- Ecosystem Accounting, Final Draft.
[10] UN-SEEA

ArcGIS			✔	✔
ARIES			✔	✔
ESTIMAP			✔	✔
For condition accounting				
Production function models			✔	✔
Carrying capacity				
Survey methods				
Key informant interviews			✔	✔
Focus Group Discussion (FGD)			✔	✔
Household surveys (E-SEAMS, etc.)			✔	✔
Online survey			✔	✔
Valuation Methods				
Travel cost method				✔
Contingent valuation method				✔
Hedonic pricing				✔
Recreation Opportunity Spectrum				✔
Cost-based valuation method				✔
Choice experiment				✔
Simulated Exchange Value (SEV)				✔
Data Analysis and Database Management using				
STATA			✔	✔
R			✔	✔
SPSS			✔	✔
MS Excel			✔	✔
ArcGIS			✔	✔

HCV 6 is composed of the following services:

1. Recreation
2. Visual amenity
3. Education, scientific and research
4. Spiritual, artistic and symbolic

HCV 6.1 Recreation

Definition

Recreation-related services are the ecosystem contributions, through the biophysical characteristics and qualities of ecosystems, that enable people to use and enjoy the environment through direct, in-situ, physical and experiential interactions with the environment. This includes services to both locals and non-locals (i.e. visitors, including tourists). Recreation-related services may also be supplied to those undertaking recreational fishing and hunting. This is a final ecosystem service.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 6.1 will require a checklist, descriptive summary, map, and economic value of the recreational services as shown in Table xx. An environmental and economic impact assessment on tourism will also be needed. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 6.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of all recreational activities at the PA level**
Level 2 **Silver**	**Descriptive summary and Contribution of PA recreation income to total PA income, and to total local tourism economy**
Level 3 **Gold**	**Mapping of recreational-related activities, Carrying capacity**
Level 4 **Platinum**	**Economic Value of Recreational Services from Nature (Using TCM, CVM, HPM or Simulated Exchange Value)**

Table xx. Data needs for the identification of HCV 6.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply:*** • Name, location and area (ha) of Protected Area (PA) • Landscape features of PA • Iconic landmarks or species per PA ***Demand:*** • Visitation rates (Number of visitors at parks and natural areas per day/month/year disaggregated by type (local and non-local) • Number and name of events (nature festivals, ecotourism, nature-based recreation) held within PA disaggregated by type (local and non-local) • Participation rates in cultural events (Number of participants per event/day/month/year) • Recreational activities in the ecotourism site
Level 2 **Silver**	***Supply:*** • Location and area of PA • Details of PA description and physical characteristics • Inventory of facilities and costs for ecosystem management of the PA ***Demand:*** • Number of accommodation facilities • Description and number of infrastructures • Description of transportation services within the PA • Income of accommodation facilities, transportation and other infrastructures within the PA • Entrance fees collected • Taxes paid by businesses within PA
Level 3 **Gold**	• GIS-referenced Maps • Location of the recreational site • Location of the facilities inside and outside of the site where tourists stay • Number of tourists • Location of designated sacred areas • Distance information • Road networks (secondary, primary road) • Location of settlements (from SEAMS) • Land cover
Level 4 **Platinum**	***Demand:*** Option 1: Recreational opportunity spectrum (system for classifying and managing recreation opportunities) Option 2: TCM • TCM + existing infrastructure

	• Travel distance and cost data • Detailed visitor information such as number by origin, visitation rates, etc. • Tourist profile including income • Projected number of visitors • Planned infra, cost of infra • Labor costs, labor requirement • Net income of businesses within PA • Visitation rates correlating to off-site tourism activities • Biophysical and socioeconomic carrying capacity assessment (maximum no. of visitors per recreational area) Option 3: CVM • Detailed visitor information such as number by origin, visitation rates, etc. • Tourist profile including income • Projected number of visitors • WTP for recreational activities and visual amenities • Planned infra, cost of infra • Payment vehicle • Labor costs, labor requirement • Visitation rates correlating to off-site tourism activities • Biophysical and socioeconomic carrying capacity assessment (maximum no. of visitors per recreational area) Option 4: Hedonic Pricing Model • Land prices • Distance of the site from surrounding communities • Environmental quality of the site itself (from gold)

Table xx. List of recommended data sources that can be used for the identification of HCV 6.1 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• BMB • DOT • Google Earth
Level 2 **Silver**	• DOT • BMB • LGUs
Level 3 **Gold**	• Primary data gathering • Surveys • DOT • LGUs • PAMBs • Tourism Master Plans • SEAMS

Level 4 **Platinum**	• Primary data gathering • Surveys • DOT • LGUs • PAMBs • Tourism Master Plans

Extent

Ecosystem Type	Number of EXISTING tourist attractions		Extent of EXISTING tourist attractions (ha)		Number of POTENTIAL tourist attractions		Extent of POTENTIAL tourist attractions (ha)		Total Recreation Area (ha) (existing + potential)	
	Opening	Closing	Opening	Closing	Opening	Closing	Opening	Closing	Opening	Closing
Forest										
Mangroves										
Coastal Beach Coral reefs ...										
Agricultural land										
...										
TOTAL										

Condition

Tourist Destinations	Size (ha)	Access (travel time from town)	Access (km of paved road to site)	Physical attractions in the site	Status/qlty. of main attractions	Personal space from other visitors	Visitors capacity/day

Supply and Use Table - Biophysical

Tourist Destinations by ecosystem type	# of Annual Visitors	Palawan visitors		Rest of Phil visitors		Foreign visitors		Total No of visit days per year
		No.	Ave length of stay	No.	Ave length of stay	No.	Ave length of stay	
Forest: Tourist Dest1 Tourist Dest2								
Mangroves								
Agricultural land								
Coastal Tourist Dest1 Tourist Des2								
Etc...								
TOTAL								

Supply and Use Table - Monetary

- **Resource Rent Estimation**: Compute what is due to nature; the unpaid input—NATURE.
- **Simulated Exchange Value**—estimate demand function using stated preference study. Estimate supply based on costs are of maintaining the recreation ecosystem service and then derive the intersection of the demand and supply curves (Caparros, et.al. 2017)
- **Travel Cost Method—**estimate costs incurred in making the visit (transport, opportunity cost of time, all other cost); derive travel cost function using visit-days information.
- **Choice Experiment-** survey-based method to get the value for the contribution of nature to the recreational experience.

HCV 6.2 Visual Amenities

Definition

Visual amenity services are the ecosystem contributions to local living conditions, in particular through the biophysical characteristics and qualities of ecosystems that provide sensory benefits, especially visual. This service combines with other ecosystem

services, including recreation- related services and noise attenuation services to underpin amenity values. This is a final ecosystem service.

Given the high correlation between recreational services and visual amenities, HCV 6.2 will be valued in combination with HCV 6.1 to avoid double counting.

Rationale

xxx

Output, Data Needs, and Data Sources

Identification of HCV 6.2 will require a checklist, descriptive summary, map, and economic value of the visual amenities, as shown in Table xx. An environmental and economic impact assessment on tourism will also be needed. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 6.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of Visual Amenities**
Level 2 **Silver**	**Descriptive summaries, Narrative Accounts, Contribution to Income, Tourism Economy**
Level 3 **Gold**	**Economic Use Values GIS-referenced maps**
Level 4 **Platinum**	**Economic Use and Non-Use Values**

Table xx. Data needs for the identification of HCV 6.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	• Area • Landscape features • Iconic landmarks for species • List of ethno-botanical species • Sacred grounds • Ancestral domain maps
Level 2 **Silver**	• Physical characteristics of PA • Costs of PA management • Biophysical and carrying capacity assessment • Inventory of species with nutraceutical/ pharmaceutical/ cosmetic uses • Anecdotal accounts of areas with symbolic, spiritual, or religious significance • CADC applications
Level 3 **Gold**	• Inventory of species with nutraceutical/ pharmaceutical/ cosmetic uses at the PA level
Level 4 **Platinum**	• Detailed flora and fauna • Hydrology • Detailed description of scenarios for CVM design in estimating non-use values

Table xx. List of recommended data sources that can be used for the identification of HCV 6.2 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• BMB • DOT • Google Earth
Level 2 **Silver**	• DOT • BMB • LGUs
Level 3 **Gold**	• Primary data • Surveys • DOT • LGUs • PAMBs • Tourism Master Plans
Level 4 **Platinum**	• Primary data gathering • Surveys

HCV 6.3 Education, Scientific, and Research Services

Definition

Education, scientific and research services are the ecosystem contributions, in particular through the biophysical characteristics and qualities of ecosystems, that enable people to use the environment through intellectual interactions with the environment. This is a final ecosystem service.

Rationale

Xxx

Output, Data Needs, and Data Sources

Identification of HCV 6.3 will require checklists, a database of scientific information, economic value, and bioprospecting value, as shown in Table xx. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

Table xx. Outputs required for the identification of HCV 6.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of Ethno-Botanical Species, Checklist of permits and revenues generated, Checklist of Studies Conducted within the PA**
Level 2 **Silver**	**Database of Scientific Info (Lit. Review and data of genetic products)**
Level 3 **Gold**	**Spatial representation**
Level 4 **Platinum**	**Bioprospecting (Option) Value of the PA, Economic Value of Education, Research and Scientific Service**

Table xx. Data needs for the identification of HCV 6.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply:*** • List of ethno-botanical species found in the area ***Demand:*** • Presence and titles of taxonomic and ethnobotanical + traditional knowledge studies • Number of taxonomic and ethnobotanical and ethnobiological studies • Presence/absence of collectors of genetic materials such as universities for taxonomic studies and firms for bioprospecting purposes or combination thereof • Permits granted to collect genetic materials, Number of permits granted • Bioprospecting fee per collector per year • Total revenues from bioprospecting fees per year • Number of publications written on NTFPs, marine genetic materials from the PAs and MPAs
Level 2 **Silver**	***Supply:*** • Existing reports of management policies and inventory of species with nutraceutical (i.e. Agar wood, Longjack (tongkat ali)), pharmaceutical uses, and cosmetics at provincial level ***Demand:*** • Literature review of scientific studies that describe benefits of all products • Literature review of scientific studies explaining the methodology to manufacture the products
Level 3 **Gold**	• Road networks • Types of forests, forest cover • Species of interest (from HCV 1) • GIS referenced maps • Demographic information • Settlements • Research sites and stations • Marine PAs and Sanctuaries
Level 4 **Platinum**	• Cost and return data of discovery and production of NTFP-based and marine species-based pharmaceuticals and nutraceutical products • Total cost of research by type of research conducted on the PA • Replacement (of PA) cost • Forecasted revenues from drugs, research, and scientific services ***Supply:*** • Existing reports of management policies and inventory of species with nutraceutical, pharmaceutical uses, and cosmetics at PA level ***Demand:*** • Pharmaceutical and industrial-based products from the PAs • Existing patent and patent applications for discovered use and production from genetic materials from the forests • Number of researchers including student thesis writers by type of studies conducted on the PA • Source and amount of funding (local or foreign)

	• Cost of studies/ research/ expeditions • Local knowledge

Table xx. List of recommended data sources that can be used for the identification of HCV 6.3 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• BMB
Level 2 **Silver**	• Publications • Literature search
Level 3 **Gold**	• PAMBs • Universities • DOST-PCAARRD • KIIs with local residents • Primary surveys of households
Level 4 **Platinum**	• Survey of bioprospectors

HCV 6.4 Spiritual, Artistic, and Symbolic Services

Definition

Spiritual artistic and symbolic services are the ecosystem contributions, in particular through the biophysical characteristics and qualities of ecosystems, that are recognised by people for their cultural, historical, aesthetic, sacred or religious significance. These services may underpin people's cultural identity and may inspire people to express themselves through various artistic media. This is a final ecosystem service.

Rationale

XXX

Output, Data Needs, and Data Sources

Identification of HCV 6.4 requires a checklist, narrative account, map, and economic value of the ecosystem services, as shown in Table xx.. The existence value of the PA will also need to be determined. Data sources and data needs should be provided, as enumerated in Tables xx and xx. These include pieces of information relevant thereto, and must be detailed, up-to-date, and as sufficient enough as possible to ensure that informed decisions are made.

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Table xx. Outputs required for the identification of HCV 6.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Output
Level 1 **Bronze**	**Checklist of Sacred Grounds, Historical Sites, Symbolic Areas**
Level 2 **Silver**	**Narrative Account of Spiritual, Artistic and Symbolic Services**
Level 3 **Gold**	**Spatial Representation, Mapped Area of Spiritual, Artistic and Symbolic Services**
Level 4 **Platinum**	**Economic Value of Spiritual, Artistic, and Symbolic Services (TCM)**

Table xx. Data needs for the identification of HCV 6.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Needs
Level 1 **Bronze**	***Supply:*** • Presence or absence of sacred grounds • Presence or absence of symbolic areas/areas with historical importance • Ancestral domain maps ***Demand:*** • Use of area for spiritual, artistic and symbolic purposes
Level 2 **Silver**	***Supply:*** • Anecdotal accounts of areas with symbolic, spiritual and religious significance • History and historical accounts related to the site

	Demand: • Population that practices faith (Ips and non-Ips) • Frequented area and number of visitors for historical, symbolic, and spiritual purposes
Level 3 **Gold**	• GIS referenced maps ***Supply:*** • Specific SItes within the PA that provide artistic inspiration • Specific sites that have historical significance • Specific sites that are used for spiritual purposes • Location shoots for movies and TV shows, cost of location shoot • Certificate of Ancestral Domain Claim (CADC) and Certificate of Ancestral Domain Title (CADT)
Level 4 **Platinum**	***Demand:*** • Time of use of areas for spiritual and symbolic purposes • Types and prices of commercial artworks, products of IPs, products inspired by the tribe (weaved products, carvings, etc.) • Travel cost and experiential benefits from the site for the various uses (specific to historical, symbolic, spiritual site) • Pilgrimage costs • Costs of organizing religious activities

Table xx. List of recommended data sources that can be used for the identification of HCV 6.4 at different levels of standardization: Bronze, Silver, Gold, and Platinum.

Level	Data Sources
Level 1 **Bronze**	• ADSDPP • NCCA • NCIP • NHCP
Level 2 **Silver**	• PAMB • NCIP • Anthropological studies • Anecdotes (e.g. local news) • DENR • Ancestral Domains Sustainable Development and Protection Plan (ADSDPP)
Level 3 **Gold**	~~• Primary surveys of visitors, households, IPs, local tourism offices, artist groups~~ ~~• CADTs from NCIP~~
Level 4 **Platinum**	~~• Primary CVM or CM surveys (local or national)~~ • Primary surveys of visitors, households, IPs, local tourism offices, artist groups • CADTs from NCIP

Extent

Location	Size (area)	Landscape features (environmental amenities if present)	Mapping of areas with spiritual significance

Condition

Location	Biophysical characteristics of the ecosystem	Soil conditions	State of vegetation	State/Health of ecosystem	State/health of sacred grounds	State/health of burial grounds, etc.

Supply and Use Table - Biophysical

Supply	Unit of Account (per year)	User Unit				Ecosystem Types (size/area)				Total Size
		Households	Individuals	Community leaders	Others	Forest/Tree system	Caves/Rock Formation	Rivers	Others	
Service to allow/enhance practice belief	# of sites and size of sites									
Service to enhance/allow connection with higher being	# of sites and size of sites									
Service to enhance/allow connection with self	# of sites and size of sites									

Service to enhance/allow connection with others	# of sites and size of sites									
Demand (Use)										
Contemplation and reflection	# of users									
Communication with higher being	# of users									
Communication with spirits	# of users									
Burial sites	# of incidence									
Wedding sites	# of incidence									
Baptism sites	# of incidence									
Others										
Supplementary Services										
Practice of rituals for activities such as planting and harvesting										

Supply and Use Table - Monetary

Supply	Unit of Account (per year)	User Unit				Ecosystem Types Value (php)				Total Value
		Households	Individuals	Community leaders	Others	Forest/Tree system	Caves/Rock Formation	Rivers	Others	
Service to allow/enhance practice belief	# of sites and size of sites									
Service to enhance/allow connection with higher being	# of sites and size of sites									

Service to enhance/allow connection with self	# of sites and size of sites									
Service to enhance/allow connection with others	# of sites and size of sites									
Demand (Use)										
Contemplation and reflection	# of users									
Communication with higher being	# of users									
Communication with spirits	# of users									
Burial sites	# of incidence									
Wedding sites	# of incidence									
Baptism sites	# of incidence									
Others										
Supplementary Services										
Practice of rituals for activities such as planting and harvesting										

8. HCV Assessment Process

References

Annex

Sample

Annex: National HCV Interpretation Process Documentation Sheet

Country or region:
Initiating organisation(s) / individual(s) with contact details:
Contact person(s):
Organisations / individuals invited to engage with the process, with dates, affiliations/interest group/sector and contact details:
Working group composition – organisations / individuals, with affiliations/interest group/sector and contact details (including additions/changes):
Coordination and facilitation (where relevant):
Procedure – please log all major steps in the process and annex minutes from decision-making working group meetings and calls:
Consultation(s) – document consultation(s) on draft version(s) of the interpretation – dates, communications, invitations for comments, number and affiliation of respondents etc.
Field testing / reality-checks (where relevant):
Final HCV Interpretation – date, scope, supporters:
Stewardship – contact details of organisation / individual agreeing to collate comments, questions and suggestions for future revision of the Interpretation:
(annex should be 'flexible' fill in – with row space increasing as needed)

Step	Period/Date	Task Process	People Involved
1	xxx	E.g inception	
2			
3			