1. Welcome and Introductions

A videoconference (VC) was held on April 28, 2014 noon-2pm Manila time with the World Bank (WB) Manila, technical expert from the University of Wageningen, Australian Bureau of Statistics (ABS) and Washington DC on the trial accounts prepared by Technical Working Group (TWG) for Southern Palawan under the Philippine Wealth Accounting and Valuation of Ecosystem services (Phil-WAVES) project. During this VC, the scope, framework, methodology data requirements and the contribution of the European Space Agency (ESA) were discussed (for a background and agenda see annex 1). For a full list of participants see annex 2.

2. Update on the ecosystem accounts for Southern Palawan

The TWG composed of the Department of Environment and Natural Resources (DENR) and the Palawan Council for Sustainable Development (PCSD) has made excellent progress on the development of the ecosystem accounts for Southern Palawan. In particular, the team presented how it has further clarified the objective and scope, developed a detailed framework for the ecosystem accounts and determined the methodology and data requirements as well as developed a preliminary schedule of activities and work plan (see annex 3). An initial assessment of the existing data has also been carried out and detailed spreadsheets for the marine and coastal, lowland and upland ecosystem accounts have been shared prior to the VC. Each of these points will be discussed below in turn.

Objective and scope: The team identified which policies and laws are relevant for the ecosystem account, all of which are relevant for land use and zoning. Furthermore, the key decision makers of Palawan were identified that could potentially use the ecosystem accounts, such as PCSD (ECAN zoning), DENR (Protected Area (PA) management), National Commission of Indigenous Peoples (Ancestral domains), Provincial Mining Board of Palawan (mining) and the Local Government Units (LGUs) (local land use plans). At the same time, plans and/or zoning for agriculture and fisheries will need to be considered. To better capture different levels of responsibility and conceptual boundaries the team proposed creating ecosystem and land accounts by (i) political boundary, (ii) land classification and tenure, (iii) ECAN classification and (iv) Watershed and sub-watersheds within the political boundary. With regards to the latter the team proposed postponing work on the third site in Rizal Municipality given data limitations and to be able to build on experiences in doing the first two sites.

Feedback on the policy links: The policy issues are well addressed in the framework, and the listing of key policy questions, major polices and policy concerns are clearly identified. To help further develop the work plan, the team was advised by the WAVES Secretariat that the link of the ecosystem services to the key policy issues would need to be further clarified. The outline should be reorganized accordingly, starting out which what the main policy use of the data will be. It would also be important that box 1 and the matrices of data are compatible with each other. The identification of policy priorities will be an iterative process determined by data availability

and modeling feasibility. However, it is important to start thinking about policy entry points upfront to help prioritize which ecosystem services should be modelled.

Feedback on proposed breakdown of accounts: The ABS cautioned that it will be very challenging to use more than one structure to breakdown the accounts. They agree that it is often important to breakdown the ecosystem and land accounts by jurisdictions vs. ecosystem boundaries to service different user groups. For example, in the case of the Great Barrier Reef some land management decisions are taken at the landscape (Natural Resource Management region) level, whereas only parts of these regions may be in the ecosystem study area. The final decision on the scope/breakdown of the accounts will be determined by the intent/policy use. However, any breakdown of accounts should be done in such a way that the different accounts can be integrated into each other. In particular, it will be important that the land cover and use layers overlap.

Feedback on the interaction between accounts: The University of Wagenigen stressed that it will be important to not only model the ecosystem services within an area (coastal/marine, lowlands, uplands) and/or jurisdiction, but also their interactions especially between the marine and terrestrial ecosystem. For example, the impacts of mining on soil erosion/sedimentation could potentially have significant impacts on coral reefs. Modelling these regulating processes will be important to understand the impact of land use changes. The team was advised to take a two-tiered approach. First it should focus on provisioning services, for which data is generally more readily available and modelling is easier. These services should be modelled for a large enough area to address key policy issues. Second, regulating services should be modelled at a smaller (subwatershed) level and then be scaled up. The latter is a major issue.

Feedback on the scope of the marine and coastal accounts: The team clarified that there are no PA or zoning layers for the marine and coastal ecosystem. It is thus challenging to delineate the marine and coastal ecosystem. One possibility would be to overlay a Lat/lon grid of where the fish are taken. The team was advised to for now keep the scope broad as the main goal is to understand the ecological process.

Feedback on the scope of the upland accounts: The team clarified that for now the main regulating ecosystem service to be covered will be hydrological services (with support of Verna Duque), focusing on the capacity and flow of the water yield. The team however agreed that it would be important to look at both water regulation and sedimentation/erosion.

Cultural services will focus on ecotourism not the cultural value of the land to IPs. However, one way to approximate the latter would be to the measuring the value of hunting land if applicable, focusing on licenses for hunters and quota. Alternatively, ancestral domains could only be included in the physical but not the monetary accounts.

Data: The DENR-Forest Management Bureau (FMB) clarified that they are currently carrying out the Forest Resources Assessment for 2012 and are collecting detailed data on closed and

open forest as well as other wooded areas. This data will be used to determine new timber volume data, but will not provide a full land cover map. Sample points exist all over the country and the DENR-FMB will verify where the sampling points in Palawan are. The current assessment is that these sampling plots are in Brookes Point, Narra and Puerto Princessa.

National Mapping and Resource Information Authority (NAMRIA) is currently in the process of updating the 2010 land cover map, but the 2 pilot areas in Southern Palawan and the Laguna Lake basin will not be mapped until 2015.

Feedback on data collection: The team was advised by the World Bank to look at data sources beyond DENR. This could include data from BFAR as well as information on water management and water districts in Southern Palawan. It will be important to delineate the available data carefully and make use of all available sources.

Feedback on hydrological data: The current hydrological data refers to data from 1992. It will be important to check whether more recent data is available, as the land use will have changed significantly since then. This will be critical to model services correctly. As collect this new data, it will be worth checking whether data is available on sediment loads and water quality.

Feedback on land cover data: It would be important to determine whether land cover data is available between the two available data points (2003 and 2010) if want to understand hydrological process. It will be discussed with ESA whether this would be possible. It is also important to note that there are major concerns about the 2003 that will make a comparison between the two years difficult (different resolution, no ground trothing, different satellites). This will need to be addressed carefully in the land and ecosystem accounts.

Feedback on other data: It would be important to determine to what extent recreation data is collection. Data on mining tenements should also be collected, including technical data on environmental conditions, operations and mitigation measures. This data could possibly be held by EMB. Little data is available on biodiversity (apart from a WWF biodiversity assessment), which is typically difficult to measure. It will be important to collaborate on this and find innovative ways to measure biodiversity.

3. Next steps

The next steps in terms of completing the data collection and consolidation process have been clearly outlined by the TWG. It was agreed that the TWG will try to address the concerns/feedback raised above and provide the technical advisors with a list of questions on which they seek guidance. Once the data collection is complete more detailed guidance will be provided on how to measure ecosystem capacity. This will further help clarify the differences between ecosystem services flows and capacity, which is currently not clear from the tables.

Annex 1: Background & Agenda

The WAVES Global Partnership Program (GPP) promotes sustainable development worldwide through the implementation of wealth accounting that focuses on integrating natural capital accounting (NCA) in conventional development planning and policy analysis. Past attempts to institutionalize NCA – both globally and in the Philippines – have often failed due to the lack of a clear policy link, disagreements on methodology, lack of global leadership and limited capacity and resources. The WAVES GPP tries to tackle these issues by (i) helping countries adopt and implement NC accounts and pilot ecosystem accounts that are relevant for policy priorities; (ii) using a universally accepted standard (SEEA 2012) for NCA and establishing a partnership to develop methodologies for ecosystem accounting; (iii) using the convening power of the World Bank to rebuild a consensus and (iv) building capacity.

The Philippines was identified as one of the pilot countries for the WAVES GPP, because: (i) there is a high Government demand for indicators, tools and methodologies that will help determine the sustainable use of natural resources and inform development planning and policy analysis; (ii) a more sustainable use of natural resources could potentially have a large impact on the poor and thus economic growth, as the poverty incidence is particularly high among natural resource-dependent sectors; and (iii) the Government has a high latent capacity in NCA from previous initiatives, while academic and private organizations have the necessary skills for ecosystems accounting.

The objective of the Philippine Wealth Accounting and Valuation of Ecosystems (Phil-WAVES) initiative is to promote sustainable development through the implementation of wealth accounting that focuses on the value of natural capital and integrating NCA in development planning and policy analysis. Phil-WAVES will generate more rigorous evidence on the value of natural capital and assess different ecosystem use scenarios to inform development planning and policy analysis. There is a strong demand for more evidence-based decision-making in the Government of the Philippines' social compact and key development plans. This initiative feeds into this demand.

The Phil-WAVES project has begun the work on the two selected ecosystem accounts in Southern Palawan and the Laguna Lake basin. The lead agency for the Southern Palawan ecosystem account is the Department of Environment and Natural Resources (DENR) in collaboration with the Palawan Council for Sustainable Development (PCSD). The lead agency for the Laguna Lake basin ecosystem account is the Laguna Lake Development Authority (LLDA), which will collaborate with the Federation of River Basin Councils. The two sites are quite different in terms of their challenges and natural resources uses.

Southern Palawan: There are numerous competing demands on resources in biodiversity-rich Southern Palawan—the area is home to a number of indigenous tribes; there is great potential for

ecotourism and agriculture; the three large protected areas are threatened by uncontrolled bird hunting, increasing conversion of forest lands, mining claims, destruction of watershed areas, illegal gathering of forest products, and wildlife poaching; and there are four mining companies currently operating in the area.

Managing these demands is a challenge to the region's sustainable and inclusive economic development. In particular, the minerals sector is highly contentious due to land conflicts and the associated large environmental and social costs. Ecosystem accounts are expected to provide decision makers with the necessary data and evidence-based analysis to make the best development decisions for the region. A framework will also be developed so that the analysis can be updated annually and/or be replicated elsewhere.

The WAVES project in the Philippines kicked off with a series of public consultations with various stakeholders last August 2013. Since then, global and local experts have conducted a series of trainings and planning workshops on eco-system accounts and the principles of natural capital accounting in Manila and Canberra. These workshops helped develop consensus among stakeholders on the policy issues the eco-system accounts would address. In Southern Palawan, the ecosystem account will help develop a plan for handling conflicting land uses

Good progress has been made on compiling the accounts for Southern Palwan, including the compilation of a land cover change matrix for Southern Palawan, the Mount Mantalingahan Protected Landscape and each municipality. Work on the data gap assessment has begun for the lowland, upland and marine/coastal accounts. In addition, the free and prior informed consent (FPIC) of Indigenous Peoples (IP) communities in Southern Palawan is in process.

Agenda

1. Introductions
2. Provide an update on preparation of ecosystem accounts for Southern Palawan (institutional arrangement, FPIC, data collection, etc.)
3. Discuss draft work plan and expected outputs
4. Discuss the data collection/consolidation efforts
5. Agree on ESA contribution (specification, scope)
6. Other matters
7. Next steps

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Annex 2: Participant list

Manila, Philippines:

Ma. Theresa Espino-Yap,	DENR-Biodiversity Management Bureau (BMB)
Teodorico Sandoval	DENR-Mines and Geosciences Bureau (MGB)
Joven Bahuns	DENR-MGB
Alejandrino Sibucao	DENR-FMB
Mary Esther Ofiaza	DENR-Environmental Management Bureau (EMB)
Raul Magabo	NAMRIA
Rosario Mamuric	NAMRIA
John Pontillas	PCSD
Bernardo Castillo	DENR-Community Environment and Natural Resources Office (CENRO), Brooke's Point, Palawan
Mr. Leonard Caluya	DENR-Provincial Environment and Natural Resources Office (PENRO), Palawan
Gina Aljecera	National Economic and Development Authority (NEDA)
Kathleen Anne Capiroso	NEDA
Neil Varcas	Laguna Lake Development Authority (LLDA)
Emiterio Hernandez	LLDA
Alvin Faraon	LLDA
Gem Castillo	World Bank, Local Consultant, Phil-WAVES
Maya Villaluz	World Bank, Co-Task Team Leader, Phil-WAVES
Elisea Gozun	World Bank, *Interim* Country Coordinator, Phil-WAVES
Ma. Lourdes Ferrer	DENR-Office of the Undersecretary for Field Operations
Verna Duque	University of Wageningen (MSc student, Environmental Science)
Zenaida Muñoz	DENR, FASPS, Phil-WAVES, Project Coordinator
Cheenee Santiago	DENR, FASPS, Phil-WAVES, (Secretariat)
Gemmalyn Yumol	DENR, FASPS, Phil-WAVES, (Secretariat DENR team)

Wageningen, Netherlands

Lars Hein	University of Wageningen, Ecosystem Accounting Expert

Canberra, Australia

John Power	ABS, Ecosystem Accounting Expert
Sean Lawson	ABS, Ecosystem Accounting Expert
Lisa Green	ABS, Ecosystem Accounting Expert

Washington DC, USA

Stefanie Sieber	World Bank, Task Team Leader Phil-WAVES
Sofia Ahlroth, Senior Environmental Economists, WAVES Secretariat	

Annex 3: Southern Palawan Ecosystem Accounts

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Introduction and Rationale

The WAVES (TA) will aim to answer key policy questions in the Philippines (Copied from PowerPoint presentation on Phil-WAVES):

1. What are the associated economic, environmental and social trade-offs associated with different resource extraction scenarios and how will this affect the sustainability of macroeconomic growth in the medium term?
2. By constructing an ecosystem account for Southern Palawan, the Phil-WAVES TA will be able to analyze different development options for Southern Palawan – one of the few largely untouched ecosystems in the Philippines? Key policy questions that will be addressed are:
3. What are the economic, environmental and social trade-offs of different development paths based on mineral extraction, ecotourism development, or fisheries and agriculture?
4. What are the implications for sustainable management and how should gains be shared with local communities to reduce poverty and create jobs in the medium term?

Major policies affecting land and resource uses in Palawan
1. Republic Act 7611 or the Strategic Environmental Plan for Palawan Strategic (enacted in 1992)
2. Republic Act 7586 or National Integrated Protected Areas System (NIPAS) Act of 1992
3. Republic Act 8371 or The Indigenous Peoples Rights Act of 1997
4. Republic Act 7942 or An Act Instituting a New System of Mineral Resources Exploration, Development, Utilization and Conservation (enacted in 1995)
5. Republic Act 7160 or An Act Providing for a Local Government Code of 1991

Policy Concerns/Pressures on the Ecosystem (listed during the Ecosystem Training in February)

- **Land/Resource Use Decision Options**
  - Mining
  - Quarrying
  - Industrial Plantation
  - Biodiversity Conservation
  - Traditional Uses by IPs
  - Ecotourism
- **Regulation/Control of Land/Resource Uses :**
  - Illegal logging/timber poaching
  - Wildlife harvesting and trading
  - Shifting cultivation on steep uplands
  - Conversion of forest to other uses
  - Encroachment on mangroves i.e. for aquaculture and other uses

- Tan barking of mangroves trees
- Illegal fishing practices/Overfishing

Objectives for Southern Palawan (for verification during the VC)

1. To apply the SEEA experimental ecosystem accounting methods in three sub-watersheds in Southern Palawan
2. To develop biophysical and monetary accounts for ecosystem services in Southern Palawan
3. To conduct policy analysis based on ecosystem services accounts

Framework of Ecosystem Accounting in Southern Palawan

Figure 1 below provides a schematic representation of the accounts for Southern Palawan. Centers of responsibility, accountability and authority (RAA Centers) such as the DENR, PCSD, LGUs will have accounts to support policy and implementation actions.

Figure 1. Summary structure of ecosystem and land accounts in Southern Palawan
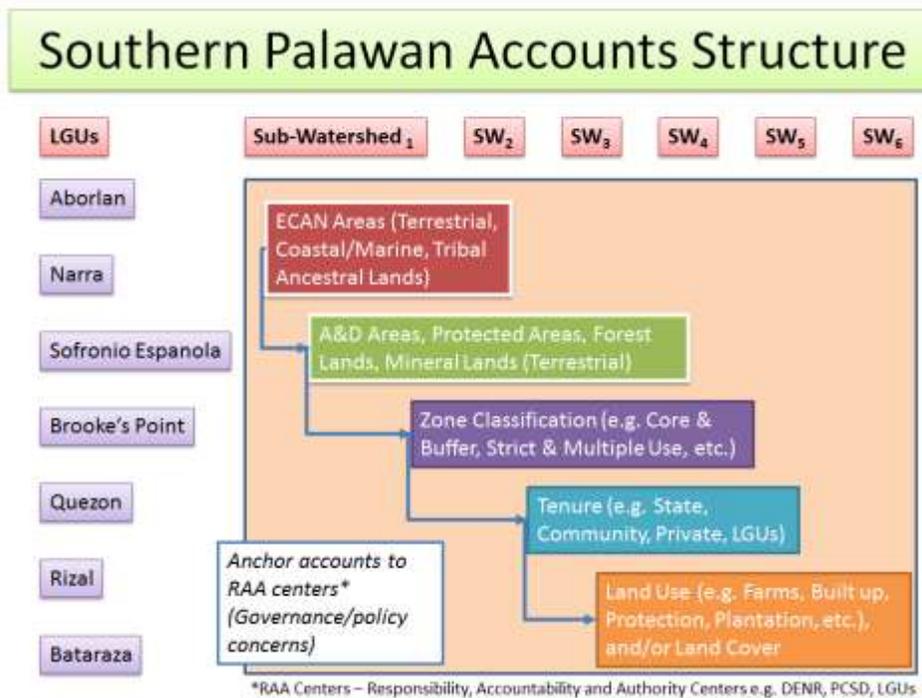
The components of the accounts of RAA centers are in **Box 1** below. The two main components as agreed are (1) Ecosystem Accounts which includes ecosystem services,

ecosystem condition, and capacity of ecosystem for sustained flow of ecosystem services, and (2) Land Accounts. The accounting units are in hectares e.g. ecosystem and land accounts of ECAN Areas, or Mt Mantalinghan, or LGU-Narra. Considering the importance placed on watersheds, the accounts will be by sub-watersheds.

BOX 1: Proposed Accounts by Type
(Ecosystem accounts components for each RAA Centers)
A. Ecosystem Accounts

- *Ecosystem Services Accounts*
    - Provisioning (Oil Palm, Coconut, Irrigation water, fish stock, other priorities recently identified)
    - Regulating (Hydrological,
    - Cultural

- *Ecosystem Condition Accounts*
    (Choice depends on basket of ecosystem service flows to be sustained in an ecosystem)
    - Water (cu m, river flow, water quality, aquatic species)
    - Soil (fertility, soil carbon, soil moisture)
    - Carbon (tonnes, net carbon balance, primary productivity)
    - Vegetation (leaf area index, biomass, density?)
    - Biodiversity (Species richness, relative abundance)

- *Ecosystem Capacity Accounts*
    (Choice depends on basket of ecosystem service flows to be sustained in an ecosystem)
    - Capacity for sustaining selected provisioning services flows
    - Capacity for sustaining selected regulating services flows
    - Capacity for sustaining selected Cultural services

B. Land Accounts (by LULC type in 2003 and 2010)

- For PAs, ECAN Areas, LGUs, IP areas

The ultimate objective (even beyond the WAVES Project) is to develop accounts for specific purposes as outlined below.

1. Ecosystem and Land Accounts by Political Boundary
(These accounts are relevant in LGU's land use regulations, monitoring, and zoning options)

- Aborlan
- Narra
- Sofronio Espanola
- Bataraza
- Quezon
- Brooke's Point
- Rizal

2. Ecosystem and Land Accounts by Land Classification and Tenure

(These accounts are useful from the national government agencies primarily DENR for monitoring status of natural wealth, and regulation of land uses in these general classification of public lands)

- National Parks (Protected Areas tenure e.g. PACBRMA, Special Uses, CADC) – Mt Mantalingahan Protected Landscape
- Timberlands (Forest lands tenure e.g. CBFMA, CSC, etc.)
- Agricultural Lands (A&D areas)
- Mineral Lands (tenure includes MPSAs, mining tenements, etc.)
- (Ancestral Domains)

3. Ecosystem and Land Accounts by ECAN Classification (SEP Law), specific for Palawan

- Terrestrial
  - Strict Protection Zone
  - Multiple Use Zone
  - Restricted Use Area
  - Controlled Use Area
  - Traditional Use Are
  - Multiple/Manipulative Use Area
- Coastal/Marine
- Tribal/Ancestral Lands

4. Ecosystem and Land Accounts by Watershed and Sub-Watersheds within Political Boundaries

Figure 2 shows a sample structure of ecosystem and land accounts for an LGU in Southern Palawan. The accounts will have component accounts by tenure boundaries (i.e. PA, CADC/CADT, etc) and corresponding land use within those boundaries. Each of the accounts will have information on prioritized ecosystem services, ecosystem condition and capacity for basket of ecosystem flows.
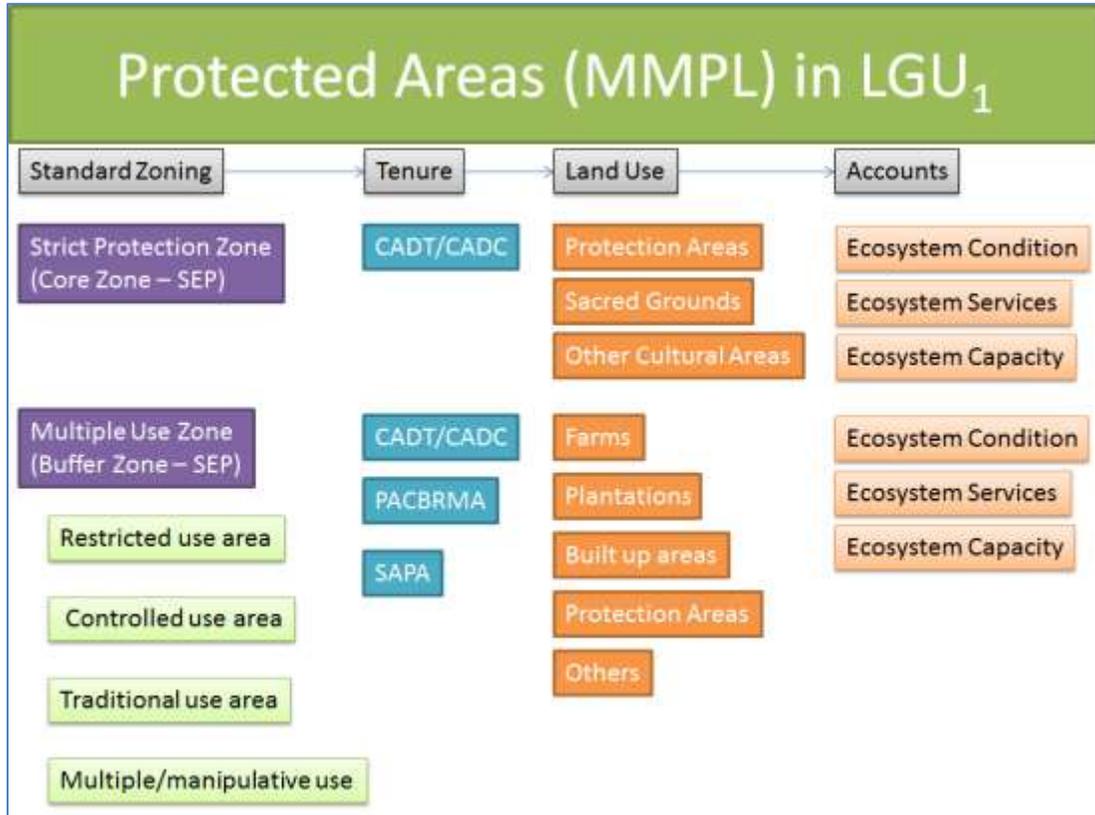
Figure 2. Sample structure of accounts for an LGU in Southern Palawan

Table 1 below shows a sample of the matrix for ecosystem account (e.g timber accounts) for an LGU in Southern Palawan. Table 2 is a sample matrix for areas under Protected Areas.

Table 1. Sample matrix of accounts (e.g. timber accounts by extent) for an LGU in Southern Palawan

Tenure / Land_Classification	Tenure (These are samples only, needs to use actual existing tenure)								
	CADC	CADT	PACBRMA	SAPA	CBFMA	Military Reservations	Academe	Others, (specify)	TOTAL
Protected Areas									
Strict Protection Zones									
Multiple Use Zone									
Restricted use area									
Controlled use area									
Traditional use area									
Multiple/manipulative use									
Forest Lands									
Protection Zone									
Production Zone									
A&D Areas									
Prime Agricultural Lands									
CARP Lands									
Residential/Commercial									
Others									
Mineral Lands									
Tenemenets									
TOTAL									

Table 2. Sample account matrix (Land and Ecosystem Accounts) for Mt. Mantalingahan Protected Landscape

Zones	Area(A), ha	Tenurial *Arrangements (Illustrative* example Only)	Area, hectares	Potential/ Existing Land Uses (Illustrative example only)	Area, hectares	Priority Ecosystem Accounts *(Unit of Measure depends on specific account)*		
						Ecosystem Condition	Ecosystem Services	Ecosystem Capacity
a. Strict protection zone (SPZ)/Core Zone (ECAN Zone)	=A-X	a.1 Areas without MOA (under DENR-PASU/DENR Field Office accountability)	SPZ_1	"No touch" area	SPZ_1	Extent of vegetation; Soil Condition; hydrology	Cultural services; water	Water production capacity
		a.2 CADC	SPZ_2	Hunting Grounds	SPZ_2	Extent of vegetation; Soil Condition; hydrology	Cultural services; water	Water production capacity
				Sacred Grounds	SPZ_3	Extent of vegetation; Soil Condition; hydrology	Cultural services; water	Water production capacity
		a.3 CADT	SPZ_3	Hunting Grounds	SPZ_4	Extent of vegetation; Soil Condition; hydrology	Cultural Services	Water production capacity

Zones	Area(A), ha	Tenurial *Arrangements* (***Illustrative* example Only)**	Area, hectares	Potential/ Existing Land Uses (**Illustrative example only)**	Area, hectares	Priority Ecosystem Accounts *(Unit of Measure depends on specific account)*		
						Ecosystem Condition	**Ecosystem Services**	**Ecosystem Capacity**
				Sacred Grounds	SPZ_5	Extent of vegetation; Soil Condition; hydrology	Cultural services; water	Water production capacity
		a.4 "NGO-Managed Biodiversity Conservation Area" – MOA example only)	SPZ_4	Wildlife Conservation Area	SPZ_6	Extent of vegetation; Soil Condition; hydrology	Cultural Services; Water	Water production capacity
		a.5 "LGU-Managed Conservation Area" MOA (example only)	SPZ_5	Flora and Fauna Conservation Area	SPZ_7	Extent of vegetation; Soil Condition; hydrology	Cultural Services; Water	Water production capacity
		A.6 Mining Tenement	SPZ_6	Active mining area	SPZ_8	Vegetative extent; hydrology, soil	Cultural Services; Water	Water production capacity
		Sub-total	**SPZ ha**					
b. Multiple use zones (MUZ)	=X	b.1 PACBRMA	MUZ_1	b.1.1 Protection Area	MUZ_{11}			
				b.1.2 Ecotourism	MUZ_{12}			

Zones	Area(A), ha	Tenurial Arrangements (*Illustrative* example Only)	Area, hectares	Potential/ Existing Land Uses (Illustrative example only)	Area, hectares	Priority Ecosystem Accounts *(Unit of Measure depends on specific account)*		
						Ecosystem Condition	Ecosystem Services	Ecosystem Capacity
				Area				
				b.1.3 Agroforestry area	MUZ_{13}		Water, food crops, non-timber products	Capacity for non-timber products flow
				b.1.4 Settlement	MUZ_{14}			
		b.2 CADC	MUZ_2	b.2.1 Sacred areas	MUZ_{21}			
				b.2.2 Ecotourism Area	MUZ_{22}			
				b.2.3 Agroforestry area	MUZ_{23}		Water, food crops, non-timber products	Capacity for non-timber products flow
				b.2.4 Settlement	MUZ_{24}			
		b.3 CADT	MUZ_3	b.3.1 Sacred Areas	MUZ_{31}			
				b.3.2 Ecotourism Area	MUZ_{32}			
				b.3.3 Agroforestry area	MUZ_{33}		Water, food crops, non-timber products	Capacity for non-timber products flow

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Zones	Area(A), ha	Tenurial *Arrangements* (*Illustrative* example Only)	Area, hectares	Potential/ Existing Land Uses (Illustrative example only)	Area, hectares	Priority Ecosystem Accounts *(Unit of Measure depends on specific account)*		
						Ecosystem Condition	Ecosystem Services	Ecosystem Capacity
				b.3.4 Settlement	MUZ_{34}			
		b.4 Others	MUZ_4	b.4.1 Protection Area	MUZ_{41}			
				b.4.2 Ecotourism Area	MUZ_{42}			
				b.4.3 Agroforestry area	MUZ_{43}		Water, food crops, non-timber products	Capacity for non-timber products flow
				b.4.4 Settlement	MUZ_{44}			
		b.5 Other areas without tenurial arrangement	MUZ_5	b.5.1 Protection Area	MUZ_{51}			
				b.5.2 Ecotourism Area	MUZ_{52}			
				b.5.3 Agroforestry area	MUZ_{53}		Water, food crops, non-timber products	Capacity for non-timber products flow
				b.5.4 Settlement	MUZ_{54}			
Total Area	= A	**Sub-total**	**MUZ ha**					

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Methodology and Data Requirements

In view of limited resources, the development of the accounts will rely on existing data collection systems by national government agencies, and other organizations regularly collecting data, and modelling using existing GIS data.

1. Secondary data gathering : Inventory of existing data available from various government agencies, programs and projects, and other sources:
    a. Boundary data
    -   Political boundaries
    -   ECAN Areas
    -   LGU land use zoning
    -   Protected Areas (Mt. Mantalingahan Protected Landscape) and its zones
    -   DENR Tenure boundaries (community-based, private, and other state tenure, including CADC)
    -   BFAR Fishpond lease agreement (boundary files)
    -   Sub-watershed boundaries
    -   Coastal zones (mangroves, coral reefs, sea grass boundaries)
    -   CADT boundaries
    -   Strategic Agriculture and Fisheries Development Zones (SAFDZ) and Network of Protected Areas for Agricultural and Agro-industrial Development (NPAAAD)

    b. Theme maps
      - Land cover (2003 and 2010) from NAMRIA
      - Soils map from Bureau of Soils and Water Management (soil type, soil fertility)
      - coral reefs, sea grass
      - hydrology
    c. Digital elevation model for Southern Palawan, and specific to 3 sub-watersheds
    d. Socio-economic profiles of LGUs
    e. Local economic data for identified provisioning services (e.g. oil palm, coconut, fish, etc.) for association with spatial boundaries
    f. Biodiversity monitoring data
    g. Fishery stock/harvest data
    h. Data from oil palm plantations and mining tenements in Southern Palawan
    i. Timber resources assessments from DENR PENRO or Forest Management Bureau

j. Data on settlements within identified boundaries including census of occupants within Mt Mantalingahan Protected Landscape

k. Water demand data from local water district or the NWRB, and Irrigators associations

l. Others (see Excel matrix for details)

2. Modelling of Ecosystems

a. Spatial modelling of waters supply and demand through hydrologic modelling (specifically water for irrigation and domestic uses)

b. Spatial modelling of soil erosion and sedimentation using the USLE (depending on data availability)

c. Bio-economic modelling using existing coastal resources assessment data

d. Modelling of watershed influence area (ridge to reef concept) – proposed to be done

3. Valuation for monetary accounting and policy analysis

4. Policy analysis based on the bio-physical and monetary accounts

5. Ecosystem data requirements (see Table 3 below for list of data requirements)

Table 3. Data requirements for ecosystem accounts in Southern Palawan

Ecosystems	Ecosystem Indicators		
	Ecosystem Condition	**Ecosystem Services**	**Ecosystem Capacity**
Upland forests	(1) Extent of natural cover, (2) species richness and abundance, (3) spatial distribution of natural landscape, (4) soil fertility and soil cover (erosion condition), (5) Ground water recharge/retention, (6) Streamflow (water supply) during dry and wet season	(1) Timber, (2) non-timber forest products, (3) soil erosion control, (4) flood control, (5) naturally growing planting materials density	(1) Timber production capacity, growth and yield models, (2) Non-timber production capacity
Lowland croplands	(1) Extent of croplands, hectares, (2) Soil nutrients, NPK soil fertility, (3) Extent of arable areas in lowlands (4) Water quality	(1) cash crops, (2) annual crops, (3) perennial crops, (4) other food crops	(1) Capacity for crop production, yield projections, (2) Irrigation canals capacity

Ecosystems	Ecosystem Indicators		
	Ecosystem Condition	**Ecosystem Services**	**Ecosystem Capacity**
Lowland forests	(1) Extent of natural cover, hectares, (2) Index of species richness and abundance, (3) Spatial distribution of natural landscape, (4) Ground water condition, (5) Water quality	(1) Timber, (2) non-timber forest products, (3) soil erosion control, (4) flood control, (5) naturally growing planting materials density	(1) Timber production capacity, growth and yield models, (2) Non-timber production capacity
Mangroves	(1) Extent of natural cover, hectares, (2) Index of species richness and abundance, (3) Spatial distribution of natural landscape, (4) Water quality	(1) Timber, (2) non-timber forest products, (3) flood control, (5) naturally growing planting materials density	(1) Capacity for flood control,
Coral Reefs	(1) Extent of coral cover, (2) Index of species richness and abundance, (3) Coral cover quality, (4) water quality	(1) Fish biomass,	(1) Fish spill over capacity
Sea grasses	(1) Extent of sea grass cover, (2) Index of species richness and abundance, (3) Sea grass cover quality, (4) water quality	(1) Fish Biomass, (2) Sea grass biomass	(1) Fish spill over capacity, (2) capacity for sea grass regeneration

Schedule of Activities

(Refer to attached Excel Matrix for details)

Work Plan

(Refer to attached Excel matrix for details)

Initial Assessment of Existing Data

(Refer to Excel matrix sent by John Fontillas and May Lacao)
A. Ecosystem Condition Data

1. Soils Data

> *Data Availability*: The Bureau of Soils and Water Management (BSWM) digitized soils map for Palawan; shapefiles are available on-line for download. Data is subject for review to validate

recency and year or period of development. Shapefiles maybe overlaid to the boundary and thematic maps in order to assess baseline soil condition for the target catchment or sub-watershed.

Soil map of the Pulot Catchment is available but need digitizing and processing

Comments on the Data: Year of data and how it was processed need validation

Action on Data: Shapefiles have been downloaded from the BSWM website and map overlay analysis is underway

2. Biodiversity Data

    Data Availability: Relative Biodiversity Index (RBI) assessment conducted in 2005; Flora and Fauna Inventory on 2003 both sites); BMS Reports (2010 to 2013) subject for review

    Comment on Data: Validation of BMS; Analysis of BMS Reports needing assistance from National BMS Core Group

    Action on Data: Biodiversity assessment data needs review and, if possible, spatial association.

3. Vegetative, Coral, Seagrass Cover Data

    a. Land Cover

        Data Availability: Shapefiles and matrices of land cover data for 2003 and 2010 have been processed. Map overlay analysis completed. Land cover change matrix between Year 2003 to Year 2010 has been completed. Satellite data at higher resolution are available and forwarded to NAMRIA to the TWG

        Comment on Data:

        Action on Data: ESA will undertake processing of higher resolution data on land cover

    b. Mangrove Cover

        Data Availability: Data on survey of mangrove forest cover for Mambalot-Filantropia and Pulot catchments in the Municipality of Brookes Point and Sofronio Espanola in 2000 and 2008, respectively (Source: Coastal Resource Monitoring, Municipality of Brookes Pt). The data includes coordinates of survey points in Calasaguen and Maasin. Data are point data on species diversity, density in trees/ha, number of seedlings/ha, and number of saplings/ha; For SF: Punang 1, Punang 2, Pulot Shore, Isumbo, Pinataray, Pinataray River, Labog 1, Gardiner Island, Labog 2/Ingiaran Point, Crawford Cove, Bintaugan Island, Inamukan/Lamukan Island, Bessie Island, Karasanan River, Karasanan, and Calasaguen 2008/2000.

        Comment on Data:

        Action on Data:

    c. Coral Cover

        Data Availability: % live coral cover Mambalot-Filantropia and Pulot catchments for 2008 and 2000 (Source: Coastal Resource Monitoring, Municipality of Brookes Pt, Palawan, Ph, 2008 and

2000), and 2001 and 2010, respectively. The data includes coordinates of survey points in Calaparan, Calasaguen, Barong-barong, Taratak, Pangobilian, Dies, Sais/Salogon, Marine Sanctuary Transect 01, and Marine Sanctuary Transect 02. The data point for SE includes Kings I, Kings II, Kings III, Bintaugan, Inamukan/Lamukan I, Inamukan/Lamukan II, Inamukan/Lamukan III, Sand Bar near Bessie Is, Bessie Is I, Bessie Is II, Bessie Is III, Bessie Is IV, Bessie Is V, Gardiner I, Gardiner II, Gardiner III, Scott's Point, Punang, Panitian near Malalong, Sand Bar near Kings I, Sand Bar near Kings I, Caramay, Calasaguen/2008 and 2000, Karasanan, Bessie submerged, Gardiner submerged I, and Gardiner submerged II.
Comment on Data:
Action on Data:

d. Sea Grass Cover

Data Availability: Survey of seagrass cover for Mambalot-Filantropia and Pulot catchments in the Municipality Of Brookes Point and Sofronio Espanola, is available for 2000 and 2008, and 2001 and 2010, respectively. The survey included species diversity, density, and percent cover. The point data includes coordinates of survey points in Calasaguen, Maasin, Mambalot, Oring-oring/Tub-tub, Tagpirara2, and Tagpirara3. The data point for SE includes Kings I, Kings II, Kings III, Bintaugan, Inamukan/Lamukan I, Inamukan/Lamukan II, Inamukan/Lamukan III, Sand Bar near Bessie Is, Bessie Is I, Bessie Is II, Bessie Is III, Bessie Is IV, Bessie Is V, Gardiner I, Gardiner II, Gardiner III, Scott's Point, Punang, Panitian near Malalong, Sand Bar near Kings I, Sand Bar near Kings I, Caramay, Calasaguen/2008 and 2000, Karasanan, Bessie submerged, Gardiner submerged I, and Gardiner submerged II.
Comment on Data:
Action on Data:

4. Ground Water Condition

Data Availability:
Comment on Data:
Action on Data: Hydrologic modelling will be conducted by Ms Verna Duques, a student from Netherlands.

5. Surface Water Conditon

Data Availability: Drainage map for Pulot Catchment (Source: Management Plan (Volume 1 Description, Evaluation and Management Plan, June 2002 (PCSDS)
Comment on Data: from Netherlands.
Action on Data: Hydrologic modelling will be conducted by Ms Verna Duques, a student
B. Ecosystem Services Flow Data (Provisioning Services)

1. Timber

Data Availability: FMB recently conducted timber resource inventory but need verification for data availability for Palawan and the target catchment or sub-watershed
Comment on Data:
Action on Data: (Check with FMB and ask to provide the data to DENR-WAVES Office)

2. Non-timber: almaciga

   Data Availability:
   Comment on Data:
   Action on Data:

3. Nickel ore

   Data Availability:
   Comment on Data:
   Action on Data:

4. Iron ore

   Data Availability:

   Comment on Data:
   Action on Data:

5. Palm Oil

   Data Availability: 2012 data on hectares of mature and immature oil palm plantation by individual outgrowers in Brooke's Point; map of areas used for oil palm plantation in Brooke's Point; number and age of standing oil palm trees in Brooke's Point; estimates of yield per hectare; estimates of costs per hectare of oil palm plantations; estimates of budget for plantation operations
   Comment on Data:
   Action on Data:

6. Water for Irrigation

   Data Availability:
   Comment on Data:
   Action on Data:

7. Water for Domestic Use

   Data Availability:
   Comment on Data:
   Action on Data:

8. Fish Production
   a. Reef Fish

      Data Availability: Coral reef fish density, individuals/500 m^2 for the Mambalot-Filantropia catchment in the municipality of Brooke's Point. The survey points in Calaparan, Calasaguen, Barong-barong, Taratak, Pangobilian, Dies, Sais/Salogon, Marine Sanctuary Transect 01, Marine Sanctuary Transect 02 have coordinates.
      Comment on Data:
      Action on Data:

   b. Inland/Commercial/Marine/Aqua Fish

      Data Availability: Data on inland, commercial, marine, and aquaculture fishery production for the province of Palawan from the website of the Bureau of Agricultural Statistics of the Department of Agriculture (not PSA);
      Comment on Data:
      Action on Data:

C. Capacity for Ecosystem Services Flow Data

1. Timber Flow Capacity

   Data Availability:
   Comment on Data:
   Action on Data:

2. Non-timber Flow Capacity: almaciga

   Data Availability:
   Comment on Data:
   Action on Data:

3. Nickel ore Flow Capacity

   Data Availability:
   Comment on Data:

Action on Data:

4. Iron ore Flow Capacity

   Data Availability:

   Comment on Data:
   Action on Data:

5. Palm Oil Flow Capacity

   Data Availability:
   Comment on Data:
   Action on Data:

6. Water for Irrigation Flow Capacity

   Data Availability:
   Comment on Data:
   Action on Data:

7. Water for Domestic Use Flow Capacity

   Data Availability:
   Comment on Data:
   Action on Data:

8. Fish Production
   c. Reef Fish

      Data Availability:
      Comment on Data:
      Action on Data:

   d. Inland/Commercial/Marine/Aqua Fish

      Data Availability: Barangay Pulot Shore Fish Catch Trend from FGD for 1990, 1995, 2000, 2005, 2010, 2011 (Source: Participatory Coastal Resource Assessment (PCRA) Municipality of Sofronio Espanola, 2011. Palawan Council for Sustainable Development Staff (PCSDS)
      Comment on Data:

Action on Data:

D. Land Accounts Data

Data Availability:

NAMRIA Data for Southern Palawan includes Land Classification Map, 2010 Land Cover Map, Slope Map, Climatic Map, Geologic Map, Land Slide Map, Flood (Prone Areas) Map, Road Map, Creeks (Drainage Pattern) Map, Tenurial Maps, Mount Matalinhagan Protected Landscape Map, Overlaid in topo, land cover & LC Map, Priority Catchment , and boundary overlaps;

PCSD Data includes Environmentally Critical Areas Network ECAN MAP, _____, , Municipal Government Of Brookes Pt Comprehensive Land Use Plan, 2000-2010, Municipal Government of S Espanola's Comprehensive Land Use Plan, 1998-2008

Department of Agriculture SAFDZ digital map to be requested from BSWM; Network of Protected Areas for Agricultural and Agro-industrial Development (NPAAAD)

Land Cover Change Matrix (2003 and 2010) for Southern Palawan

(Refer to previous analysis)

Initial Tabulation of Land Accounts

(Refer to attached Excel Overlay Matrices - SouthernPalawan_overlays.xlsx)