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**LAND ASSET ACCOUNTS: THE CORDILLERA EXPERIENCE**

by

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# LAND ASSET ACCOUNTS: THE CORDILLERA EXPERIENCE<sup>1</sup>

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## ABSTRACT

This paper presents the asset accounts for land of the Cordillera Administrative Region (CAR) covering the period 1999-2018. The project aims to support the institutionalization of environmental-economic accounting following the United Nations System of Environmental-Economic Accounting (SEEA) 2012 Central Framework, the framework utilized in the compilation of land accounts of CAR.

The study presents the asset accounts for land in physical and monetary terms. In physical terms, the land cover in hectares were estimated with the corresponding changes in stocks. The 2010 and 2015 Land Cover map data of CAR prepared by the National Mapping and Resource Information Authority (NAMRIA) were used as references in assessing the stock of land in the region.

For monetary accounts, the economic use of the land was considered and then valued using the zonal value per square meter matrix from the Bureau of Internal Revenue (BIR). The corresponding changes in the stock of land were also valued accordingly.

The resulting physical asset accounts for land revealed increases in tree-covered areas, shrub-covered areas, crops, artificial surfaces and inland water bodies. On the other hand, the area of grassland and terrestrial barren land decreased as an effect of the growth of the other land classifications.

The monetary asset accounts also posted an increase in the valuation of land within the period covered. The sum of the values of all land use classifications amounted to ₱1.5 trillion by the end of 2018.

## INTRODUCTION

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The Cordillera Administrative Region (CAR) accounts for 6.1 percent of the total land mass of the Philippines. The region has a total land area of 1,829,368 hectares delineated into alienable and disposable lands and forestlands. Forestlands consisted of 1,553,599 hectares or 84.9 percent of the regional total while disposable and alienable land comprised 275,769 hectares or 15.1 percent of total land area of the region.

The region has a mountainous topography characterized by towering peaks, plateaus and intermittent patches of valleys. Consequently, about 71 percent of the region's land area has slopes of 30 degrees and above.

The region's total population grew to 1,722,006 in 2015 from 1,365,412 in 2000 which corresponds to a 1.5 percent growth or an average of 23,773 annual increase. In 2016, agriculture remained to be the region's primary source of occupation employing about 44 percent of the region's workforce.

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The region's growing population has led to massive encroachment and land use/cover conversion because of limited alienable and disposable lands. The denudation of forest areas for economic development and conversion to other land uses further increased erosion rates and the depletion of soil nutrients, which if left unchecked, would affect the region's agricultural productivity. It is important to monitor changes such as denudation of forest areas in order to conserve, manage and protect the region's land resources effectively.

The increasing population underscores the need to conserve and manage land and soil resources so as to maintain or improve productivity of the land to feed the growing population. Understanding the nature of these resources is vital to manage them sustainably.

## **OBJECTIVES OF THE STUDY**

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The general objective of the study is to support the institutionalization of environmental-economic accounting following the UN System of Environmental-Economic Accounting (SEEA) 2012 Central Framework, particularly in the compilation of the asset accounts for land of the region. The study also aims to strengthen the data support on environmental accounting.

Specifically, the study intends to:

1. Come up with the asset accounts for land of CAR in terms of area;
2. Value the land cover according to their use in the economy;
3. Establish a database on physical and monetary asset accounts for land; and
4. Come up with possible recommendations for the improvement of the accounting and valuation of stocks of land in CAR.

## **FRAMEWORK OF THE STUDY**

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### **Scope and coverage**

Land is defined as a unique environmental asset that delineates the space in which economic activities and environmental processes take place and within which environmental assets and economic assets are located (UN, 2014, p.174).

The SEEA 2012 Central Framework also introduces the concept of land use and land cover that outlined the physical and monetary asset accounts for land. Land use, as defined by SEEA 2012, reflects both the activities undertaken and the institutional arrangements put in place in an area, either for economic production purposes or for maintenance and restoration of environmental functions (UN, 2014, p.175). On the other hand, land cover refers to the observed physical and biological cover of the Earth's surface, including natural vegetation and abiotic surfaces (UN, 2014, p.176).

This paper presents the physical and monetary accounts for land covering the period 1999 to 2018. It includes all the classifications from the georeferenced data from the 2010 and 2015 land cover and all the reported changes in the stocks using all the available data that can relate to the additions and/or reductions of land in the region.

### **Classification of land cover**

The SEEA 2012 – Central Framework established an interim land cover classification with 14 classes based on the Food and Agriculture Organization's (FAO) Land Cover

Classification System (LCCS). The LCCS is used to systematically record the biophysical characteristics of all areas of land within any territory.

There is an enormous number of different land cover features that can be created with the LCCS approach. For the purpose of standardization and harmonization across statistical data sets, a classification comprising 14 classes has been established:

1. Artificial surfaces (including urban and associated areas)
2. Herbaceous crops
3. Woody crops
4. Multiple or layered crops
5. Grassland
6. Tree-covered areas
7. Mangroves
8. Shrub-covered areas
9. Shrubs and/or herbaceous vegetation, aquatic or regularly flooded
10. Sparsely natural vegetated areas
11. Terrestrial barren land
12. Permanent snow and glaciers
13. Inland water bodies
14. Coastal water bodies and intertidal areas

Table 1 presents a modified bridge table to align the local land cover classification used by the DENR-NAMRIA in relation to the SEEA 2012 – Central Framework interim land cover classification.

**Table 1. Bridge Table on SEEA 2012 Interim Land Cover Classification and NAMRIA Land Cover Classification<sup>4</sup>**

SEEA 2012 – Central Framework	DENR-NAMRIA
Artificial surfaces (including urban and associated areas)	Built-up area
Crops	Annual cropland Perennial cropland
Shrub-covered areas	Shrub land Fallow Wooded grassland
Tree-covered areas	Closed Forest Open Forest Plantation Forest
Inland water bodies	Inland water Fishpond
Mangroves	Mangrove forest
Grassland	Grassland
Terrestrial barren land	Barren land
Regularly flooded areas	Marshland/Swamp
Sparse natural vegetated areas	
Permanent snow and glaciers	
Coastal water bodies and inter-tidal areas	

<sup>4</sup> Adopted from the paper presented on the 13th National Convention on Statistics entitled “Accounting for Forest Cover of the Philippines: A Tool for Sustainable Management” by Bathan, Virginia M. et. al. with inputs from DENR-CAR

The local land cover classifications and terms are also used in the operationalization of the framework. Mangroves are not included in the accounting matrix since there is no mangrove forest in the region. Permanent snow and glaciers are not applicable in the Philippines. Also, no equivalent local classification matched for the sparsely natural vegetated areas and the coastal water bodies and inter-tidal areas.

## Conceptual Framework

The asset accounts for land resources in the region, in physical and monetary terms, used the UN SEEA 2012 – Central Framework. This framework is the first comprehensive international statistical standard for environmental-economic accounting adopted by the United Nations Statistical Commission (UNSC). It is a multipurpose conceptual framework for understanding the interaction between the economy and the environment, including for describing the stocks and changes in stocks of environmental assets (UN, 2014, vii).

The opening stock represents the stock of resources at the beginning of the accounting period while the closing stock represents the stock of resources at the end of the accounting period. Within the period, several factors may occur resulting to changes in the stocks. These changes could either be due to managed expansion, natural expansion and upward reappraisals for additions to stock or managed regression, natural regression and downward reappraisals for reductions in stock. The closing stock for a year is equal to the opening stock of the succeeding year.

The physical and monetary accounts are then computed for an accounting period. The monetary value of the physical accounts is computed by multiplying each transaction item by the zonal value for each type of land use. The zonal value is defined as the value of real properties which can more or less approximate the present fair market value of real properties and as basis for computing the Property Tax (capital gains tax, documentary stamp tax, estate tax when the property is sold or transferred). It is highly dependent on the area where the property is located (Anchor Land Holdings Inc., 2013).

Table 2 presents the basic structure of asset accounts for land based on SEEA 2012 Central Framework. It provides information on the quantities of stock and changes over the period covered.

**Table 2. Basic Structure of Physical Asset Account for Land**

<b>Opening stock of resources</b>	
<b>Additions to stock</b>	
Managed expansion	An increase in the area of land cover type due to human activity.
Natural expansion	An increase in the area resulting from natural processes including seeding, sprouting, suckering or layering.
Upward reappraisals	Reflect changes due to use of updated information that permits a reassessment of the size of the area of different land covers.
<b>Reductions in stock</b>	
Managed regression	A decrease in the area of land cover type due to human activity.
Natural regression	A decrease in the area of land cover type due to natural reasons.
Downward reappraisals	Reflect changes due to use of updated information that permits a reassessment of the size of the area of different land covers.
<b>Closing stock of resources</b>	

Source: SEEA 2012 Central Framework

## **OPERATIONAL FRAMEWORK**

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### **Data and data sources**

The data utilized in the estimation of physical asset account on land were from line bureaus and offices under the DENR. Georeferenced data came from NAMRIA, the agency mandated to provide natural resources data in the form of maps, charts, texts and statistics.

The 2010 Land Cover Maps and Statistics were the results of the national mapping activity carried out by NAMRIA using ALOS-AVNIR-2, SPOT5 and Landsat 7 imageries with 30-meter resolution while the 2015 Land Cover Data and Statistics were the result of the latest mapping activity using Landsat 8 with 30-meter resolution and Google Earth. The land cover classification followed the DENR Department Memorandum Circular 2005-05: Adopting Forestry Definitions Concerning Forest Cover/Land Use and the Forest Resources Assessment (FRA) of the Food and Agriculture Organization (FAO) of the UN.

Other data used were sourced from the Department of Agrarian Reform (DAR) for the land conversions of agricultural lands to built-up areas and PSA for the land use for aquaculture. The zonal values downloaded from Bureau of Internal Revenue (BIR) website were used for monetary asset accounts. The BIR zonal values were inputs in the estimation of the monetary values of each land use. It was an approximation of the prevailing market values per square meter expressed in peso.

### **Data limitations**

Land cover of the region provided by DENR-CAR from NAMRIA for 2010 and 2015 were used as bases for the estimation of land resource of the region. The land area of the region in 2010 and 2015 based on cadastral maps were adjusted to equal the official total land area of 1,829,368 hectares.

The administrative reports compiled showed no relationship to the changes observed in the stock of land from 2010 and 2015. The discrepancy was addressed by distributing the changes within the five-year period of the land cover mapping. For the other years, the data gathered from other sources were incorporated to reflect the additions and reductions.

Data on the area of aquaculture from PSA-CAR was limited only to the period 2008 to 2018. These data were used in the estimation of monetary asset accounts for land use for aquaculture.

### **Estimation methodology**

#### **Physical asset account**

The compilation of the asset account in physical terms presents the changes in the opening and closing stocks of land cover in the region. Stocks increase due to natural and/or managed expansion. The decreases in stocks are attributed to natural and/or managed regression.

Information on the land cover area was generated through the data provided by NAMRIA and DENR. The land cover area by classification for 2010 and 2015 served as bases for the closing stocks for their respective year of accounting. Generally, the closing stock is derived by adding the total additions to stock and subtracting the total reductions in the stock from the opening stock. But for 2010 and 2015 as entries for closing stocks, the opening stock was

computed by adding the total reductions and subtracting the total additions from the closing stock. Closing stock for the year will be the opening stock for the next year.

### Monetary asset account

In monetary terms, the land resource account was estimated using the physical land area in each year, multiplied by the average prevailing zonal value obtained from the BIR. The BIR zonal values were summarized according to the land type and land use. It was an approximation of the prevailing market values expressed in peso. The area of land use was converted from hectare to square meter to directly multiply the zonal value to the area per classification. The monetary estimates of the opening and closing stocks as well as the changes in the area were calculated by multiplying the physical area (in square meter) with the average prevailing zonal value for the region.

The framework also provided a facility on the effect of the year to year change in price through the item *revaluation*. In the monetary accounts for land, revaluation was computed as a residual. This was done by deducting from the closing stock the difference between the opening stock and the net changes.

## **RESULTS AND DISCUSSIONS**

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### **Land Cover**

Land cover was categorized into major land use groupings namely open, closed and plantation forest; inland water; fishpond; other land uses which include built up area, annual and perennial crop, barren land and grassland; and other wooded lands which include fallow, shrubs and wooded grassland.

Table 3 shows the result of the adjustment made with the 2010 and 2015 land cover of the region. Tree-covered areas of the region, which composed of open, closed and plantation forest, increased from 800,871.5 hectares in 2010 to 856,765.3 hectares in 2015. It grew by an annual average of 1.4 percent or a yearly increase of 11,178.8 hectares. Plantation forest had the biggest increase from 15,646.1 hectares in 2010 to 40,620.8 hectares in 2015, a 164.2 percent increase. Open forest grew also by 5.8 percent. On the other hand, closed forest decreased by 0.1 percent from 249,419.1 hectares in 2010 to 249,123.2 hectares in 2015.

Shrub-covered areas (shrubs, fallow and other wooded land) increased by 75.2 percent from 291,350.0 hectares in 2010 to 510,377.8 hectares in 2015. Artificial surfaces or built-up areas grew by 49.2 percent with yearly increment of 1,540.0 hectares. Other land cover that posted an increase include crops with area derived from the annual and perennial crops with 7.3 percent growth and inland water bodies which include fishpond with 4.4 percent growth, during the period 2010 to 2015.

Grassland shrank by of 65.2 percent from 457,087.9 hectares in 2010 to 159,122.7 hectares in 2015 corresponding to an annual decrease of 59,593.0 hectares. The land cover data also showed a decrease in the area of terrestrial barren land by 17.7 percent from 12,915.0 hectares in 2010 to 10,627.7 hectares in 2015.

**Table 3. Land Cover, CAR: 2010 and 2015 (in Hectares)**

<b>Land Cover</b>	<b>2010</b>	<b>2015</b>
Closed forest	249,419.1	249,123.2
Open Forest	536,075.6	567,021.2
Plantation Forest	15,376.8	40,620.8
Built-up area	15,646.1	23,346.3
Annual Crop	226,397.0	240,354.5
Perennial Crop	2,355.1	5,019.9
Barren land	12,915.0	10,627.7
Grassland	457,087.9	159,122.7
Fallow	-	-
Shrubs	291,350.0	510,377.8
Wooded grassland	-	-
Fishpond	-	218.5
Inland Water	22,745.4	23,535.4
<b>Total</b>	<b>1,829,368.0</b>	<b>1,829,368.0</b>

Source: PSA RSSO-CAR

### Physical Asset Accounts

Artificial surfaces increased with an annual average growth of 2.2 percent from 15,604.1 hectares in 1999 to 23,348.7 in 2018. In terms of area, 407.6 hectares were added annually. Crops or agricultural land also increased with annual average growth of 0.4 percent from 228,794.2 hectares in 1999 to 245,371.9 hectares in 2015 or an annual increase of 872.5 hectares.

Tree-covered areas in the region exhibited an uptrend with an annual average growth of 0.7 percent or equivalent to 5,785.8 hectares annual average increase. The effect of National Greening Program (NGP) that started in 2011 was seen to have contributed to the increase in forest cover of the region.

Grasslands and shrub-covered areas gradually decreased from 1999 to 2009 believed to be the result of reforestation activities. However, some procedures were done to arrive at 2015 land cover from 2010. The observed changes were distributed to the years in between following the percentage contribution of the reported conversions for each year. The resulting adjustments posted an annual average increase of 2.7 percent for shrub-covered areas or 9,619.0 hectares yearly increment and a 5.3 percent decline on the area of grassland or 16,617.6 hectares annual decrease from 1999-2018.

**Table 4. Land Cover by Land Classification, CAR: 1999-2018 (in Hectares)**

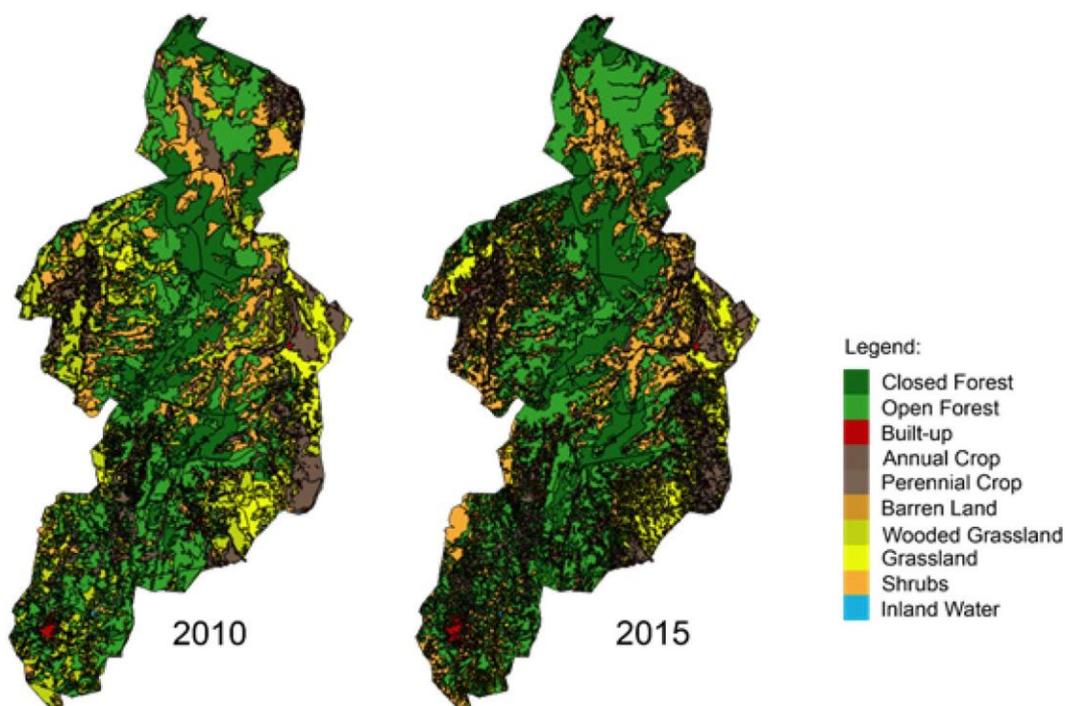
Year	Artificial surfaces	Crops	Grassland	Tree-covered area	Shrub-covered area	Terrestrial barren land	Inland water bodies
1999	15,604.1	228,794.2	465,152.9	787,665.8	296,490.7	12,915.0	22,745.4
2000	15,604.1	228,794.2	463,175.3	790,903.9	295,230.2	12,915.0	22,745.4
2001	15,604.1	228,794.2	461,003.2	794,460.5	293,845.7	12,915.0	22,745.4
2002	15,608.1	228,790.1	461,279.6	794,008.1	294,021.8	12,915.0	22,745.4
2003	15,616.1	228,782.1	460,605.9	795,111.1	293,592.4	12,915.0	22,745.4
2004	15,619.8	228,778.4	460,663.9	795,016.2	293,629.4	12,915.0	22,745.4
2005	15,624.8	228,773.4	460,937.3	794,568.6	293,803.6	12,915.0	22,745.4
2006	15,629.8	228,768.5	462,288.6	792,355.9	294,664.9	12,915.0	22,745.4
2007	15,631.4	228,766.8	460,789.3	794,810.8	293,709.3	12,915.0	22,745.4
2008	15,641.5	228,756.7	458,292.2	798,899.6	292,117.6	12,915.0	22,745.4
2009	15,646.0	228,752.2	453,178.8	807,272.3	288,858.3	12,915.0	22,745.4
2010	15,646.1	228,752.1	457,087.9	800,871.5	291,350.0	12,915.0	22,745.4
2011	17,384.0	228,932.2	434,177.8	805,443.5	308,025.9	12,457.5	22,947.1
2012	18,633.6	232,475.0	399,541.0	811,857.1	331,712.5	12,000.1	23,148.8
2013	21,621.7	238,925.4	300,271.0	830,535.8	403,121.0	11,542.6	23,350.5
2014	23,262.9	241,622.8	218,218.3	845,939.5	465,687.2	11,085.2	23,552.2
2015	23,346.3	245,374.3	159,122.7	856,765.3	510,377.8	10,627.7	23,753.9
2016	23,347.4	245,373.2	156,031.3	869,772.2	500,462.3	10,627.7	23,753.9
2017	23,348.0	245,372.7	152,149.3	886,105.5	488,011.0	10,627.7	23,753.9
2018	23,348.7	245,371.9	149,418.4	897,595.8	479,251.6	10,627.7	23,753.9

Source: PSA RSSO-CAR

### Physical Asset Accounts, Land Cover Change

Figure 1 shows the conversion of land covers from one type to another. The map comparison reflected the changes made by the afforestation/reforestation activities of the combined efforts of different government agencies and private sectors. The presence of artificial surfaces on agricultural lands can also be observed from the figure. None of the data compiled can relate to the changes in regularly flooded areas, terrestrial barren-land and inland water of the region.

Figure 1. Land Cover Map, CAR: 2010 and 2015



Source: NAMRIA

### Monetary Asset Accounts

The value of land used for agriculture generally increased from ₱17.3 billion in 1999 to ₱66.1 billion in 2015. The annual average growth was 9.6 percent or equivalent to an annual increase of ₱2.6 billion.

Land used in forestry was valued at ₱21.0 billion in 1999 and ₱73.9 billion in 2018. The average increase was 8.3 percent annually equivalent to ₱2.8 million yearly addition.

The biggest share to the total monetary valuation of land in the region was the built-up areas. It contributed to as much as 96.5 percent in 1999 and 2000. In 2018, it was estimated to share 90.7 percent to the total value of lands in CAR. During the 20-year accounting period, built-up areas registered an annual average increase of 1.5 percent or an annual average increase of ₱16.0 billion. Built-up areas were valued at ₱1.1 trillion in 1999 and went up to ₱1.4 trillion in 2018.

Lands used for aquaculture was valued at ₱68.0 million in 2009 and decreased to ₱66.0 million in 2015. The rate of decrease was 0.3 percent annually or a decrease of ₱216 thousand annually.

**Table 5. Estimated Value of Land, CAR: 1999-2018 (in Million Pesos)**

Year	Agriculture	Forestry	Aquaculture	Built-up	Total
1999	17,266.8	21,004.4	...	1,055,604.6	1,093,875.9
2000	17,266.8	21,090.8	...	1,055,604.6	1,093,962.2
2001	17,266.8	21,185.6	...	1,055,604.6	1,094,057.0
2002	33,526.2	38,115.8	...	1,050,898.4	1,122,540.5
2003	33,525.1	38,168.8	...	1,051,437.1	1,123,131.0
2004	33,524.5	38,164.2	...	1,051,685.6	1,123,374.4
2005	33,523.8	38,142.7	...	1,052,024.2	1,123,690.8
2006	33,523.1	38,036.5	...	1,052,356.8	1,123,916.4
2007	33,522.8	38,154.4	...	1,052,470.4	1,124,147.5
2008	33,521.4	38,350.6	-	1,053,146.2	1,125,018.2
2009	59,953.6	59,118.4	68.0	911,356.8	1,030,496.8
2010	61,605.9	65,950.3	64.3	911,549.5	1,039,170.0
2011	61,654.4	66,326.8	66.5	1,012,798.4	1,140,846.2
2012	62,608.6	66,854.9	68.1	1,085,597.1	1,215,128.7
2013	64,345.7	68,393.1	69.3	1,259,686.9	1,392,495.0
2014	65,072.2	69,661.5	68.3	1,355,302.4	1,490,104.4
2015	66,082.5	70,553.0	65.7	1,360,162.6	1,496,863.8
2016	66,082.2	71,624.1	68.9	1,360,229.2	1,498,004.3
2017	66,082.1	72,969.1	66.0	1,360,259.3	1,499,376.6
2018	66,081.9	73,915.3	66.0	1,360,304.5	1,500,367.7

Note: (...) Data not available

(-) Nil or zero

Source: PSA RSSO-CAR

The total valuation of all closing stocks of land use in CAR amounted to ₱1.5 trillion in 2018. It grew by an annual average of 1.8 percent from ₱1.1 trillion in 1999 or an annual average increase of ₱21.4 billion.

## RECOMMENDATIONS

Based on the results of the study taking into consideration the limitations mentioned beforehand, the following are the recommendations to improve the land resource accounting of the region:

- a. The result of the compilation and estimation including the indicators drawn from this study should be consolidated in a databank or database to support and as bases for project preparations and policy recommendations;
- b. The concerned agencies should improve and update their databanks/databases to be able to conduct a more thorough land accounting. Data on the following should be continuously updated, and where appropriate and possible, incorporated in the reports regularly submitted by the concerned agencies:
  - i. actual area effectively converted not only from agricultural land to built-up areas but also other conversions such as forest land to agricultural land and/or built-up areas, et al.;

- ii. data implying the changes in the area of barren lands and inland water bodies should be identified to be incorporate in the accounting table. Data on regularly flooded areas should have at least two-year survey results for comparison; and
  - iii. all data must have a provincial estimate or disaggregation to make way for asset accounting at the provincial level.
- c. Local terms and definitions used by DENR and other concerned agencies in reporting data on land cover should be standardized in accordance to international standards to ensure comparability of data on the national and international level.
  - d. Special studies on land valuation should be conducted to provide an overview of existing or more current land market in the region and compare different valuations.

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