

14th National Convention on Statistics (NCS)
Crowne Plaza Manila Galleria, Ortigas Center, Quezon City, Philippines
October 1-3, 2019

CAR Asset Accounts for Timber Resources

by

Aldrin Federico R. Bahit, Jr., and Jeannel I. Barcayan

For additional information, please contact:

Author's name	ALDRIN FEDERICO R. BAHIT, JR.
Designation	Chief Statistical Specialist
Authors' name	JEANNIEL I. BARCAYAN
Designation	Assistant Statistician
Affiliation	Statistical Operations & Coordination Division, Philippine Statistics Authority- Cordillera Administrative Region
Address	3F CTL Bldg, 141 Abanao Extension, 2600 Baguio City
Tel. no.	+63 917 836 7508, +63 74 442 7449
E-mail	aldrib@gmail.com, jeannelbarcayan@yahoo.com

CAR Assets Accounts for Timber Resources¹

by

Aldrin Federico R. Bahit, Jr.² and Jeannel I. Barcayan³

ABSTRACT

This paper presents the state of the forestland of the Cordillera Administrative Region (CAR) by reporting the physical and monetary asset accounts of timber resources covering the period 1999-2018. The compilation of timber accounts for the region followed the United Nations System of Environmental-Economic Accounting (SEEA) 2012 Central Framework.

The physical asset account is based on the 2010 and 2015 Land Cover of CAR that classify forestlands as closed forest, open forest and plantation forest. The physical asset accounts present the area of the forests in hectares and the volume of timber resources in terms of cubic meters. For monetary asset accounts, the stumpage value of standing timber was used to value the resources at constant prices. At current prices, the corresponding inflation rates were applied to estimate the value.

Out of the total land area of the region, 84.9 percent or 1,553,599 hectares are considered forestlands. Although considered forestlands, not all of the 84.9 percent are tree-covered areas. As of 2018, the region's total forestland area covers 897,595.8 hectares which is equivalent to 49.1 percent of the region's total land area of 1,829,368 hectares. In terms of volume, the closing stock of standing timber resources add up to 153,190.0 million cubic meters in 2018. Both the area and the volume of timber posted an increase during the period covered.

The monetary asset accounts also posted an increase in the valuation of timber resources from 1999 to 2018. The volume of the closing stock of timber resources at the end of the period was valued at PHP 483.8 billion at current prices and PHP180.2 billion at constant prices.

INTRODUCTION

The Cordillera Administrative Region (CAR) is dubbed as the "Watershed Cradle of North Luzon". As of December 2013, there are 46 major proclaimed forests and watersheds in the region. Total forestland covers an area of 1,553,599 hectares or about 84.9 percent of the 1,829,368 hectares of the region's total land although not all forestlands are covered with trees. The region abounds in forest resources such as timber and minor forest products that contribute significantly to local, regional and national economy.

The region hosts 13 major river basins with an estimated drainage area of 18,293 square kilometers suitable for water and energy exploration and other economic purposes. The water bearing capacities of the region's river basins provide continuous supply of water for irrigation and estimated to be able to irrigate some 68,623 hectares of farmlands or 36.0 percent of the irrigable areas in CAR and the rest of Northern Luzon. Available water resource could likewise support hydro-power generation with a potential to reach 659 megawatts. The region's

¹ Output of the Environment and Natural Resources Accounting (ENRA) Project of the Regional Statistical Services Office-Cordillera Administrative Region (RSSO-CAR), Philippine Statistics Authority (PSA)

² Chief Statistical Specialist and Officer-In-Charge of the Statistical Operations and Coordination Division (SOCD), PSA RSSO-CAR; CAR ENRA Project Team Leader; and Secretary of the CAR ENRA Steering Committee

³ Statistical Analyst, Statistical Operations and Coordination Division (SOCD) PSA RSSO-CAR

forestlands also serve as the habitat for a diverse number of flora and fauna which are important sources of medicine, food and other products of economic importance.

State of the Forest: Cordillera Administrative Region

Forestland or permanent forest refers to land owned by the government that is still in public domain based on official system of classification. According to the Department of Environment and Natural Resources (DENR) – CAR, 84.9 percent or 1,553,599 hectares of the region’s total land area is legally classified as forestland however, much of the forest land are not covered with trees.

The 2015 land cover map of the National Mapping and Resource Information Authority (NAMRIA) showed that only 46.8 percent or 856,765.3 hectares of the region’s total land area can be categorized as forest cover. This figure is only about 52.5 percent of the legally declared forestland. The forest cover in the region is further classified into closed forest and open forest.

Table 1. Land Area by Forest Type, CAR: 2015

Forest Type	Area (in hectares)	% to Total Forestland	% to Total Land Area
Total land area	1,829,368.0
Total forestland*	856,765.3	..	46.8
<i>Closed Forest</i>	249,123.2	29.1	13.6
<i>Open Forest</i>	567,021.2	66.2	31.0
<i>Plantation</i>	40,620.8	4.7	2.2

(..) Not applicable
 *Tree-covered area
 Source: NAMRIA

The recent figures show an increase in the forest cover of the region. The average remaining forest cover shows that in 1987, forest cover has fallen to about 34.0 percent. This increased in years 2003 and 2010 at 38.0 percent and 43.0 percent, respectively. The 1.6 percentage points increase from 2010 to 2015 is due to several factors such as the growth of the past reforestation efforts into full forest plantation, the extension of natural regeneration, the protection efforts of the stakeholders and the participation of private land owners in tree planting activities.

OBJECTIVES OF THE STUDY

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 timber resources accounting.

Specifically, the study intends to:

1. Come up with accounts of the timber resources of CAR in terms of area and volume;
2. Value the standing timber resources of CAR in constant and current prices;
3. Establish a database on physical and monetary asset accounts of timber resources of CAR; and
4. Come up with possible recommendations for the improvement of the accounting and valuation of timber resources of CAR.

FRAMEWORK OF THE STUDY

Scope and coverage

Timber is one of the seven individual components of the environment that is considered as environmental asset in the SEEA Central Framework. Timber resources are defined by the volume of trees, living or dead, and include all trees regardless of diameter, tops of stems, large branches and dead trees lying on the ground that can still be used for timber or fuel (UN, 2014, p.192).

The focus of the physical and monetary asset accounts presented in this study is on the timber resources found in areas of forest and other wooded land/afforested areas. Forest resources in the region are classified into three major types, namely: closed forest, open forest and plantation forest which are further categorized to broadleaved, coniferous and mixed.

The period of accounting covers 20 years from 1999 to 2018. It presents the stock of timber resources in terms of area and volume. The volume of standing timber is then valued to come up with the monetary asset accounts at constant and current prices.

Forest

These are lands with an area of more than 0.5 hectare and tree crown (or equivalent stocking level) of more than 10 percent. The trees should be able to reach a minimum height of 5 meters at maturity in situ. The three major types of forest resources include the following (FAO, 2000):

- Closed forest – formations where trees in the various storeys and the undergrowth cover a high proportion (exceeding 40 percent) of the ground and do not have a continuous dense grass layer. They are either managed or unmanaged forest, in advance state of succession and may have been logged over one or more times, having kept their characteristics of forest stands, possibly with modified structure and composition.
- Open forest – formations with discontinuous tree layer with coverage of at least 10 percent and less than 40 percent. They are either managed or unmanaged forests, in initial state of succession.
- Plantation forest – forest stands established by planting or/and seeding in the process of afforestation or reforestation.

Other wooded land

These are lands either with crown cover (or equivalent stocking level) of 5-10 percent of trees able to reach a height of 5 meters at maturity; or crown cover (or equivalent stocking level) of more than 10 percent not able to reach a height of 5 meters at maturity (e.g. dwarfed or stunted trees); or with shrubs or bush cover of more than 10 percent (FAO, 2000). According to the Food and Agriculture Organization (2000), wooded land is classified under the following:

- Shrubland – where the dominant woody vegetation are shrubs, generally of more than 0.5 meter and less than 5 meters in height in maturity and without a definite crown. The growth habit can be erect, spreading or prostrate. The height limits for trees and shrubs should be interpreted with flexibility, particularly the minimum tree and maximum shrub height, which may vary between 5 and 7 meters approximately.

- Wooded grassland – areas predominantly vegetated with grasses such as Imperata, Themeda, Saccharum and where the tree cover is between 5 to 10 percent of area and their height may reach 5 meters at maturity.
- Fallow – refers to woody vegetation resulting from the clearing of natural forest for shifting agriculture. It is an intermediate class between forest and non-forest land uses. Part of the area, which is not under cultivation, may have the appearance of a forest.

Conceptual Framework

The framework for the CAR asset accounts for timber resources, in physical and monetary terms, is based on the UN SEEA 2012 – Central Framework. The United Nations Statistical Commission (UNSC) formally adopted the SEEA 2012 – Central Framework as an international statistical standard for environmental-economic accounting. It is a multipurpose conceptual framework for understanding the interaction between the economy and the environment, including that of stocks and changes in stocks of environmental assets (UN, 2014, vii).

The basic structure of asset accounts for timber resources is presented in Table 2. It provides information on the quantities of stock and changes over the period covered.

Table 2. Basic Structure of Physical Asset Account for Timber Resources

Opening stock of timber resources	
Additions to stock	
Natural growth	An increase in the stock which is measured in terms of the gross annual increment.
Afforestation/Reforestation	An increase in the stock due to the establishment of forest plantations on temporarily unstocked lands that are considered as forest. Also called artificial regeneration
Reclassifications	An increase in the area of forest land, other wooded land and other areas of land that lead to an increase in the volume of available forest resources.
Reductions in stock	
Removals	A decrease in the stock due to confiscation of forest products and timber productions.
Forest disturbances	A decrease in the stock due to forest destruction.
Felling residues	A decrease in the stock due to damage caused by logging, excess in terms of size requirements and those that are rotten at the time of felling.
Natural losses	A decrease in the stock due to natural mortality.
Closing stock of timber resources	

Source: SEEA 2012 Central Framework

OPERATIONAL FRAMEWORK

Sources of data

The data utilized in the estimation of physical asset account for timber resources came from line bureaus and offices under the DENR. Georeferenced data were 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 results 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 Program Monitoring and Evaluation Division (PMED) of DENR-CAR. Reports on the area afforested/reforested were gathered to comprise the additions to stock. Timber production, confiscated timber resources and forest destruction were collected to comprise the reductions in the stock.

Stumpage value was used on the estimation of monetary asset accounts. The stumpage value was adopted from the study conducted by the former National Statistical Coordination Board (NSCB) and presented in the publication on Environmental and Natural Resources Accounting: The Cordillera Experience. Inflation rates with 2012 base year were also gathered from PSA to determine the value of standing timber at current prices.

Data limitations

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

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

Data on other additions and reductions to stock i.e. natural growth, felling residues, natural losses, catastrophic losses and reclassifications were not available/not reported according to DENR-CAR. It was also not possible to separate afforestation from reforestation data. The Philippines has no data on afforestation/forest expansion (FRA Philippine Report, 2015).

Data format on forest destruction, timber production, confiscation of forest products and afforestation/reforestation did not indicate the affected forest, e.g. open forest. It was assumed that these data fall either on open forest or cultivated timber resources/plantation forest.

Aside from the physical asset accounts for timber resources in terms of volume, area accounts were also estimated. Also, the monetary asset account was estimated at constant and current prices.

Estimation methodology

Physical asset accounts, area

The compilation of the asset account in physical terms denotes the changes in the opening and closing stocks of timber resources in the region. Stocks increase due to natural growth, afforestation/reforestation and/or reclassifications. The decrease in stocks are attributed

to removals, forest disturbances, felling residues, natural losses, catastrophic losses and/or reclassifications.

Information on the area of forest cover was generated through the data provided by NAMRIA and DENR. The area of closed, open and plantation forests for 2010 and 2015 served as bases for the closing stocks for their respective year of accounting. Entries on natural timber resources, available for wood supply, were estimated using the area of open forests. Area of closed forests fell under natural timber resources, not available for wood supply. Plantation forests were used as an entry for cultivated timber resources, available for wood supply.

Physical asset accounts, volume

Volume of timber was estimated by multiplying the area with an assumed harvestable volume per unit hectare. The factor used was 174.22 cubic meters for closed, open and plantation forests (FRA-Philippine Country Report, 2005). Seventy percent of the afforestation/reforestation efforts by government, non-government and private sectors were assumed to have been done on open forests and denuded areas which fall under natural timber resources, available for wood supply and 30 percent of the total efforts fell under plantation forests or cultivated timber resources. Areas affected by forest disturbances, data on confiscation of forest products and data on timber production also held the same assumption as to that of the physical asset accounts in terms of area.

Monetary asset accounts

The monetary account was computed by multiplying the volume of timber resources to the stumpage value of forest resources adopted from the NSCB ENRA CAR project in 2001. For constant prices, the volume was directly multiplied with the stumpage value. For current prices, the inflation rates (2012 as base year) for all items for each year were incorporated with the stumpage value before multiplying with the estimated volume. Natural timber resources, not available for wood supply were not included in the asset accounts for timber resources in monetary terms. The value of standing timber in protected forests in terms of income from the sale of timber resources was reduced to zero since it was assumed that these should not be touched for any commerce.

The framework provided information on the effect of the year-on-year change in price through the item *revaluation*. In the monetary accounts for timber resources, 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

Physical Asset Accounts, Area

In 2018, the region's forestlands with tree-covered area was estimates at 897,595.8 hectares or 49.1 percent of the region's total land area. The tree-covered areas consisted of 66.4 percent open forest, 27.7 percent closed forest, and 4.7 percent plantation forest.

The closing stock of timber resources in terms of area in CAR increased from 787,665.8 hectares in 1999 to 897,595.8 hectares 2018. This represented a 14.0 percent growth rate with an annual average increase of 0.7 percent or 5,785.8 hectares per year.

The area of open forest increased from 526,411.0 hectares in 1999 to 595,791.5 hectares in 2018. This represented a growth rate of 13.2 percent at an annual average increase of 0.7 percent or 3,652 hectares annual increment.

Cultivated timber resources showed the biggest increase in area with a rate of 371.3 percent from 11,234.9 hectares in 1999 to 52,951.0 hectares in 2018. This increase corresponded to an annual average growth of 9.0 percent equivalent to 2,195.6 hectares per year.

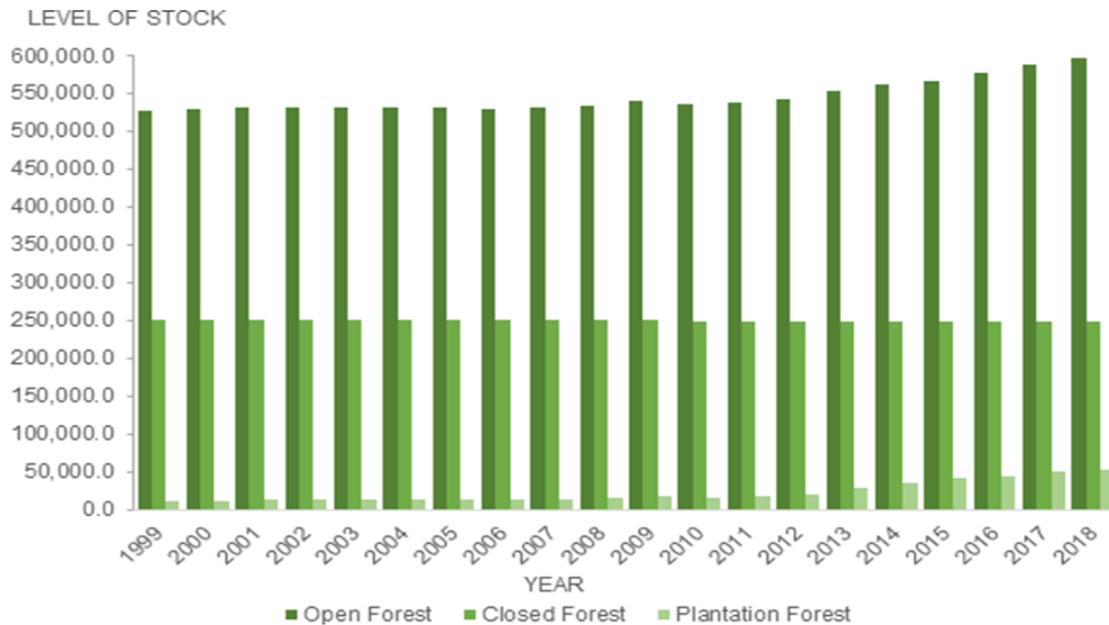
Closed forest, on the other hand, was seen to decrease. The area declined by an annual average of 0.02 percent or a yearly decrease of 61.4 hectares from 250,019.9 hectares in 1999 to 248,853.4 hectares in 2018.

Table 3. Closing Stock of Area of Timber Resources, CAR: 1999-2018 (in Hectares)

Year	Natural timber		Cultivated timber resources	Total tree-covered area
	Available for wood supply	Not available for wood supply		
1999	526,411.0	250,019.9	11,234.9	787,665.8
2000	528,684.0	250,010.8	12,209.0	790,903.9
2001	531,173.7	250,010.8	13,276.0	794,460.5
2002	530,936.2	249,897.7	13,174.2	794,008.1
2003	531,711.5	249,893.0	13,506.5	795,111.1
2004	531,653.9	249,880.5	13,481.8	795,016.2
2005	531,372.1	249,835.4	13,361.1	794,568.6
2006	529,892.4	249,736.6	12,726.9	792,355.9
2007	531,618.9	249,725.1	13,466.8	794,810.8
2008	534,483.8	249,721.1	14,694.7	798,899.6
2009	540,346.6	249,718.4	17,207.3	807,272.3
2010	536,075.6	249,419.1	15,376.8	800,871.5
2011	538,594.6	249,417.2	17,431.7	805,443.5
2012	542,127.8	249,415.3	20,313.9	811,857.1
2013	552,442.0	249,366.0	28,727.8	830,535.8
2014	560,984.2	249,259.2	35,696.1	845,939.5
2015	567,021.2	249,123.2	40,620.8	856,765.3
2016	576,232.4	248,971.4	44,568.5	869,772.2
2017	587,684.3	248,944.8	49,476.4	886,105.5
2018	595,791.5	248,853.4	52,951.0	897,595.8

Source: PSA RSSO-CAR

Figure 1. Closing Stock of Area of Timber Resources, CAR: 1999-2018 (in Hectares)



Source: PSA RSSO-CAR

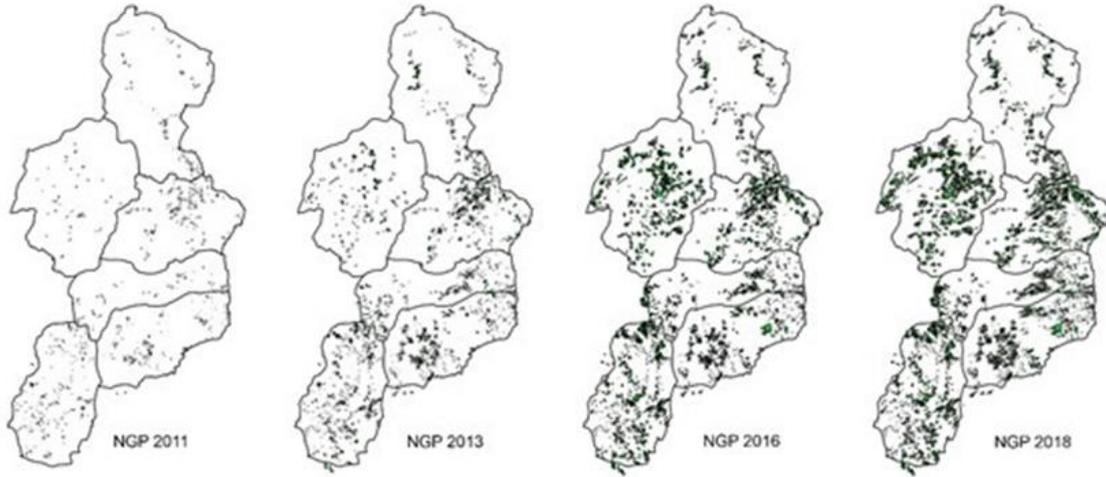
There was a minimum change in the area of closed forests since these areas were legally closed to any form of intensive human activities and occupation. The logging moratorium that was imposed through Executive Order No. 23, series of 2011 suspending timber harvesting in all-natural forests also had significant effect to the level of stocks of the region’s forest resources (Figure 1).

Figure 1 further illustrated that the estimated forest cover generally increased. The largest increase in stocks occurred in 2013 (19,528.7 hectares) while the smallest increase occurred in 2004 (401.0 hectares). There were also noted decrease in the area of forest cover. The biggest decreased occurred in 2010 with 8,527.8 hectares affected by forest disturbances.

The afforestation/reforestation activities of DENR and other government agencies and private sector significantly increased the forest cover of the region. Annual average area reforested by various sectors from 1999 to 2010 was about 3,008.2 hectares, with largest area reforested recorded in 2009 with 8,570 hectares and smallest area reforested in 2004 with 401 hectares.

Figure 2 shows the progress and status of afforestation/reforestation activities through the implementation of the National Greening Program via Executive Order No. 11, series of 2011. From 2011 to 2018, a total of 109,566.9 hectares were afforested/reforested. Annual average area afforested/reforested between these periods was 13,695.9 hectares.

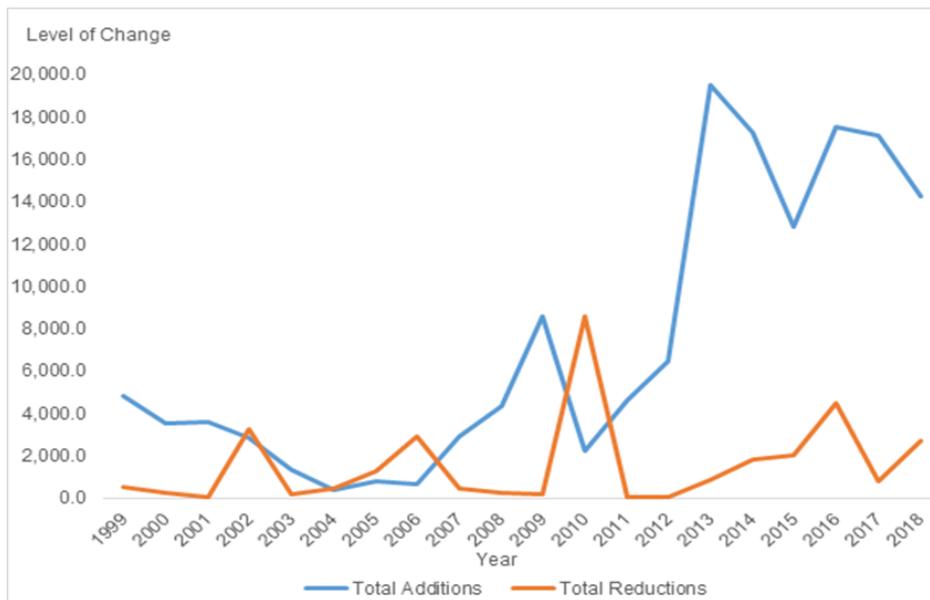
Figure 2. Area Afforested/Reforested Via National Greening Program, CAR: 2011, 2013 and 2016



Source: DENR-CAR, National Greening Program: 2011-2018

The reductions (Figure 3), peaked in 2010. This was due to forest disturbances affecting 8,527.8 hectares mainly because of forest fires that ravaged 96.4 percent or 8,216.6 hectares of forestlands. The total forest disturbances from 1999 to 2018 was estimated at 30,433.6 hectares. Adding the total accumulated removals of 961.8 hectares, the total reductions in the area of forest cover aggregated to 31,395.4 hectares.

Figure 3. Area Afforested/Reforested Versus Area Affected by Forest Disturbance, CAR: 1999-2018 (in Hectares)



Source: PSA RSSO-CAR

Physical Asset Accounts, Volume

**Table 4. Closing Stock of Volume of Timber Resources, CAR: 1999-2018
(in thousand cubic meters)**

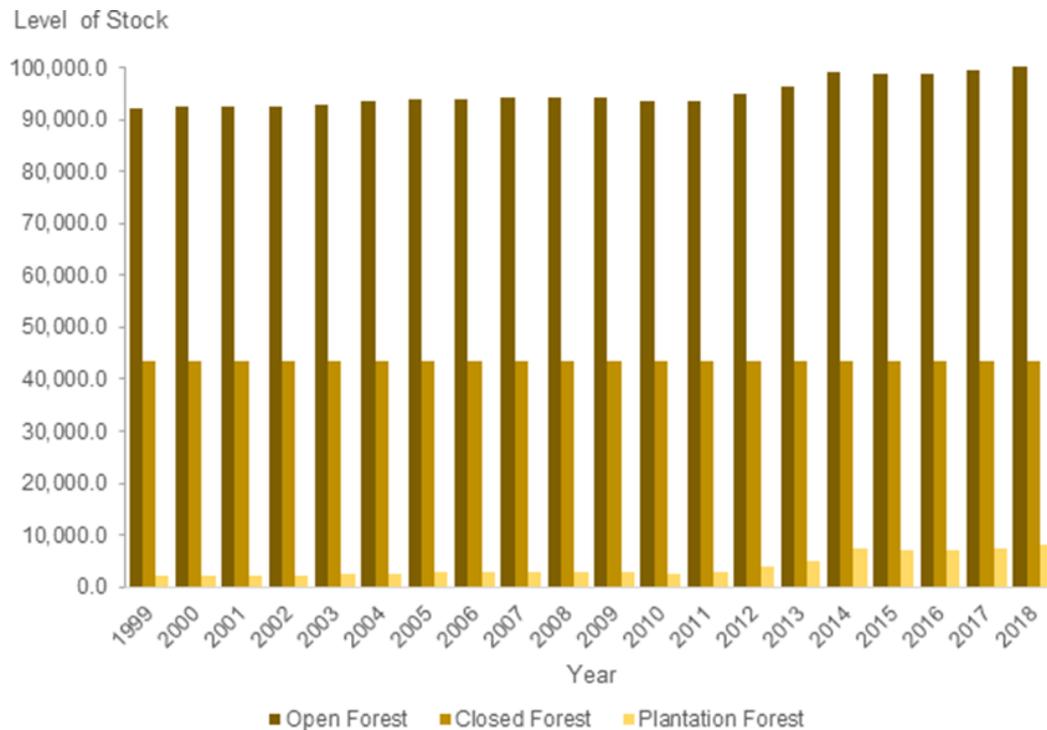
Year	Natural timber		Cultivated timber resources	Total tree-covered area
	Available for wood supply	Not available for wood supply		
1999	92,233.7	43,558.5	2,181.2	137,973.4
2000	92,322.7	43,556.9	2,219.3	138,098.9
2001	92,471.5	43,556.9	2,283.1	138,311.5
2002	92,412.1	43,537.2	2,257.7	138,207.0
2003	92,950.8	43,536.4	2,488.5	138,975.7
2004	93,482.8	43,534.2	2,716.5	139,733.5
2005	93,760.1	43,526.3	2,835.4	140,121.8
2006	93,856.5	43,509.1	2,876.7	140,242.3
2007	94,151.1	43,507.1	3,003.0	140,661.2
2008	94,282.3	43,506.4	3,059.2	140,847.9
2009	94,307.0	43,505.9	3,069.8	140,882.7
2010	93,395.1	43,453.8	2,679.0	139,527.8
2011	93,689.8	43,453.5	2,919.4	140,062.6
2012	95,012.8	43,453.1	3,998.6	142,464.4
2013	96,442.8	43,444.1	5,165.2	145,052.1
2014	99,156.7	43,424.5	7,379.0	149,960.1
2015	98,786.4	43,402.2	7,077.0	149,265.6
2016	98,814.5	43,375.8	7,089.0	149,279.2
2017	99,507.0	43,371.2	7,385.8	150,263.9
2018	101,566.4	43,355.2	8,268.4	153,190.0

Source: PSA RSSO-CAR

Volume of stocks in closed forest declined by an annual average growth of 0.02 percent or an annual decrease of 1,069.6 cubic meters from 43.6 million cubic meters in 1999 to 43.4 million cubic meters in 2018. Open forest gradually increased from 92.2 million cubic meters in 1999 to 101.6 million cubic meters in 2018. This was an annual average growth of 0.5 percent or an average addition of 491.2 thousand cubic meters annually. The volume of standing timber in plantation forest also increased. It grew by an annual average of 8.0 percent or annual increase of 320.4 thousand cubic meters from 2.2 million cubic meters in 1999 to 8.3 million cubic meters in 2018.

Volume changes were positive throughout the years except for 2002, 2010, and 2015. The largest additions to stock was recorded in 2014 (7.2 million cubic meters) while a decrease of 1.4 million cubic meters was observed in 2010 (Figure 4).

Figure 4. Closing Volume of Timber Resources in Open, Closed and Plantation Forest, CAR: 1999-2018 (in '000 of Cubic Meters Over Bark)



Source: PSA RSSO-CAR

Monetary Asset Accounts

The value of standing timber increased from ₱158.4 billion in 1999 to ₱180.3 billion in 2018 with an annual average growth of 0.7 percent or ₱1.1 billion yearly increment (Table 5). The positive growth of the value of timber stocks was largely due to the increase of the volume of timber.

Cultivated timber resources grew by 8.0 percent from ₱2.1 billion in 1999 to ₱8.1 billion in 2018 or an average yearly increase of ₱314.7 million. For natural timber resources, available for wood supply, the monetary value increased from ₱156.3 billion in 1999 to ₱172.1 billion in 2018 at an annual average rate of 0.5 percent or ₱832.4 million average annual addition.

Table 5. Summary of Monetary Asset Account for Timber Resources, at Constant Prices, CAR: 1999-2018 (in thousand Pesos)

Year	Cultivated timber	Natural timber resources (available for wood supply)	Total
1999	2,142,571.6	156,312,985.8	158,455,557.4
2000	2,180,025.0	156,463,763.8	158,643,788.8
2001	2,242,661.1	156,715,920.9	158,958,582.0
2002	2,217,673.7	156,615,328.0	158,833,001.8
2003	2,444,434.3	157,528,208.5	159,972,642.8
2004	2,668,408.1	158,429,870.0	161,098,278.1
2005	2,785,153.2	158,899,856.2	161,685,009.4
2006	2,825,737.5	159,063,238.3	161,888,975.7
2007	2,949,762.4	159,562,530.9	162,512,293.3
2008	3,004,975.2	159,784,803.9	162,789,779.1
2009	3,015,371.9	159,826,658.3	162,842,030.2
2010	2,631,483.4	158,281,220.5	160,912,703.8
2011	2,867,645.3	158,780,703.9	161,648,349.2
2012	3,927,718.3	161,022,762.2	164,950,480.6
2013	5,073,649.5	163,446,410.9	168,520,060.4
2014	7,248,238.7	168,045,675.2	175,293,913.9
2015	6,951,567.5	167,418,214.5	174,369,782.0
2016	6,963,362.6	167,465,698.5	174,429,061.2
2017	7,254,888.4	168,639,307.3	175,894,195.7
2018	8,121,861.4	172,129,520.5	180,251,382.0

Source: PSA RSSO-CAR

At current prices, the total monetary value of standing timber grew from ₱204.4 billion in 1999 to ₱483.8 billion in 2018. This was an annual average of 4.7 percent increase or an annual average increase of ₱14.7 billion. Cultivated timber resources posted an annual average growth of 12.3 percent or an average yearly increase of ₱1.2 billion during the accounting period.

Natural timber resources, available for wood supply, were valued at about ₱201.0 billion in 1999 and ₱456.8 billion in 2018. This represented an annual growth of 4.4 percent or ₱13.5 billion yearly increment for the span of 20 years.

Table 6. Summary of Monetary Asset Account for Timber Resources, at Current Prices, CAR: 1999-2015 (in thousand Pesos)

Year	Cultivated timber resources	Natural timber resources (available for wood supply)	Total
1999	3,440,678.3	200,968,452.2	204,409,130.5
2000	3,702,755.1	212,765,586.0	216,468,341.1
2001	3,947,353.5	220,840,939.9	224,788,293.4
2002	3,943,715.5	222,980,194.7	226,923,910.2
2003	4,584,280.0	236,523,993.9	241,108,273.9
2004	5,332,723.1	253,488,322.9	258,821,046.1
2005	5,897,432.0	269,377,589.5	275,275,021.6
2006	6,295,990.1	283,743,644.5	290,039,634.5
2007	6,788,613.4	294,001,174.4	300,789,787.8
2008	7,393,720.7	314,761,584.5	322,155,305.2
2009	7,692,452.9	326,435,425.0	334,127,877.9
2010	7,024,770.3	338,286,754.5	345,311,524.8
2011	7,899,539.0	350,185,484.8	358,085,023.8
2012	11,220,065.9	368,270,088.8	379,490,154.6
2013	14,913,889.1	384,653,720.4	399,567,609.5
2014	22,136,985.6	410,901,225.4	433,038,211.0
2015	21,443,225.6	413,460,643.4	434,903,869.0
2016	21,844,762.8	420,608,735.8	442,453,498.6
2017	23,168,975.7	431,180,399.6	454,349,375.4
2018	26,923,345.7	456,828,209.1	483,751,554.8

Source: PSA RSSO-CAR

Protected areas covered 68.5 percent or 170,720 hectares of the total area of closed forest in 2015. These areas can also be a source of timber. However, these cannot be harvested because of their role in the conservation of biodiversity of the region and it follows that they are excluded in monetary valuation and thus reduced to zero. But to emphasize their significance and impact to the total forest cover of the region, and see the value in economic terms, the Table 7 was prepared for the valuation of timber in protected areas.

Table 7. Physical and Monetary Valuation of Timber in Protected Areas, CAR: 2018

Protected Area	Area (in ha)	Volume (in thousands of m3)	Valuation at constant price (in '000 peso)	Valuation at current price (in '000 peso)
CAR	170,720.2	29,742.9	119,326,202.6	237,919,954.3
Abra	1,701.2	296.4	126,852.7	636,098.1
Apayao	-	-	-	-
Benguet	142,802.2	24,879.0	100,710,153.8	200,478,389.1
Ifugao	1,355.2	236.1	955,772.9	1,902,606.7
Kalinga	23,307.8	4,060.7	16,437,617.3	32,721,497.4
Mt. Province	1,553.8	270.7	1,095,805.9	2,181,363.0

Source: PSA RSSO-CAR

Protected areas in Abra are classified as broadleaved while the rest were classified as coniferous. They were valued according to category using their respective stumpage value. As shown in Table 7, protected areas in CAR was valued at PHP119.3 billion and PHP237.9 billion at constant and current price respectively.

RECOMMENDATIONS

Based on the results of this study as well as the limitations mentioned, the following are therefore recommended to improve the timber resource accounting of the region:

- a. Standardization of local terms and definitions in accordance to international standards should be done to ensure comparability. The standardization not only ensures comparability of statistics produced by different government agencies, it also guarantees that terms and statistics are at par with other countries.
- b. The region's current pool of data on forest resources can still be improved and developed for better timber resource accounting. Data on the following should be continuously updated, and where appropriate and possible, incorporated in the reports regularly submitted by the DENR's field offices:
 - i. Actual areas effectively afforested/reforested by both private and government organizations and the corresponding changes in standing volume through the years. These also include the species of trees planted and to what type of forest they are rendered;
 - ii. Impact of agriculture, illegal logging, cutting by indigenous peoples for domestic consumption, forest fires, pests and diseases, and natural disasters on forest volume and area, also including the effect of natural growth, natural losses, reclassifications and felling residues;
 - iii. Updated stumpage value and/or prevailing market price of timber by tree species, and if possible, by province (also to include production cost by area); and
 - iv. Timber confiscations (including type of timber, source).
- c. Forest resource-related studies should be conducted, such as, but not limited to:
 - i. Determination of the true value of forest resources, which reflects full economic, environmental, and social benefits;
 - ii. Inventory of existing forest resources (flora and fauna, ground and surface water, trees) and the changes in demand for such resources; and
 - iii. Carbon absorption or absorptive capacity of the forestlands of the region.
- d. PSA-CAR to link the timber resources accounts to the estimation of the forestry sub-industry of the Agriculture, Hunting, Forestry and Fishing (AHFF) of the Gross Regional Domestic Product (GRDP) of the Cordillera region.

REFERENCES

- Department of Environment and Natural Resources. (2013). State of the Forest: Cordillera Administrative Region. Baguio City, Philippines
- Fischlin, A., G.F. Midgley, J.T. Price, R. Leemans, B. Gopal, C. Turley, M.D.A. Rounsevell, O.P. Dube, J. Tarazona, A.A. Velichko. (2007). Ecosystems, their properties, goods, and services. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth

- Assessment Report of the Intergovernmental Panel on Climate Change. Document available at https://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch4s4-1-2.html.
- Food and Agriculture Organization. (February 2001). Global Forest Resources Assessment 2000 Main Report. FAO Forestry Paper No. 140. Rome.
- Food and Agriculture Organization. (February 2005). Forest Resources Assessment – Philippine Country Report. Manila, Philippines.
- Food and Agriculture Organization of the United Nations. (2015). Philippines - Global Forest Resources Assessment 2015 – Country Report. Document available at <http://www.fao.org/documents/card/en/c/cc3fe2b4-bd4d-4752-9f7f-cc64dc615f90/>.
- Forest Management Bureau. (2014). 2014 Philippine Forestry Statistics. Document available at <http://forestry.denr.gov.ph/>
- National Statistical Coordination Board. (2001). Environmental and Natural Resource Accounting: The Cordillera Experience. Baguio City, Philippines.
- National Economic and Development Authority. (2010). Cordillera Regional Development Plan 2011-2016. Baguio City, Philippines.
- United Nations. (2014). System of Environmental-Economic Accounting 2012 – Central Framework. New York City, USA.
- Pulhin, Juan M., Ph.D. (2002). Trends in Forest Policy of the Philippines
- United Nations Development Programme. Sustainable Development Knowledge Platform. Website last updated on 22 September 2016. Available at <https://sustainabledevelopment.un.org/>.
- United Nations Forum on Forests. (2014). Technical Support Team (TST) Issues Brief: Forests. (For the Eight Session of the Open Working Group on Sustainable Development Goals for 3-7 February 2014). Document available at http://www.un.org/esa/forests/wpcontent/uploads/bsk-pdf-manager/10_FOREST_ISSUES_BRIEF_FINAL.PDF