



System of Environmental - Economic
Accounting 2012
Central Framework

Cordillera Administrative Region (CAR)

Asset Accounts for Mineral Resources: 2004-2016



REPUBLIC OF THE PHILIPPINES
PHILIPPINE STATISTICS AUTHORITY
REGIONAL STATISTICAL SERVICES OFFICE
CORDILLERA ADMINISTRATIVE REGION

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Cordillera Administrative Region (CAR) Asset Accounts for Mineral Resources : 2004 - 2016

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Foreword

The Philippine Statistics Authority (PSA) since 2015, embarked on the Philippine Economic-Environmental and Natural Resources Accounting (PEENRA) Project to develop environmental accounts highlighting on technical capability building and the compilation of the asset accounts. Environmental accounts aimed to serve as valuable tool for assessing and monitoring the trends in stock and use of natural resources, extent of environmental emissions and discharges resulting from economic activities, and the amount of economic activity carried out for environmental purposes.

In the Cordillera Administrative Region (CAR), PEENRA has piloted the development of accounts covering four resources, namely: a) forest resources; b) land and soil resources; c) water resources; and d) mineral resources, from 1990 to 1998. Under the initiative of the Regional Statistical Services Office of CAR to further develop the region's environmental accounts, the mineral resources were compiled based on the latest Central Framework of the United Nations System of Environmental-Economic Accounting (SEEA) for 2012.

In 2018, the asset accounts for mineral resources was developed with pilot estimates for 2004 to 2016. The release of this report is a significant accomplishment of the PSA in guiding policy-makers, project implementers and regional stakeholders to make evidence-based environmental decisions, develop environmental policies and programs, and integrate environmental concerns for the region. It is our desire that the environmental accounts will pave the way to institutionalize the region's environmental data and indicators to support the monitoring and implementation of the Sustainable Development Goals (SDG) in the region.

The PSA expresses its sincere gratitude to its partners in the mining industry particularly the Mines and Geosciences Bureau-CAR of the Department of Environment and Natural Resources (DENR), for providing us data on mining and mineral resources. It also wishes to acknowledge the members of the Environment and Natural Resources Accounting - CAR Steering Committee and project team for their utmost support and cooperation.


LISA GRACE S. BERSALES, Ph. D.

Undersecretary
National Statistician and Civil Registrar General
Philippine Statistics Authority

Message

The *Cordillera Administrative Region (CAR) Asset Accounts for Mineral Resources: 2004-2016* was developed and compiled by the Philippine Statistics Authority–CAR (PSA-CAR) under the Philippine Economic-Environmental and Natural Resource Accounting (PEENRA) project, a locally-funded effort to develop the different environmental accounts in pursuit of deriving indicators and describing the interactions between the environment and the economy. The accounts were compiled under the guidelines of the United Nations System of Environmental-Economic Accounting (SEEA) 2012 Central Framework.

The accounts are the third of its kind in the region. The other two, the *CAR Asset Accounts for Land* and the *CAR Asset Accounts for Timber Resources*, which were both released in 2017, account for the physical stocks and monetary value of the land and timber resources of the region from 1999 to 2015. PSA-CAR considers this effort as a milestone, being the pioneer region towards development of environmental accounts following the UN SEEA 2012 Central Framework.

We commend the PSA-CAR on their efforts in the development of the mineral asset accounts, including the region's stakeholders and partners on their participation as members of the Steering Committee. We hope that this effort will serve as a guide in policymaking and generating programs in the region for the betterment of the mining industry.



ROSALINDA P. BAUTISTA

(Director II)

OIC Deputy National Statistician

Sectoral Statistics Office

Philippine Statistics Authority


Message

The Philippine Statistics Authority is proud to present the *Cordillera Administrative Region (CAR) Asset Accounts for Mineral Resources: 2004-2016*, the third set of environmental accounts published by PSA-CAR.

This publication provides information relevant for evidence-based decision-making and mainstreaming environmental concerns by presenting the stocks and changes in stocks of mineral reserves. Presented here are the physical and monetary asset accounts for the region's gold and copper resources, which serve to monitor the activities involving these resources.

We congratulate PSA-CAR, especially the Statistical Operations and Coordination Division (SOCD), in releasing these accounts as part of their continuous effort in the development of environmental accounting through the Philippine Economic-Environmental and Natural Resources Accounting (PEENRA) project.

We would also like to express our sincerest gratitude to the Mines and Geosciences Bureau (MGB)–CAR, the Department of Environment and Natural Resources (DENR)–CAR, the Watershed and Water Resources Research Center (WWRRC)–CAR and the National Economic and Development Authority (NEDA)–CAR, for providing the technical assistance and the data support for the compilation of the asset accounts for mineral resources.


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The CAR ENRA Steering Committee examined and approved the processes and results of the project. The committee was co-chaired by Director Ralph C. Pablo of DENR and Director Milagros A. Rimando (NEDA), Director Fay W. Apil (MGB), Director Reynaldo S. Digamo (EMB), Dr. Carlos S. Arida (WWRRC), ARD Augusto D. Lagon (DENR) and Engr. Francis G. Basali (DENR) as members.

Jeannel I. Barcayan and Stephen Dale C. Estigoy compiled the estimates and drafted the publication manuscript and Winsky B. Salisa designed the cover/graphics and layout and led the typesetting process.

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VILLAFE P. ALIBUYOG
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 Regional Director, PSA-RSSO-CAR

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Acronyms

ASPBI	Annual Survey on Philippine Business and Industry
BSP	Bangko Sentral ng Pilipinas
CAR	Cordillera Administrative Region
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
DAO	Department Administrative Orders
DENR	Department of Environment and Natural Resources
DMPF	Declaration of Mining Project Feasibility
EMB	Environmental Management Bureau
ENRA	Environment and Natural Resource Accounting
ENRAD	Environment and Natural Resources Accounts Division
GIR	Gross International Reserves
GVA	Gross Value Added
IAR	Integrated Annual Report
MAS	Macroeconomic Accounts Service
MGB	Mines and Geosciences Bureau
MPFS	Mining Project Feasibility Study
MPSA	Mineral Production Sharing Agreement
MRI	Mineral Resource/Reserve Inventory
NEDA	National Economic and Development Authority
NIRC	National Internal Revenue Code
NPV	Net Present Value
OECD	Organisation for Economic Co-operation
PEENRA	Philippine Economic-Environmental and Natural Resources Accounting
PMD	Planning Management Division
PMRC	Philippine Mineral Resource Classification
PSA	Philippine Statistics Authority
RSSO	Regional Statistical Services Office
SDG	Sustainable Development Goals
SEEA	System of Environmental-Economic Accounting
SNA	System of National Accounts
SOCD	Statistical Operations and Coordination Division
UN	United Nations
UNFC	United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources
UNSC	United Nations Statistical Commission
WWRRC	Watershed and Water Resources Research Center



CAUTION
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HERE

Tunnel leading to the 908 MASL underground central communication room
at Philex Mining Corporation, Padcal site, Tuba, Benguet

Executive Summary

This study attempts to measure the metallic and non-metallic mineral reserves in the Cordillera Administrative Region (CAR), specifically gold, copper, silver, sand and gravel, quicklime, slake lime, and limestone. These minerals, in the meantime, have obtainable data from source agencies in the region. The study is based on the United Nations System of Environmental-Economic Accounting 2012 (SEEA) Central Framework.

Assets were handled into two accounts for metallic mineral reserves only for gold and copper - physical and monetary accounts. These accounts provide information on changes in stock resulting from any of the following events: discoveries and extractions; upward and downward reappraisals; catastrophic losses; reclassifications; and revaluations.

In line with the framework, three classes of gold and copper were derived: Class A – minerals that were being mined, Class B – minerals that can be mined in the future with researches and explorations done, and Class C – minerals that have a probability to be mined where studies were conducted and a high level of confidence that it can be mined. These classes were presented in ore form and in metal content.

For monetary account, Net Present Value (NPV) approach was applied in the valuation of the mineral resources focusing only on Class A reserves posted at 12 percent and 15 percent discount rates.

As for the silver and the other non-metallic minerals (sand and gravel, quicklime, slake lime and limestone), only their production data were compiled. Tables were prepared for quantity and value of production. The accounts cover a span of 13 years, from 2004 to 2016. The succeeding sections present these accounts.

Gold

From 2004 to 2014, Class C in ore form contributed the largest to the total stock. It accounted the highest in 2009 where it posted 84.2 percent or 18.7 million metric tons (MT) of gold reserves. Class A posted the highest in 2016 where it contributed 61.2 percent or 9.9 million MT to the total stock. The share of Class B posted the highest in 2015 wherein 47.1 percent or 5.2 million MT of gold reserves were declared.

The closing stocks of Class A gold ore reserve varied throughout the accounting period. However, it was noted that the level of ore increased from 3.6 million MT in 2004 to 9.9 million MT in 2016 with an annual average growth of 19.9 percent or 523.4 thousand MT mainly due to upward reappraisals. The highest level of ore reserve was seen in 2016 with a total of 9.9 million MT. On the other hand, the lowest recorded reserve was in 2009 with only 2.7 million MT of ore.

The gold reserve in metal content displayed a different scenario as compared to the ore form. Class A shared the highest to the total stock to as much as 86.7 percent in 2016 or equivalent to 1.3 million kg. On the average, Class A contributed 1.2 million kg of metal content annually to the gold reserves during the period covered. Class B posted the highest share in 2010 accounting to 26.0 percent. The metal content is highly dependent on the grade and milling recovery reported for a given year.

The mine life of gold reserve in the region in 2016 was estimated to last up to 14 years. The longest estimated mine life was determined in 2012 that can last up to 23 years while the lowest was in 2004 and 2009 with 6 years. It was also estimated that it would take 12 years, on the average for the gold reserve to be exhausted or totally depleted.

At 12 percent discount rate, gold reserve in metal content yielded the highest in 2011 at PHP45.1 billion. The value of stock increased from PHP4.8 billion in 2004 to PHP14.3 billion in 2016 by an annual average of 21.6 percent or PHP793.4 million yearly increment.

The valuation of gold reserve at 15 percent discount rate exhibited an overall upward trend with annual average growth of 19.9 percent or an increase of PHP662.7 million. The highest derived monetary estimate was recorded at PHP37.9 billion in 2011. The lowest registered value of gold in metal content was seen in 2004 at PHP4.4 billion.

Copper

Class C had the highest share in the volume of stock of copper ore in the region within the period covered. However, it is important to note that copper ore reserve for Class C and Class B remained the same from 2004 to 2016. Class A posted its highest share in 2010 where it contributed 32.7 percent of the copper reserves to the total stock. In 2005, Class A contributed the least at 22.5 percent to the total stock.

Class A copper ore reserve decreased by an annual average of 0.6 percent or 4.8 million MT from 64.5 million MT in 2004 to 59.7 million MT in 2016. There were four instances during the accounting period where the reported reserve was higher than the previous year. These increases in the reserve were recorded in 2006, 2009, 2010, and 2015. The mean of the closing stocks for the 13-year period was estimated at 67.5 million MT. The highest closing stock was reported in 2010 with 90.2 million MT and the lowest was in 2005 at 54.0 million MT.

The percentage share to the total stock in metal content was dominated by Class C copper. Class C shared as much as 71.2 percent or 54.8 million MT in 2005. Class B contributed the highest in 2005 and in 2016 with 15.6 percent of the total stock. In 2010, Class A yielded the highest at 20.9 percent or 18.2 million MT of the total volume. The least share for Class A copper was observed in 2005 with only 13.2 percent or an equivalent of 10.2 million MT in metal content.

The mine life of copper ore reserve was estimated to have an average of eight years before the reserve will be depleted. The estimated mine life ranges from six years, which was determined in 2005, 2008 and 2016, to as long as 11 years which was determined in 2010.

The trend of the monetary valuation of copper in metal content at 12 percent discount rate sloped upward. It grew by an annual average growth of 12.5 percent or an addition of Php325.3 million yearly during the 13-year period. The estimates range from Php1.1 billion generated in 2004 to Php25.2 billion registered in 2007.

The valuation at 15 percent exhibited the same trend with that of the 12 percent valuation. The highest derived monetary estimate was recorded at PHP22.6 billion in 2007. The lowest registered value of copper in metal content was seen in 2004 at PHP978.2 million. The ending stock in 2016 was valued at PHP4.6 billion.

Silver

The lowest quantity produced was recorded in 2012 at 3,680.3 kg while the highest quantity produced was recorded in 2004 at 7,185.0 kg. The average production of silver in the region was estimated at 5,552.1 kg. Production decreased by an annual average of 0.1 percent or 232.6 kg yearly decrement.

The output of silver in terms of monetary value does not reflect a direct relationship to that of the quantity produced. The second biggest production posted in 2004 was the lowest estimated value in monetary terms with PHP83.1 million. The highest valuation was recorded in 2011 at PHP246.0 million. The quantity of silver produced in 2016 was valued at PHP119.0 million.

Sand and Gravel

The output of sand and gravel increased from 152,773.0 cubic meters in 2004 to 770,275.5 cubic meters in 2016 represented by an annual average growth of 20.4 percent or 51,458.5 cubic meters yearly increment. The total produced quantity was recorded at 5.1 million cubic meters with an average production amounted to 393,716.4 cubic meters from 2004 to 2016. The lowest production was recorded in 2005 with a quantity of 115,930.9 cubic meters and the highest was in 2015 with 903,154.6 cubic meters.

The lowest value of the extracted minerals was in 2004 at PHP27.2 million and the highest was in 2016 that reached PHP163.6 million. The value of production sloped upward with annual average growth of 28.4 percent.

Quicklime

The lowest production of quicklime during the accounting period was recorded in 2005 at 6,229.8 MT and the highest was in 2014 at 9,770.3 MT. The quantity produced posted an average of 8,157.9 MT. In terms of monetary value, the lowest derived estimate was in 2010 at PHP5.0 million. Meanwhile, the highest estimated value was recorded in 2016 at PHP76.7 million.

Slake lime

The total output of slake lime from 2004 to 2016 amounted to 2,993.7 MT with an average yearly output of 230.3 MT. The highest production was recorded in 2016 at 461.1 MT. On the other hand, the lowest production and value of slake lime was recorded in 2013 at 33.1 MT which was valued at only PHP181.4 thousand.

Limestone

From 2004 to 2016 the total production of limestone was 146,209.8 MT with an annual average production of 11,246.9 MT for the span of 13 years. The lowest production of limestone was reported in 2007 at 532.7 MT while the highest was in 2013 at 20,476.3 MT. The lowest monetary value registered for limestone was in 2008 at PHP34.4 thousand while the highest was recorded in 2015 at PHP18.6 million.



Mine tailings facility of Philex Mining Corporation,
Padcal site, Tuba, Benguet on 9 March 2018

Introduction

CAR Mineral Profile

According to the mineral profile of the Philippines reported by the Mines and Geosciences Bureau (MGB), about nine million hectares or 30.0 percent of the total land area of the country were identified as having high mineral potential in 2016¹. For the Cordillera Administrative Region (CAR), there were 11 approved Mineral Production Sharing Agreement (MPSA) in 2016 covering a total land area of 15,542.9 hectares or 0.8 percent of the total land area of the region and 0.2 percent as compared to the total mineable land in the country².

Based on the result of the 2016 Annual Survey of Philippine Business and Industry (ASPBI), CAR employed 5,156 workers or 17.8 percent of the total employment for Mining and Quarrying which ranked third in the whole country. Davao region had the highest employment with 5,887 workers or 20.3 percent share and then Caraga with 5,804 workers or 20.0 percent share in the total employment of the sector. The region came fourth with the highest total expenses including compensation with a total expense of PHP13.8 billion or 15.1 percent of the total for the sector in the whole country³.

It was reported in the mining profile of the region in 2016 that the mining companies committed an amount of PHP558.0 million for the development of host neighboring communities through the approved Social Development and Management Program, and PHP15.0 million for the Community Development Program. For the implementation of projects under the Environmental Protection and Enhancement Program, and Final Mine Rehabilitation and/or Decommissioning Plan, the companies committed an amount equal to PHP552 million. Under the Mining Forest Program, there were eight million seedlings planted by the mining companies in more than three thousand hectares of mined-out and other areas⁴.

Mining and quarrying sector contributed 2.9 percent to the total Gross Regional Domestic Product of CAR at current prices in 2016. The gross value added (GVA) of mining and quarrying sector in CAR declined by an annual average growth of 2.3 percent from PHP9.4 billion in 2004 to PHP7.0 billion in 2016⁵.

Table 1 shows the output of production of mineral resources and their value in 2016

Table 1. Production and value of mineral resources of CAR: 2016

Minerals	Production	Value (in PHP)
Metallic		
Gold	4, 410.9 Kg	8.1 billion
Copper	73, 109.0 MT	3.8 billion
Silver	4, 394.4 Kg	112.0 million
Non-metallic		
Sand and Gravel	770, 275.5 m ³	175.0 million
Quicklime	9, 253.8 MT	78.0 million
Slake lime	3, 201.8 MT	198.0 thousand
Limestone	5, 008.2 MT	5.6 million

Source: Mines and Geosciences Bureau -CAR

¹DENR-MGB. (2017). *The Philippine Minerals Industry at a Glance*

²DENR-MGB-CAR. (2017). *Regional Mineral Profile*

³PSA. (2018). *2016 Annual Survey of Philippine Business and Industry (ASPBI) - Mining and Quarrying Sector with Total Employment of 20 and Over: Preliminary Results*

⁴DENR-MGB-CAR. (2017). *Mineral Industry in the Cordillera Administrative Region - CY 2016*

⁵PSA. (2018). *2017 Cordillera Economic Performance*

Objectives of the Study

The general objective of the study is to support the institutionalization of environmental-economic accounting by following the UN System of Environmental-Economic Accounting (SEEA) 2012 being its main Central Framework, particularly in mineral resources accounting. The study also aims to strengthen the data support on environmental accounting.

Specifically, the study intends to:

1. Come up with accounts of the mineral reserves of CAR in gold and copper;
2. Value the gold and copper reserves of CAR;
3. Report the quantity and value of production of silver and non-metallic minerals;
4. Establish a database on metallic and non-metallic minerals of CAR; and
5. Come up with possible recommendations for the improvement of the accounting and valuation of the mineral resources of CAR.

Framework of the Study

Scope and coverage

The asset accounting for mineral resources includes large-scale mining firms/companies located and operating in the region. Only gold and copper minerals are presented in physical and monetary terms. Other minerals like silver, sand and gravel, and lime are presented in terms of production since there are no sufficient data on these minerals for the System of Environmental-Economic Accounting (SEEA) 2012 – Central Framework to be applied.

The period of accounting covers 13 years from 2004 to 2016. It presents the physical stock of mineral reserve in ore and metal content. The metal content of gold and copper are then valued to derive the monetary asset accounts.

Conceptual Framework

The asset accounts for mineral resources in the region in physical and monetary terms employ the System of Environmental-Economic Accounting (SEEA) 2012 – Central Framework. The SEEA 2012 – Central Framework is an international statistical standard for environmental-economic accounting adopted by the United Nations Statistical Commission (UNSC). It is a multi-purpose conceptual framework for understanding the interactions between the economy and the environment, and for describing stocks and changes in stocks of environmental assets (UN 2014, vii).

The opening stock constitutes 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 these periods, several factors may occur resulting to changes in the stocks. These changes could either be due to discoveries, upward reappraisals and reclassifications for additions to stock or extractions, catastrophic losses, downward reappraisals and reclassifications for reductions in stock. The closing stock for a year is equal to the opening stock of the succeeding year.

The basic structure of asset accounts for mineral resources is presented in Table 1 based on SEEA 2012 – Central Framework. It provides information on the quantities of stock and changes over the period covered.

Table 2. Basic accounting structure of physical account for mineral resources

Opening stock of mineral resources 1/	
Additions to stock 1/	
Discoveries	Estimates of the quantity of new deposits found during an accounting period.
Upward reappraisals	An increase due to changes in the categorization of specific deposits between class A, B or C based on changes in geologic information, technology, resource price or a combination of these factors
Reclassifications	May occur if certain deposits are opened or closed to mining operations owing to government decisions concerning the access rights to a deposit.
Total additions to stock	Aggregated estimates of discoveries, upward reappraisals and reclassifications
Reductions in stock 1/	
Extractions	Quantity of the resource physically removed from the deposit
Catastrophic losses	Reflects losses due to catastrophic or exceptional events like flooding and collapsing of mines.
Downward reappraisals	A decrease due to changes in the categorization of specific deposits between class A, B or C based on changes in geologic information, technology, resource price or a combination of these factors.
Reclassifications	May occur if certain deposits are opened or closed to mining operations owing to government decisions concerning the access rights to a deposit.
Total reductions in stock	
Revaluations 2/	
Closing stock of mineral resources 1/	

Note: 1/ measured in terms of value in monetary asset accounts

2/ applicable only in monetary asset accounts

Classification of mineral resources

The framework used to define the scope of known deposits is the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) (United Nations, Economic Commission for Europe, 2010). The UNFC-2009 is a generic, flexible scheme for classifying and evaluating quantities of fossil energy and mineral resources (UN 2014, 161).

The UNFC-2009 categorizes mineral and energy resources through determining whether, and to what extent, projects for the extraction and exploration of the resources have been confirmed, developed or planned. The underlying resources are classified based on the maturity of the projects. The UNFC-2009 is based on a breakdown of the resources according to three criteria affecting their extraction:

- Economic and social viability (E)
- Field Project status and feasibility (F)
- Geological knowledge (G)

Criterion E designates the degree of favorability of economic social conditions in establishing the commercial viability of the project. Criterion F designates the maturity of studies and commitments necessary to implement mining plans or development of projects, extending from early exploration efforts occurring before it has been confirmed that a deposit or accumulation exists, to projects involving extraction and sale of a product. Criterion G designates the level of certainty of geologic knowledge and of potential recoverability of quantities of the resource concerned.

Known deposits are categorized in three classes, each defined according to combinations of criteria derived from UNFC-2009 (see appendix B):

- a. **Class A:** Commercially recoverable resources. This class includes deposits for projects that fall in categories E1 and F1 and where the level of confidence in the geologic knowledge is high (G1), moderate (G2) or low (G3);
- b. **Class B:** Potentially commercially recoverable resources. This class includes deposits for those projects that fall in the category E2 (or eventually E1) and at the same time in F2.1 or F2.2 and where the level of confidence in the geologic knowledge is high (G1), moderate (G2) or low (G3);
- c. **Class C:** Non-commercial and other known deposits. These are resources for those projects that fall into category E3 and for which the feasibility is categorized as F2.2, F2.3 or F4 and where the level of confidence in the geologic knowledge is high (G1), moderate (G2) or low (G3).

Operational Framework

Data and data sources

The data utilized in the estimation of the physical and monetary asset accounts for mineral resources are based on the accomplished administrative forms submitted by the mining firms to MGB-CAR. The MGB is mandated to take charge in the administration and disposition of mineral lands and resources; promulgation of rules and regulations, policies, and programs relating to mineral resources management and geosciences development; and performing such other duties and functions as may be assigned by the DENR Secretary and/or provided by law.

Only active mining companies are considered in this study for the period 2004 to 2016 which fall under Class A. Other mining companies with declared mineral resource/reserve are

further studied for the inclusion in either Class B or Class C. Active mining companies with exploration activities are classified accordingly.

Understanding the stages of mining operation and compliance to legal requirements are two major factors considered in the review of data and its sources. Based on the availability of information relevant to the accounting, the historical data with complete entries are found on reports for year 2004 onwards. Data on mineral reserve, extraction and production of minerals for each company are culled which then serve as primary entries in the accounting matrices, including information on how the mining companies in the region operate as a whole.

Data and Data Sources: Physical accounts

1. *The Declaration of Mining Project Feasibility (DMPF)*. The DMPF is a regulatory requirement for application by mining companies, which is submitted to the MGB prior to the start of a mining operation. This includes the plans of a mining firm to undertake the operation requiring approval from the government. The DMPF and the attached documents are as follows:
 - Exploration Report — includes the profile of the mining company, including the following: name of company, address, primary and secondary commodity produced. Basic information that can be generated in this report consists of: (a) ore resource and reserve data; (b) mineral grade and recovery rate; (c) unit of measurement; (d) projected mine life including technology used; (e) date of the approval of mining contracts and explorations; (f) date of submission and approval of DMPF; (g) date of company letter informing MGB of the commencement of operations; and, (h) MGB's subsequent date of reply on approval or disapproval of the mining operation.
 - Mining Project Feasibility Study (MPFS) — this document submitted by mining companies to MGB serves as accompanying information to the Exploration Report. For the purpose of this study, the MPFS is used to validate the data coming from the said report. The validation is done to compare the data from the Exploration Report and to ensure that these two sets of documents are consistent.
2. *Annual Mineral Resource/Reserve Inventory (AMRI) Report*. This is one of the MGB forms and is a monitoring form based on Department Administrative Order (DAO) 1996-40, Section 270 of Chapter XXIX – Reporting Requirements and Fines. The relevant information that is available covers: (a) annual data on the remaining reserves; (b) extraction or production; (c) data related to reappraisals (i.e., changes in mineral grade and recovery rates); (d) classification of reserves; (e) status of mining operations; and (f) date of submission to MGB by the mining companies.
3. *MGB Forms 29-01 and 29-02*. These contain information on Monthly Report on Production, Sales, Inventory of Metallic Minerals for Gold (29-01) and Copper (29-02). Like the AMRI, MGB Forms 29-01 and 29-02 are documents submitted in compliance to Department Administrative Order (DAO) 1996-40, Section 270 of Chapter XXIX. Data on monthly milling recovery are generated from this report
4. *Administrative Orders (AO)*. AOs contain information including suspension orders and

orders and the lifting of said orders. Such information should establish the status of the mining operations and facilitate the proper classification of the reserve based on the criteria set under the UNFC-2009 Classification System.

Data and Data Sources: Monetary accounts

Integrated Annual Report (IAR) of Mining Companies. The IAR, consolidated by the MGB, provides disaggregated data on revenue income and other secondary income, detailed cost estimates of mining companies, etc. The IAR provides parameters to come up with other breakdowns of cost estimates that are not explicitly available from the data provided in the national accounts, input-output accounts, and establishment surveys. These data include other cost estimates like interest paid on loans including other payments by mining companies, e.g., environmental fees, fiduciary costs, insurance fees, etc.

Data limitations

The Mineral Resource/Reserve Inventory (MRI) Report is the primary source of data on mineral reserves. Given the availability of the hard copy of the reports for verification purposes, the coverage of the study is limited for years 2004 to 2016.

As to the completeness of entries, there are missing data in the IAR, MRI and MGB Forms 29-01 and 29-02. Some of these data are statistically imputed to complete the series. Other omitted data are verified using other generated reports of the bureau.

The minerals presented in these report in complete accounting are focused only on metallic minerals, specifically, gold and copper. Data on non-metallic minerals are not sufficient enough to apply the SEEA 2012 – Central Framework. However, data on production of lime and sand and gravel are compiled. These are then presented thru tables with information on quantity and value.

The classification of ore is based on the declared primary commodity of the mining company.

Estimation methodology

Physical accounts

The compilation of physical asset accounts denote the changes in the opening and closing stocks of mineral resources in the region. Stocks increase due to discoveries, upward reappraisals and/or reclassifications. The decrease in stock of resources are attributed to extraction, catastrophic losses, downward reappraisals and/or reclassifications.

Data on discoveries are not explicitly seen on the Mineral Resources/Reserve Inventory Report submitted by the mining firms to the MGB – CAR. Also, data on reclassifications are not readily available. However, there are indicators that reflect the increase and decrease of the reserves. Reappraisals are used as balancing item. All derived additions to stock of mineral resources are assumed to be upward reappraisals.

Extractions contribute most to the reductions in stock, while other reductions are assumed to be downward reappraisals. Therefore, stocks increase due to the assumed upward reappraisals, while decreases in the stocks are mainly due to extractions. Other factors are due to downward reappraisals.

Similarly, there are no data available that corresponds to reclassification. Although it is found that no mining company/ies is/are closed or opened owing to government decisions concerning the access rights to a deposit during the accounting period.

The presented ore form in this study is based on the classification system by the Philippine Mineral Resource/Reserve Classification (PMRC). The PMRC is bridged with the UNFC classification system recommended by the SEEA 2012 central framework to align the two classifications and to facilitate comparison. Positive mineral reserve is classified as Class A, probable mineral reserve is classified as Class B and possible mineral reserve is classified as Class C.

The mineral accounts for gold and copper reserves are estimated in ore and metal content. The unit of measurement used in ore form is metric ton (MT) both for gold and copper. In metal content, gold reserve is measured in terms of kg while copper is measured in MT.

The following are the general procedures in the estimation.

Ore form

1. Since the reference period of the MRI report of the mining firms is at the end of the year, the reported reserve in ore form for a given year is equal to the closing stock for that same year.
2. Extraction is one of the contributors to the reduction in stocks of mineral resources. It is the only change in the stock that is explicitly reported.
3. To balance the stock of mineral resources, any observed additions to the stock are assumed as upward reappraisals while observed reductions in the stock are assumed as downward reappraisals.
4. Closing stock for a year will be the opening stock for the succeeding year.

Metal content

1. To arrive at the physical asset account in metal content, ore reserve for a given year is multiplied with the grade and finally multiplied with milling recovery for the same year.

Mill recovery, as defined by MGB, refers to the amount of valuable materials (metal/mineral product) obtained in an ore processing operation as compared to the amount of waste material and is usually expressed as a percentage of the total amount of ore processed. On the other hand, **Grade** refers to the amount of valuable mineral in each ton of ore, expressed as troy ounces per ton for precious metals and as percentage for other metals.

The formula is as follows:

$$MC = Ore * Grade * MR$$

Where:

MC = metal content

MR = mill recovery

2. Entries for extraction and reappraisals (upward and downward) are also multiplied with the two factors to get the metal content.

Monetary accounts

The monetary account is estimated using the Net Present Value (NPV) approach. As defined in the SEEA 2012 – Central Framework, NPV is the value of an asset determined by estimating the stream of income expected to be earned in the future, and discounting the future income back to the present accounting period. The NPV approach requires to determine parameters such as *Resource Rent*, which is the surplus value taken to be the return to the asset itself; *resource or asset life*, which refers to the expected time over which an asset can be used in production or the expected time over which extraction from a natural resource can take place; and *discount rate* to convert the expected stream of resource rents into a current-period estimate of the overall value.

In the valuation of mineral reserves, only the reserve identified as class A, in metal content is valued for its economic purpose. Companies with no report on gross output are imputed from the consolidated annual production output/value for the region

Estimation of resource rent

The first assumption in the estimation of resource rent (RR) in this study is that, although mining firms declared themselves as gold or copper mining companies, their output cannot be separated for specific commodity (i.e. Company A is a copper mining company but also has gold and silver by-product). In this case, based on the gross output or annual production value, the percentage contribution of each commodity is computed and multiplied for each item of expenditure to arrive at a share of expense to which the commodity is produced. Therefore, each variable in the computation of resource rent is by commodity.

The first step in the derivation of resource rent is the computation of gross operating surplus given in the following form:

$$GOS = GO - OC$$

Where:

GOS = gross operating surplus

GO = gross output

OC = operating costs

Operating costs include intermediate consumption or the input costs of goods and services at purchasers' prices, including taxes on products; compensation of employees or the input costs of labor; and other taxes on production and other subsidies on production. These

variables are generated from the IAR of each company which serve as the main data source in the valuation of the mineral accounts.

Before proceeding to the next step, specific subsidies on extraction are deducted and specific taxes on extraction are added from the resulting GOS, if available. Mining companies in CAR do not receive subsidy from the government and specific taxes on extraction are not specifically reported in the IAR. Following the framework, the next procedure is to estimate the RR. The formula is expressed in the following form:

$$RR = GOS - (CFC + IE)$$

Where:

RR = resource rent
GOS = gross operating surplus
CFC = consumption of fixed capital
IE = interest expense

The sum of Consumption of Fixed Capital (CFC) and Interest Expense (IE) is the user costs of produced assets. CFC or depreciation, as defined in the 2009 Organisation for Economic Co-operation and Development (OECD) Manual, is the decline in the current value of the stock of fixed assets during the course of the accounting period, owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage. Interest expense on the other hand is the value of return to produced assets. These two variables are also included in the IAR of mining companies

Estimation of resource value

After coming up with the RR, other factors are also estimated to generate the resource value. As discussed, there is a need to identify a discount rate to discount the future income back to the present accounting period. The discount rate can be interpreted as an expected rate of return on the non-produced assets as defined in the SEEA 2012 – Central Framework. The discount rates used in this study are 12 percent and 15 percent to allow comparison with other studies and/or projects.

Also, one parameter that needs to be estimated is the mine life. Mine life is derived by dividing the closing stock for a given year by the average extraction for the period covered. The calculation is presented in the following formula:

$$Mine\ Life_t = \frac{Closing\ stock_t}{Average\ extraction}$$

Resource value is then computed using the following formula:

$$RV_t = \sum_{t=1}^N \frac{RR_t}{(1+r)^t}$$

Where:

RV = resource value

t = year

RR = resource rent

r = discount rate

The computed resource value in a given period is the total valuation of the reserve within the accounting period. Indirectly, it is also computed by multiplying a Unit Resource Value (URV) by the total reserve. The URV for given year is computed by dividing the derived total value of the resource by the total volume of that same year.

$$URV = \frac{RV}{\text{Closing Stock}_{(\text{in metal content})}}$$

Where:

URV = unit resource value

RV = resource value

The derived URV is multiplied to the changes (additions and reductions) in stock to estimate the monetary asset accounts of mineral resources for each commodity.

$$Val = URV * \text{Changes}$$

Where:

Val = valuation of changes

URV = unit resource value

Changes = additions and reductions in stock

Revaluation is computed as a residual (balancing item of the accounting procedure). It is the result of the price changes.

$$Rev = CS - (OS - Net)$$

Where: Rev = Revaluation

CS = Closing stock

OS = Opening stock

Net = Net changes



Underground central communication room at 908 MASL at Philex Mining Corporation, Padcal site, Tuba, Benguet.



Results and Discussion

Physical Asset Accounts for Gold

The closing stocks of Class A gold ore reserve varied throughout the accounting period. However, it was noted that the level of ore increased from 3.6 million MT in 2004 to 9.9 million MT in 2016 with an annual average growth of 19.9 percent or 523.4 thousand MT mainly due to upward reappraisals. The highest level of ore reserve was seen in 2016 with a total of 9.9 million MT. On the other hand, the lowest recorded reserve was in 2009 with only 2.7 million MT of ore.

The level of extraction declined by annual average of 1.3 percent or 20.2 thousand MT of ore yearly within the 13 year accounting period as shown in Table 3. It reached to a maximum of 745,309 MT that happened in 2013. The lowest recorded extraction of gold ore was in 2016 accounting to only 295,464 MT. Adding up all the extracted ore from 2004 to 2016 gave a total of 6.2 million MT.

Table 3. Closing Stock of Class A Gold Reserve, Extraction and Mine Life, CAR: 2004-2016

Year	Extraction in Ore Form (in '000 MT)	Closing Stock in Ore Form (in '000 MT)	Extraction in Metal Content (in '000 kg)	Closing Stock in Metal Content (in '000 kg)	Mine Life (in years)
2004	537.4	3,647.0	91.1	618.6	6
2005	459.6	4,088.0	86.1	765.8	8
2006	571.2	5,170.5	120.7	1,092.9	11
2007	586.2	5,049.4	122.8	1,058.2	11
2008	474.1	5,193.7	103.1	1,133.1	12
2009	389.3	2,684.2	81.8	564.8	6
2010	337.0	3,030.7	72.3	651.4	7
2011	529.2	9,128.1	106.9	1,848.4	19
2012	568.7	8,559.3	137.3	2,205.6	23
2013	745.3	8,344.4	186.6	2,092.4	21
2014	381.4	7,714.1	58.9	1,194.4	12
2015	349.8	5,558.1	60.3	964.3	10
2016	295.5	9,928.1	39.8	1,331.5	14

Source: Philippine Statistics Authority – CAR

The highest level of gold metal content was estimated in 2012 with 2.2 million kg as shown in Table 3. Reserve in 2009 remained to be the lowest both in ore form and metal content. The level of stock increased with annual average growth of 17.5 percent or 59.4 thousand kg from 618,585.3 kg in 2004 to 1.3 million kg in 2016.

The total extraction from 2004 to 2016 was determined to have a total metal content of 1.3 million kg. The level of extraction declined by 4.3 thousand kg annually from 91,051.9 kg in 2004 to 39,755.8 kg in 2016. The highest observed extraction in 2013 was estimated to have a metal content equal to 186,574.0 kg. Still, the extraction in 2016 was the lowest with 39,755.8 kg of gold metal content.

From 2004 to 2016, the total 6.2 million MT of gold ore extracted yielded 1.3 million kg of extracted metal content. This represented an average ratio of 0.2 kg metal content for every ton of ore extracted.

The longest estimated mine life was determined in 2012 which can last up to 23 years while the lowest was in 2004 and 2009 with 6 years. It was also estimated that it would take 12 years on the average for the gold reserve to be exhausted or totally depleted during the accounting period (Table 3).

Monetary Asset Accounts for Gold

As shown in Table 4, the closing stock of gold reserve in metal content varies widely both at 12 percent and 15 percent discount rate. The monetary asset accounts for gold required factors that can be attributed to the fluctuation. One of which was the gross output generated for the year.

At 12 percent discount rate, gold reserve in metal content yielded the highest in 2011 with PHP45.1 billion. The value of stock increased from PHP4.8 billion in 2004 to PHP14.3 billion in 2016 by an annual average of 21.6 percent or PHP793.4 million yearly increment.

The valuation of gold reserve at 15 percent discount rate exhibited an overall upward trend with annual average growth of 19.9 percent or an increase of PHP662.7 million. The highest derived monetary estimate was recorded at PHP37.9 billion in 2011. The lowest registered value of gold in metal content was seen in 2004 with PHP4.4 billion.

Extraction in metal content was also valued using the Net Present Value approach.

Table 4. Monetary Valuation* of Closing Stock, Class A Gold Reserve, Extraction, CAR: 2004-2016

Year	Closing Stock in Metal Content			Extraction in Metal Content		
	Level (in '000 kg)	Valuation at 12% (in '000 PHP)	Valuation at 15% (in '000 PHP)	Level (in '000 kg)	Valuation at 12% (in '000 PHP)	Valuation at 15% (in '000 PHP)
2004	618.6	4,768,988.5	4,389,775.4	91.1	701,965.6	646,147.7
2005	765.8	6,467,534.5	5,842,192.3	86.1	727,071.2	656,771.1
2006	1,092.9	16,378,614.8	14,436,728.5	120.7	1,808,445.4	1,594,031.9
2007	1,058.2	21,267,506.0	18,745,981.5	122.8	2,467,854.3	2,175,259.8
2008	1,133.1	22,271,262.1	19,489,301.5	103.1	2,027,256.7	1,774,026.9
2009	564.8	13,436,292.0	12,367,885.4	81.8	1,946,741.9	1,791,943.9
2010	651.4	22,665,323.2	20,662,201.6	72.3	2,516,104.2	2,293,735.3
2011	1,848.4	45,091,460.3	37,944,035.1	106.9	2,608,976.7	2,195,429.1
2012	2,205.6	25,837,152.5	21,419,855.1	137.3	1,607,902.5	1,333,004.4
2013	2,092.4	25,391,499.4	21,195,822.5	186.6	2,264,107.8	1,889,988.0
2014	1,194.4	18,226,806.2	15,950,048.9	58.9	898,314.3	786,103.6
2015	964.3	19,401,517.6	17,233,253.9	60.3	1,212,462.2	1,076,960.5
2016	1,331.5	14,290,379.7	12,342,011.7	39.8	426,672.0	368,499.1

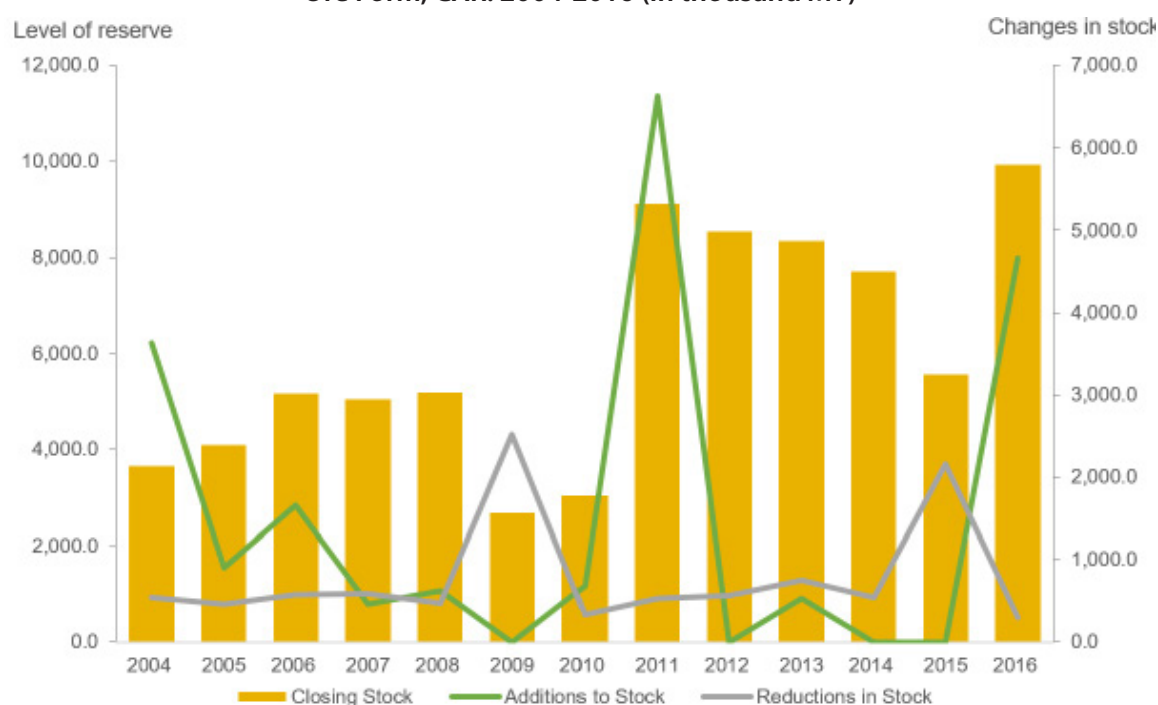
*At Net Present Value

Source: Philippine Statistics Authority – CAR

The total reductions in stock in ore reserves across the years amounted to 10.3 million MT. In 2009, a total of 2.5 million MT of gold ore was deducted from the stocks, where 84.5 percent or 2.1 million MT was considered as downward reappraisal. The remaining 15.5 percent constituted the level of extraction for the year. The lowest reduction in stock was reported in 2016, while the biggest decline was seen between 2008 and 2009 with 48.3 percent change in the closing stock.

For the additions to stock, the highest increase was posted at 6.6 million MT in 2011 contributed by the upward reappraisals. Aside from the low extraction in 2016, there was an increase equal to 4.7 million MT of gold ore reserve that related to the high level of closing stock at the end of the accounting period. Additions were at the minimum in 2007 at 465,166 MT. The sum of all additions to stocks accounted 19.8 million MT with an average of additional 1.5 million MT yearly during accounting period. There were no recorded additions for the years 2009, 2012, 2014 and 2015.

Figure 1. Closing Stock and Changes in Stock of Class A, Gold Reserve, Ore Form, CAR: 2004-2016 (in thousand MT)

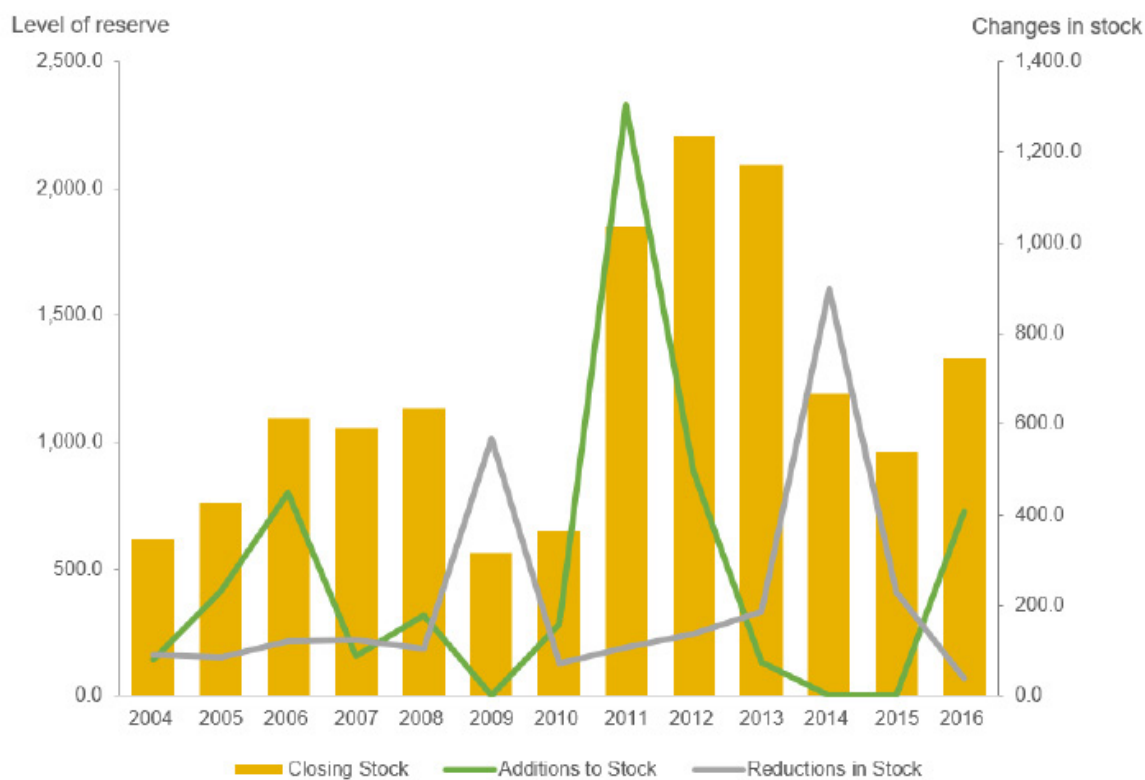


Source: Philippine Statistics Authority – CAR

The biggest addition to stock, in terms of metal content, was ascertained in 2011 with a total of 1.3 million kg. The largest increase in the reserve also occurred in the same year with almost thrice the reserve of the previous year due to the high grade and milling recovery. The sum of all additions to stocks amounted to 3.5 million kg. There were no recorded additions for years 2009, 2014 and 2015.

The largest decrease was recorded in 2014 with a total of 898,007.6 kg of metal content deducted from the stock. A large quantity of metal content equal to 568,324.8 kg was also deducted in 2009. The total reductions in stock in ore reserves from 2004 to 2016 amounted to 2.8 million kg.

Figure 2. Closing Stock and Changes in Stock of Class A, Gold Reserve, Metal Content, CAR: 2004-2016 (in thousand kg)



Source: Philippine Statistics Authority – CAR

As can be seen in Table 5, Class B and Class C gold ore reserves also varied from year to year. Class B exhibited an overall upward trend with highest level of reserve in 2010 equal to 9.8 million MT. The lowest of which was recorded in 2009 with 815,315.7 MT of ore. For the exploration activities that fall under Class C, the largest reserve was declared in year 2011 with 24.3 million MT of gold ore that remained until the closing stock of 2012.

Class B gold reserve in metal content also exhibited an overall upward trend. It posted the highest level of reserve in 2010 with 445,554.0 kg of metal content. The lowest of which was recorded in 2009 with 38,178.7 kg of metal content.

Class C, on the other hand, displayed a downward trend with 12.5 percent annual average decline from 2004 to 2016. The largest reserve in metal content was estimated in 2005 with 1.6 million kg. The stock of reserve decreased by 96.9 percent in 2015 from 451,191.2 kg in 2014.

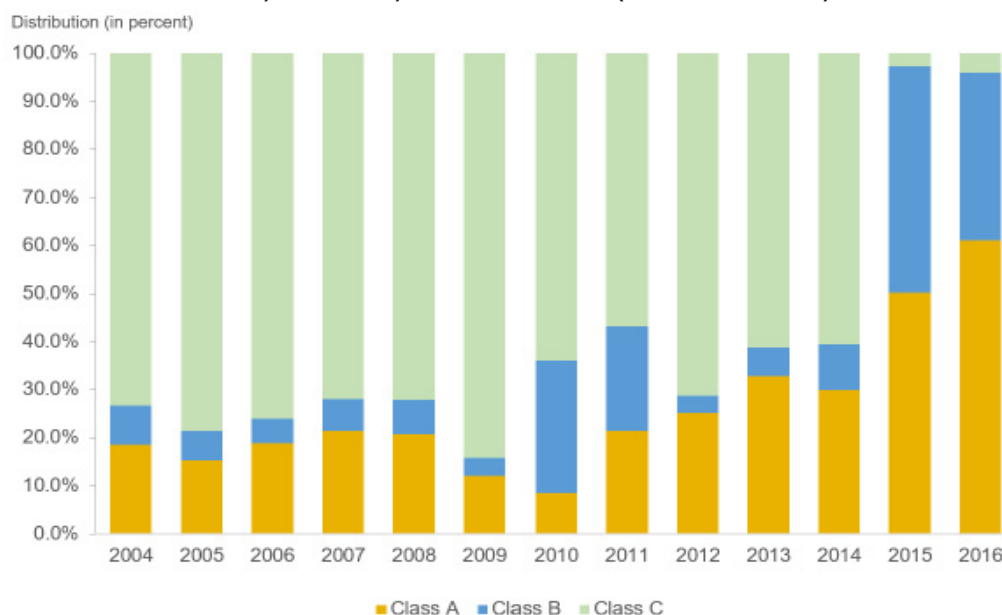
Table 5. Summary Closing Stock of Class B and C Gold Reserve, Ore Form and Metal Content, CAR: 2004-2016 (in thousand MT)

Year	Class B		Class C	
	Ore Form (in MT)	Metal Content (in kg)	Ore Form (in MT)	Metal Content (in kg)
2004	1,634.1	74.4	14,482.1	1,615.6
2005	1,630.9	73.6	21,116.1	1,767.9
2006	1,424.0	63.9	20,948.7	1,618.5
2007	1,538.2	63.5	16,941.2	1,147.5
2008	1,786.8	75.2	18,045.9	574.8
2009	815.3	38.2	18,703.7	660.7
2010	9,753.6	445.6	22,677.4	617.5
2011	9,344.8	421.0	24,288.3	659.8
2012	1,201.2	47.5	24,288.3	655.9
2013	1,545.9	56.4	15,588.3	449.6
2014	2,420.6	80.4	15,588.3	451.2
2015	5,207.3	133.9	288.8	14.0
2016	5,644.3	142.1	655.3	61.9

Source: Philippine Statistics Authority – CAR

It can be seen from Figure 3 that from 2004 to 2014, Class C contributed the largest to the total stock. It accounted the highest in 2009 where it posted 84.2 percent or 18.7 million MT of gold reserves. Class A posted the highest in 2016 where it contributed 61.2 percent or 9.9 million MT to the total stock. The share of Class B posted the highest in 2015 where 47.1 percent or 5.2 million MT of gold reserve were declared.

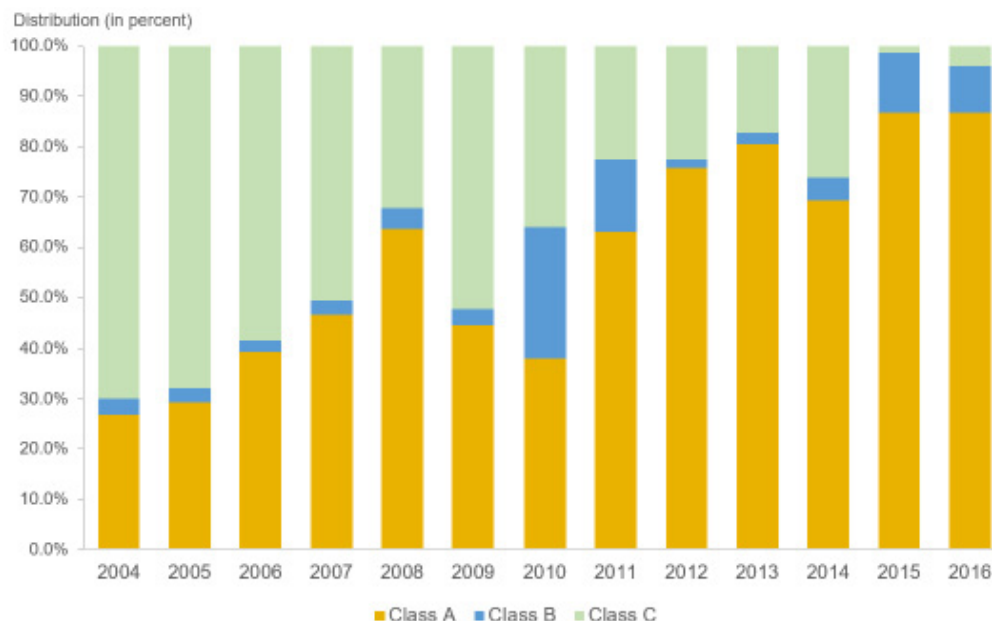
Figure 3. Share of Class A, B and C Gold Reserve to the Total Stock, Ore Form, CAR: 2004-2016 (in thousand MT)



Source: Philippine Statistics Authority – CAR

The gold reserve in metal content displayed a different scenario as compared to the ore form. It can be observed from Figure 4 that Class A shared the highest to the total stock to as much as 86.7 percent in 2016 or equivalent to 1.3 million kg. On the average, Class A contributed 1.2 million kg of metal content to the gold reserves during the period covered. Class B posted the highest share in 2010 accounting to 26.0 percent. As discussed earlier, the metal content is highly dependent on the grade and milling recovery reported for a given year.

Figure 4. Share of Class A, B and C Gold Reserve to the Total Stock, Metal Content, CAR: 2004-2016 (in thousand kg)



Source: Philippine Statistics Authority – CAR

Physical Asset Accounts for Copper

Class A copper ore reserve declined by an annual average of 1.0 percent or 400 thousand MT yearly from 64.5 million MT in 2004 to 59.7 million MT in 2016. There were four instances during the accounting period where the reported reserves were higher than the previous year. These increases in the reserve were recorded in 2006, 2009, 2010, and 2015. The mean of the closing stocks for the 13 year period was estimated at 67.5 million MT. The highest closing stock was reported in 2010 with 90.2 million MT and the lowest was in 2005 with 54.0 million MT.

Generally, the level of extracted ore increased by an annual average growth of 2.2 percent or 41,232.1 MT of ore yearly within the 13 year accounting period as shown in Table 6. Extraction peaked in 2014 with 9.5 million MT of ore removed from the reserve. The lowest recorded extraction of copper ore was in 2012 amounting to 5.6 million MT. From 2004 to 2016, the sum of all extracted ore was 112.8 million MT.

**Table 6. Closing Stock of Class A Copper Reserve,
Extraction and Mine Life, CAR: 2004-2016**

Year	Extraction in Ore Form (in thousand MT)	Closing Stock in Ore Form (in thousand MT)	Extraction in Metal Content (in thousand MT)	Closing Stock in Metal Content (in thousand MT)	Mine Life (in years)
2004	8,846.9	64,500.0	1,589.8	11,590.6	7
2005	8,639.2	54,000.0	1,629.0	10,181.9	6
2006	8,804.4	72,100.0	1,831.9	15,001.7	9
2007	9,131.9	63,900.0	2,128.1	14,891.4	9
2008	8,973.5	54,700.0	1,782.7	10,866.7	6
2009	8,183.7	69,200.0	1,727.7	14,609.3	9
2010	9,368.9	90,200.0	1,888.6	18,182.4	11
2011	9,477.6	80,800.0	1,675.2	14,281.5	9
2012	5,607.9	73,500.0	1,026.9	13,458.9	8
2013	7,729.9	66,000.0	1,398.9	11,943.7	7
2014	9,504.9	59,700.0	1,739.1	10,922.9	7
2015	9,195.3	69,700.0	1,668.0	12,643.7	8
2016	9,341.7	59,700.0	1,665.6	10,644.3	6

Source: Philippine Statistics Authority – CAR

The closing stock for Class A copper reserve remained to be highest in 2010 in terms of metal content (18.2 million MT). The level of metal content reserve was at the minimum in 2005 (10.2 million MT). The stock decreased by an annual average of 1.6 percent or 78,861.9 MT from 11.6 million MT in 2004 to 10.6 million MT in 2016 (Table 6).

A total of 21.8 million MT of metal content was extracted in the span of 13 years. In 2007, the largest extraction was recorded at 2.1 million MT of metal content. The lowest extraction in metal content was observed in 2012 at 1.0 million MT. The level of extraction grew by 2.3 percent or 6,316.9 MT annually from 1.6 million MT in 2004 to 1.7 million MT in 2016.

The mine life of copper ore reserve was estimated to have an average of eight years before the reserve will be depleted. The estimated mine life ranges from six years, which was determined in 2005, 2008 and 2016, to as long as 11 years which was determined in 2010.

From 2004 to 2016, the total 112.8 million MT of copper ore extracted yielded 21.8 million MT of copper metal content. This meant an average ratio of 0.2 MT of copper metal content for every ton of copper ore.

Monetary Asset Accounts for Copper

The trend of the monetary valuation of copper in metal content at 12 percent discount rate was upward. It grew by an annual average growth of 58.6 percent or an addition of PHP325.3 million yearly during the 13 year period. The estimates ranged from PHP1.1 billion generated in 2004 to PHP25.2 billion in 2007.

The valuation at 15 percent discount rate exhibited the same upward trend with that of the 12 percent discount rate valuation. The highest derived monetary estimate was recorded at PHP22.6 billion in 2007. The lowest registered value of copper in metal content was seen in 2004 with PHP978.2 million. The ending stock in 2016 was valued at PHP4.6 billion.

**Table 7. Monetary Valuation of Closing Stock, Class A Copper
Reserve, Extraction, CAR: 2004-2016**

Year	Closing Stock in Metal Content			Extraction in Metal Content		
	Level (in '000 kg)	Valuation at 12% (in '000 PHP)	Valuation at 15% (in '000 PHP)	Level (in '000 kg)	Valuation at 12% (in '000 PHP)	Valuation at 15% (in '000 PHP)
2004	11,590.6	1,073,070.8	978,234.7	1,589.8	147,183.4	134,175.5
2005	10,181.9	6,152,069.5	5,662,878.6	1,629.0	984,241.2	905,977.8
2006	15,001.7	23,927,932.9	21,428,075.7	1,831.9	2,921,939.5	2,616,671.5
2007	14,891.4	25,210,110.1	22,576,298.2	2,128.1	3,602,739.8	3,226,345.6
2008	10,866.7	11,238,558.7	10,344,908.1	1,782.7	1,843,682.5	1,697,079.3
2009	14,609.3	11,177,225.9	10,009,491.6	1,727.7	1,321,833.4	1,183,735.6
2010	18,182.4	22,688,344.9	19,998,362.5	1,888.6	2,356,603.7	2,077,199.3
2011	14,281.5	21,312,549.4	19,085,932.9	1,675.2	2,499,892.1	2,238,717.3
2012	13,458.9	10,229,374.8	9,240,302.3	1,026.9	780,474.6	705,010.9
2013	11,943.7	10,010,702.9	9,125,974.5	1,398.9	1,172,456.3	1,068,836.6
2014	10,922.9	8,850,267.6	8,068,096.4	1,739.1	1,409,065.3	1,284,534.6
2015	12,643.7	9,650,564.6	8,717,457.0	1,668.0	1,273,163.5	1,150,062.1
2016	10,644.3	4,976,831.1	4,581,091.0	1,665.6	778,758.4	716,834.3

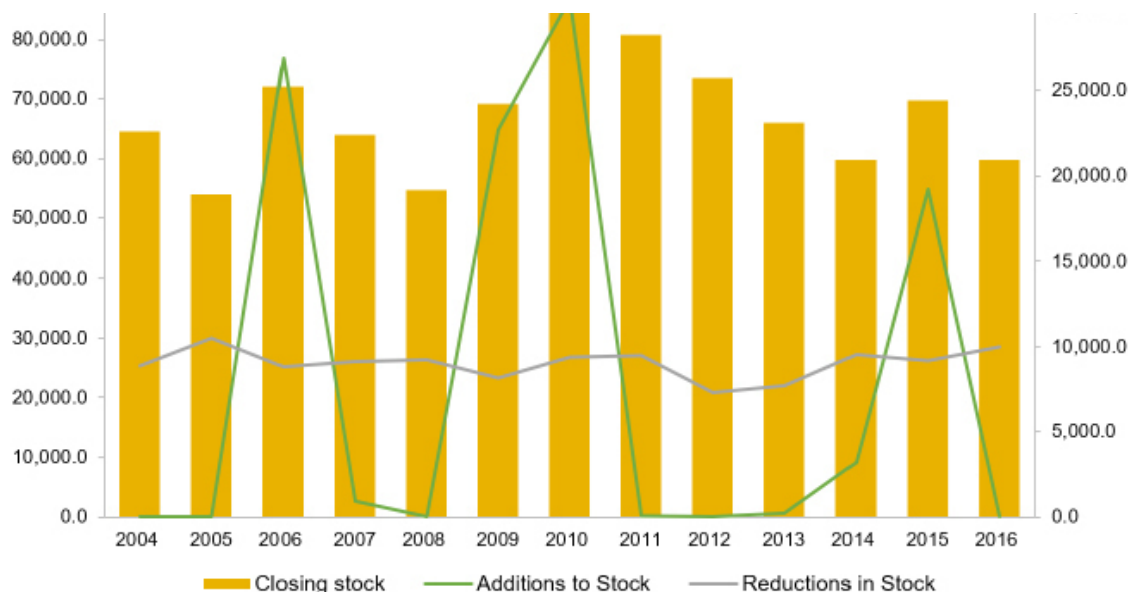
*At Net Present Value

Source: Philippine Statistics Authority – CAR

Figure 5 shows the level of closing stocks and changes in the stock of copper ore reserves. The highest additions to stock happened in 2010 where 21.0 million MT was added. There were no recorded additions to stock for the years 2004, 2005, 2008, 2012 and 2016. The lowest addition to the stock occurred in 2011 at 77,575.0 MT contributed by the upward reappraisals. The sum of all additions to stocks amounted to 103.6 million MT of ore.

The total reductions in stock of copper ore reserves across the years was 117.2 million MT with annual average of 9.0 million MT during the accounting period. The biggest reduction in stock was seen in 2005 with 10.5 million MT of copper ore deducted. The smallest incurred reduction was observed in 2012 with 7.3 million MT.

Figure 5. Closing Stock and Changes in Stock of Class A, Copper Reserve, Ore Form, CAR: 2004-2016 (in thousand MT)

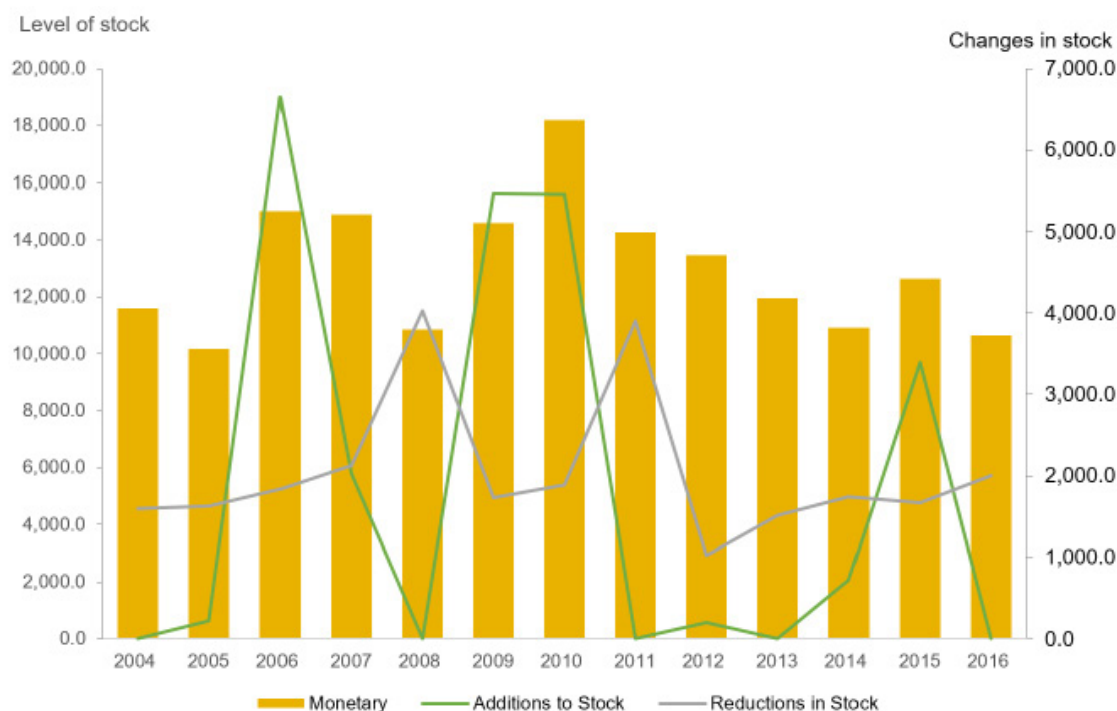


Source: Philippine Statistics Authority – CAR

In terms of metal content, the upward reappraisal posted in 2006 was the biggest additions in stock of Class A copper at 6.7 million MT. This was when the reserve went up by 47.3 percent. The least incurred addition to the total reserve was noted in 2012 which amounted to 204,266.8 MT of copper in metal content (Figure 6).

In terms of metal content, the reduction was at the highest in 2008 at 4.0 million MT, with 57.1 percent or 2.2 million MT due to downward reappraisals. The minimum reduction was in 2012 with 1.0 million MT of copper in metal content. The total estimated reductions amounted to 26.7 million MT with an average decrease of 2.1 million MT from 2004 to 2016 (Figure 6).

Figure 6. Closing Stock and Changes in Stock of Class A, Copper Reserve, Metal Content, CAR: 2004-2016 (in thousand MT)



Source: Philippine Statistics Authority – CAR

For the span of 13 years, the stocks of Class B and C copper ore were left untouched at 63.0 million MT and 123.0 million MT, respectively, without any form of increase nor decrease (Table 8).

The annual average increase of copper reserve in metal content both for Class B and C was minimal with 0.1 percent. The changes in the reserve over the years were only due to the declared ore grade and milling recovery. Nonetheless, it was in 2007 where the metal content of Class B and C recorded the highest with 12.8 million MT and 58.1 million MT, respectively. It was also in 2007 where ore grade registered the highest at 27.6 percent and milling recovery produced the highest at 84.4 percent.

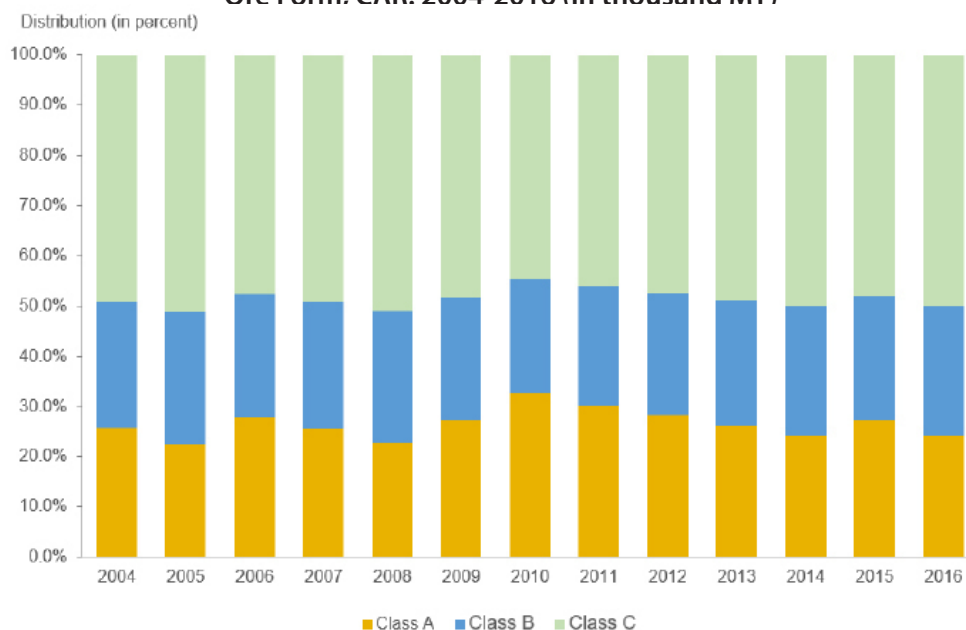
Table 8. Summary Closing Stock of Class B and C Copper Reserve, Ore Form, CAR: 2004-2016 (in thousand MT)

Year	Class B		Class C	
	Ore Form (in '000 MT)	Metal Content (in '000 MT)	Ore Form (in '000 MT)	Metal Content (in '000 MT)
2004	63,000.0	12,350.3	122,978.1	56,252.3
2005	63,000.0	12,029.2	122,978.1	54,790.0
2006	63,000.0	12,289.0	122,978.1	55,973.4
2007	63,000.0	12,766.7	122,978.1	58,149.0
2008	63,000.0	12,361.1	122,978.1	56,301.7
2009	63,000.0	12,382.0	122,978.1	56,396.9
2010	63,000.0	12,409.9	122,978.1	56,523.8
2011	63,000.0	12,430.2	122,978.1	56,616.2
2012	63,000.0	12,360.2	122,978.1	56,297.7
2013	63,000.0	12,160.9	122,978.1	55,389.6
2014	63,000.0	12,075.1	122,978.1	54,998.9
2015	63,000.0	12,410.9	122,978.1	56,528.4
2016	63,000.0	12,423.2	122,978.1	56,584.6

Source: Philippine Statistics Authority – CAR

As shown in Figure 7, Class C had the highest share in the volume of stock of copper ore in the region within the period covered. However, it is important to note that copper ore reserve for Class C and Class B remained the same from 2004 to 2016. Class A posted the highest share in 2010 where it contributed 32.7 percent of copper reserves to the total stock. In 2005, Class A contributed the least at 22.5 percent to the total stock.

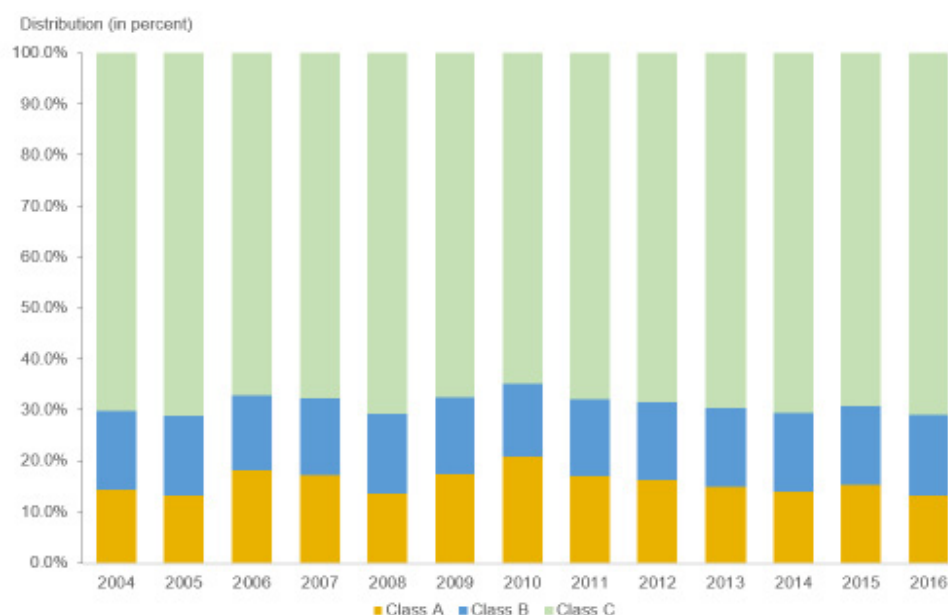
Figure 7. Share of Class A, B and C Copper Reserve to the Total Stock, Ore Form. CAR: 2004-2016 (in thousand MT)



Source: Philippine Statistics Authority – CAR

The percentage share to the total stock was dominated by Class C copper in metal content. Class C shared as much as 71.2 percent or 54.8 million MT in 2005. Class B was at its highest in 2005 and in 2016 with 15.6 percent of the total stock. In 2010, Class A was at its highest at 20.9 percent or 18.2 million MT of the total volume. The least share for Class A copper was observed in 2005 with only 13.2 percent or an equivalent of 10.2 million MT in metal content.

Figure 8. Share of Class A, B and C Copper Reserve to the Total Stock, Metal Content, CAR: 2004-2016 (in thousand MT)



Source: Philippine Statistics Authority – CAR

Silver Production

The lowest quantity produced was recorded in 2012 with 3,680.3 kg while the highest quantity produced was recorded in 2004 with 7,185.0 kg. The annual average production of silver in the region was estimated at 5,552.1 kg. Production declined by an annual average of 0.1 percent or annual decrease of 232.6 kg.

The output of silver in terms of monetary value does not reflect a direct relationship to that of the quantity produced. As shown in Table 9, the second biggest production posted in 2004 was the lowest estimated value in monetary terms with PHP83.1 million. The highest valuation was recorded in 2011 with PHP246.0 million. The ending stock in 2016 was valued at PHP119.0 million.

Table 9. Silver Production, CAR: 2004-2016

YEAR	Quantity(kg)	Value (PHP)
2004	7,185.0	83,052,194.0
2005	4,978.0	194,369,365.0
2006	5,096.0	92,476,807.0
2007	6,716.0	129,799,325.0
2008	9,889.8	171,129,097.3
2009	5,219.4	118,090,896.0
2010	5,376.0	160,774,209.8
2011	5,181.4	246,041,663.0
2012	3,680.3	97,288,217.0
2013	5,051.3	157,968,022.3
2014	4,564.7	122,603,992.1
2015	4,845.5	104,789,162.1
2016	4,394.4	118,923,247.2

Source: MGB-CAR

Production of Non-metallic Minerals

Sand and Gravel

In terms of quantity, the lowest production was recorded in 2005 with a volume of 115,930.9 cubic meters and the highest was in 2015 with 903,154.6 cubic meters. With the data on hand, the annual average production of sand and gravel in CAR was 393,716.4 cubic meters. The output of sand and gravel increased from 152,773.0 cubic meters in 2004 to 770,275.5 cubic meters in 2016, an annual average growth of 20.4 percent or 51,458.5 cubic meters yearly. The total production from 2004 to 2016 was estimated at 5.1 million cubic meters.

The lowest value production was in 2004 with PHP27.2 million and the highest was in 2016 with PHP163.6 million. The value of production trended upward with annual average growth of 28.4 percent.

Table 10. Sand and Gravel Production, CAR: 2004-2016

YEAR	Quantity (m ³)	Value (PHP)
2004	152,773.0	27,160,156.0
2005	115,930.9	29,938,906.0
2006	134,579.9	33,336,918.8
2007	213,694.3	36,781,719.1
2008	161,767.5	28,192,090.7
2009	293,814.8	35,224,697.4
2010	243,646.7	40,157,522.4
2011	372,085.0	41,851,729.0
2012	545,179.2	41,228,199.5
2013	454,525.0	36,007,118.4
2014	756,886.9	139,364,578.4
2015	903,154.6	152,621,915.3
2016	770,275.5	163,621,606.9

Source: MGB-CAR

Lime

The lowest recorded production of quicklime during the accounting period was in 2005 with 6,229.8 MT and the highest was in 2014 with 9,770.3 MT (Table 11). The quantity produced posted an average of 8,157.9 MT.

In terms of monetary value, the lowest derived estimate was in 2005 with PHP27.4 million. Meanwhile, the highest estimated value was recorded in 2016 with PHP76.7 million.

Table 11. Quicklime Production, CAR: 2004-2016

YEAR	Quantity (MT)	Value (PHP)
2004	7,734.4	36,805,941.3
2005	6,229.8	27,374,138.1
2006	7,327.0	37,462,951.0
2007	7,824.0	42,392,888.0
2008	9,347.4	64,715,772.5
2009	7,375.4	49,415,233.6
2010	7,422.4	50,001,827.1
2011	8,171.3	55,102,046.2
2012	8,678.8	58,147,946.6
2013	9,070.1	60,770,125.0
2014	9,770.3	65,461,049.4
2015	7,848.1	59,069,664.5
2016	9,253.8	76,744,197.9

Source of raw data: MGB-CAR

The accumulated output of slake lime from 2004 to 2016 was 2,993.7 MT with an annual average production of 230.3 MT. As shown in Table 12, the highest production was recorded in 2012 with 461.1 MT which was valued at PHP2.5 million. On the other hand, the lowest production and value of slake lime was recorded in 2013 with 33.1 MT which was valued at only PHP181,420.

Table 12. Slake lime Production, CAR: 2004-2016

YEAR	Quantity	Value (PHP)
2004	265.2	919,156.7
2005	277.4	1,064,936.5
2006	257.5	1,319,286.1
2007	273.7	1,405,908.7
2008	205.1	1,230,584.5
2009	312.0	1,708,090.8
2010	312.4	1,710,280.5
2011	383.1	2,097,176.8
2012	461.1	2,524,520.0
2013	33.1	181,420.1
2014	123.8	677,646.2
2015	53.5	327,575.1
2016	35.9	205,213.2

Source of raw data: MGB-CAR

From 2004 to 2016 the total production of limestone was 146,209.8 MT with an annual average production of 11,246.9 MT. The lowest production of limestone was reported in 2007 with 532.7 MT while the highest was in 2013 with 20,476.3 MT. The lowest production value registered for limestone was in 2008 with PHP34,438 while the highest was recorded in 2015 with PHP18.6 million.

Table 13. Limestone Production, CAR: 2004-2016

YEAR	Quantity	Value (PHP)
2004	2,784.1	182,688.7
2005	766.9	43,223.5
2006	1,649.0	144,047.7
2007	532.7	63,106.5
2008	18,346.4	34,437.5
2009	15,448.8	12,359,048.0
2010	14,358.5	11,486,808.0
2011	15,030.8	12,024,600.0
2012	18,609.0	14,887,192.0
2013	20,476.3	16,381,024.0
2014	16,599.6	18,259,598.5
2015	16,599.6	18,578,832.4
2016	5,008.2	5,618,827.2

Source of raw data: MGB-CAR



Sand and gravel facility of Mountain Rock Aggregates, Camp 4, Tuba, Benguet

Conclusions and Recommendations

The following conclusions were drawn based on the results of this study:

- a. At the end of the accounting period, the closing stock of Class A gold reserve amounted to 9.9 million MT in ore form and 1.3 million kg in metal content and with estimated 14 years of mine life. Class A copper reserve, on the other hand, posted 59.7 million MT in ore form and 10.6 million MT in metal content with 6 years of mine life;
- b. In 2016, the closing stock of Class A gold reserve in metal content was valued at PHP14.3 billion and PHP12.3 billion in 12 percent and 15 percent discount rates respectively while the closing stock of Class A copper reserve in metal content was estimated at PHP5.0 billion and PHP4.6 billion in 12 percent and 15 percent discount rates respectively;
- c. In 2016, silver production was at 4,394 kg and was valued at PHP118.9 million. For the non-metallic minerals, sand and gravel production posted 770,276 cubic meters valued at PHP163.6 million. Quicklime production amounted to 9,254 MT and was valued at PHP76.7 million. Slake lime production recorded 35.9 MT with an estimated value of PHP205,213, while limestone production registered 5,008 MT and was valued at PHP5.6 million; and
- d. The changes in the value of production of metallic and non-metallic minerals do not show a direct association with the quantity produced. Factors such as, but not limited to, fluctuations of foreign exchange rate, demand of commodity and price may have an effect to the total valuation.

Based on the stated conclusions above, the following are therefore recommended:

- 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 basis of project preparations and policy recommendations;
- b. Creation, improvement, and monitoring of databank/database of information culled from administrative reports of mining companies, i.e., reserves and IAR;
- c. Standardization of local terms and definitions in accordance to international standards to ensure comparability, i.e., adoption of United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC) by the mining industry. The mining industry in the country is currently using the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) as basis for reporting and classification; and
- d. Expansion of mineral resource accounting to include other mineral resources.

Takeaways

It is worth to mention the takeaways from the environmental accounting project beside the compiled data and prepared tables on the mineral asset accounts of the region. The following are some of the notable takeaways:

Hands-on learning on mining operations. As part of the orientation on the mining industry, the conducted trainings and site visits provided first-hand information that better visualize the accounting of mineral resources. The hands-on learning on the operations of the mining industry including their corporate social responsibilities provided the visual and tangible backdrop for the estimation process. The learnings and experiences gained will form part of the continuing effort of PSA CAR in developing the asset accounts and exploring other accounts, e.g. flow and activity-purpose accounts.

Administrative reporting forms better utilized. The uses of MGB administrative forms were further realized as they provide relevant information for the estimation of the physical and monetary mineral asset accounts. These reports were better utilized with their contribution to this study. MGB-CAR was prompted to a more in-depth review and validate entries of the accomplished forms submitted by the mining and quarrying firms. This presses the companies to be more conscious on their reporting.

Defining terms and setting standards. Terms used in this study were conceptually and operationally defined for better understanding. Mine/asset life for example was defined by the MGB as the same as the 25 years mineral agreements with mining companies. Mine life then diminishes as the years pass by. SEEA on the other hand defined mine life as the years before the stock of mineral resource be exhausted which was operationally defined as the closing stock divided by the average extraction. Both definitions were better understood and for what purposes they are used. This study follows the operational definition and standards of the SEEA 2012 Central Framework.

Discussion on small-scale mining. The mineral accounting project also provided a venue for productive discourses on issues besetting the mining industry in the region. The more in-depth discussions were not just limited to issues on minerals data but also emphasized the issue on small-scale mining. The need for statistics on small-scale mining activities was brought to the surface and with that, churned a flurry of ideas and proposals on how to include them in the mineral accounting of the region.

Way Forward

The introduction of SEEA 2012 Central Framework in accounting the mineral resources of CAR highlighted not only the physical and monetary asset accounts of gold and copper reserve but also the concerns raised for the improvement of environmental accounts and its integration in policy-making and development of programs.

The produced environmental accounts on mineral resources captured the attention of the Regional Statistics Committee – CAR and the Sectoral Committee on Watershed and Environmental Management and connected to the issue on the regulation of small-scale mining. The tragedy brought by Typhoon Ompong in September 2018 at Itogon, Benguet was in part due to the unregulated small-scale mining activity in the region. It was concluded that the tragedy was an evidence that their methods of mining are destructive and life hazard.

The legalization of the small-scale mining through the Minahang Bayan was raised by both committees and efforts to help small-scale miners get approval of their application was discussed. The Sectoral Committee on Watershed and Environmental Management initiated a workshop regarding the matter and came up with a proposed simplified application process. The Regional Development Council – CAR passed a resolution regarding the matter.

With the Minahang Bayan, it is hoped that the small-scale miners will not only be regulated but data with regards to their production, gross output and the like will also be reported and will be included in the mineral asset accounting of the Cordillera region.

On another front, the Senate Bill No. 2127, or the Act to Strengthen the Country's Gross International Reserves (GIR) was approved on third and final reading last January 29, 2019, a bill offering tax exemptions to small-scale miners who sell their gold to the Bangko Sentral ng Pilipinas (BSP). The measure seeks to amend sections 32 and 151 of the National Internal Revenue Code (NIRC) in order to provide income and excise tax exemptions to registered small-scale miners and accredited traders on their gold sales to the BSP⁶.

The measure was proposed to encourage small-scale miners to sell their gold to the BSP. The BSP purchases gold from small-scale miners in accordance with Republic No. 7076 or the People's Small Scale Mining Act of 1991. The imposition of 2% excise tax and 5% creditable withholding tax on gold purchases since 2011, BSP's total gold purchases in 2010 of 918,110 troy ounces decreased by 98% to 20,354 troy ounces in 2014⁷. The additional taxes encouraged small-scale miners to sell to the black market.

The BSP data on gold purchases are used as proxy indicator for the gold production of small-scale miners. If the measure is passed into law, the gold purchases will be an improved indicator on gold production from small-scale mining. The project team will then have to do an assessment of the feasibility of using and incorporating the BSP gold purchases into the mineral asset accounts.

⁶BusinessWorld, 29 January 2019. <https://www.bworldonline.com/senate-approves-tax-perks-for-small-gold-miners-on-3rd-reading/>

⁷BusinessWorld, 4 October 2018. <https://www.bworldonline.com/bill-exempting-small-miners-from-tax-on-bsp-gold-sales-clears-2nd-reading/>



Site visit at ML Carantes Development and General Construction at
Camp 4, Tuba Benguet on 20 September 2017

Appendices

Appendix A – Physical and Monetary Asset Accounts

Appendix Table 1

Physical Asset Account for Mineral Resources, Gold, Class A, Ore form, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	552.7	3,647.0	4,088.0	5,170.5	5,049.4	5,193.7	2,684.2
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	3,631.7	900.6	1,653.7	465.2	618.4	-	683.6
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	3,631.7	900.6	1,653.7	465.2	618.4	-	683.6
Reductions in stock							
Extractions	537.4	459.6	571.2	586.2	474.1	389.3	337.0
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	537.4	459.6	571.2	586.2	474.1	2,509.5	337.0
Closing stock of mineral resources	3,647.0	4,088.0	5,170.5	5,049.4	5,193.7	2,684.2	3,030.7

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(-) Nil or Zero

Appendix Table 1 continued
Physical Asset Account for Mineral Resources, Gold, Class A, Ore form, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	3,030.7	9,128.1	8,559.3	8,344.4	7,714.1	5,558.1
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	6,626.5		530.3			4,665.5
Reclassifications	...	...	...	...	...	...
Total additions to stock	6,626.5	-	530.3	-	-	4,665.5
Reductions in stock						
Extractions	529.2	568.7	745.3	381.4	349.8	295.5
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	-	-	156.7	1,806.2	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	529.2	568.7	745.3	538.1	2,156.1	295.5
Closing stock of mineral resources	9,128.1	8,559.3	8,344.4	7,714.1	5,558.1	9,928.1

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(-) Nil or Zero

Appendix Table 2
Physical Asset Account for Mineral Resources, Gold, Class A, Metal Content, CAR: 2004-2016 (in thousand kg)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	631.2	618.6	765.8	1,092.9	1,058.2	1,133.1	564.8
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	78.5	233.3	447.7	88.1	178.1	...	158.9
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	78.5	233.3	447.7	88.1	178.1	-	158.9
Reductions in stock							
Extractions	91.1	86.1	120.7	122.8	103.1	81.8	72.3
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	486.5	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	91.1	86.1	120.7	122.8	103.1	568.3	72.3
Closing stock of mineral resources	618.6	765.8	1,092.9	1,058.2	1,133.1	564.8	651.4

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(-) Nil or Zero

Appendix Table 2 continued
Physical Asset Account for Mineral Resources, Gold, Class A, Metal Content, CAR: 2004-2016 (in thousand kg)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	651.4	1,848.4	2,205.6	2,092.4	1,194.4	964.3
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	1,303.9	494.5	73.4	-	-	406.9
Reclassifications	...	...	...	...	...	...
Total additions to stock	1,303.9	494.5	73.4	-	-	406.9
Reductions in stock						
Extractions	106.9	137.3	186.6	58.9	60.3	39.8
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	-	-	839.1	169.8	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	106.9	137.3	186.6	898.0	230.0	39.8
Closing stock of mineral resources	1,848.4	2,205.6	2,092.4	1,194.4	964.3	1,331.5

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(-) Nil or Zero

Appendix Table 3
Physical Asset Account for Mineral Resources, Gold, Class B, Ore form, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	6,330.9	1,634.1	1,630.9	1,424.0	1,538.2	1,786.8	815.3
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	-	-	114.2	248.7	-	8,938.3
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	-	-	114.2	248.7	-	8,938.3
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	4,696.9	3.2	206.9	-	-	971.5	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	4,696.9	3.2	206.9	-	-	971.5	-
Closing stock of mineral resources	1,634.1	1,630.9	1,424.0	1,538.2	1,786.8	815.3	9,753.6

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 3 continued
Physical Asset Account for Mineral Resources, Gold, Class B, Ore form, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	9,753.6	9,344.8	1,201.2	1,545.9	2,420.6	5,207.3
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	-	-	344.6	874.8	2,786.7	437.0
Reclassifications	...	...	...	...	...	...
Total additions to stock	-	-	344.6	874.8	2,786.7	437.0
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	408.8	8,143.6	-	-	-	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	408.8	8,143.6	-	-	-	-
Closing stock of mineral resources	9,344.8	1,201.2	1,545.9	2,420.6	5,207.3	5,644.3

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 4
Physical Asset Account for Mineral Resources, Gold, Class B, Metal Content, CAR: 2004-2016 (in thousand kg)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	360.9	74.4	73.6	63.9	63.5	75.2	38.2
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	-	-	-	11.8	-	407.4
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	-	-	-	11.8	-	407.4
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	286.4	0.9	9.7	0.4	-	37.0	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	286.4	0.9	9.7	0.4	-	37.0	-
Closing stock of mineral resources	74.4	73.6	63.9	63.5	75.2	38.2	445.6

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 4 continued
Physical Asset Account for Mineral Resources, Gold, Class B, Metal Content, CAR: 2004-2016 (in thousand kg)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	445.6	421.0	47.5	56.4	80.4	133.9
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	-	-	8.8	24.0	53.5	8.3
Reclassifications	...	...	...	...	...	...
Total additions to stock	-	-	8.8	24.0	53.5	8.3
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	24.6	373.5	-	-	-	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	24.6	373.5	-	-	-	-
Closing stock of mineral resources	421.0	47.5	56.4	80.4	133.9	142.1

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 5
Physical Asset Account for Mineral Resources, Gold, Class C, Ore form, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	898.1	14,482.1	21,116.1	20,948.7	16,941.2	18,045.9	18,703.7
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	13,584.0	6,634.0	-	-	1,104.7	657.8	3,973.7
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	13,584.0	6,634.0	-	-	1,104.7	657.8	3,973.7
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	167.3	4,007.6	-	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	-	-	167.3	4,007.6	-	-	-
Closing stock of mineral resources	14,482.1	21,116.1	20,948.7	16,941.2	18,045.9	18,703.7	22,677.4

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 5 continued
Physical Asset Account for Mineral Resources, Gold, Class C, Ore form, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	22,677.4	24,288.3	24,288.3	15,588.3	15,588.3	288.8
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	1,610.9	-	-	-	-	366.5
Reclassifications	...	...	...	...	...	...
Total additions to stock	1,610.9	-	-	-	-	366.5
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	-	8,700.0	-	15,299.5	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	-	-	8,700.0	-	15,299.5	-
Closing stock of mineral resources	24,288.3	24,288.3	15,588.3	15,588.3	288.8	655.3

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 6
Physical Asset Account for Mineral Resources, Gold, Class C, Metal Content, CAR: 2004-2016 (in thousand kg)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	88.0	1,615.6	1,767.9	1,618.5	1,147.5	574.8	660.7
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	1,527.5	152.4	-	-	-	85.8	-
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	1,527.5	152.4	-	-	-	85.8	-
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	149.5	470.9	572.7	-	43.1
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	-	-	149.5	470.9	572.7	-	43.1
Closing stock of mineral resources	1,615.6	1,767.9	1,618.5	1,147.5	574.8	660.7	617.5

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 6 continued
Physical Asset Account for Mineral Resources, Gold, Class C, Metal Content, CAR: 2004-2016 (in thousand kg)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	617.5	659.8	655.9	449.6	451.2	14.0
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	42.3	-	-	1.6	-	47.9
Reclassifications	...	...	...	...	...	...
Total additions to stock	42.3	-	-	1.6	-	47.9
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	3.9	206.3	-	437.2	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	-	3.9	206.3	-	437.2	-
Closing stock of mineral resources	659.8	655.9	449.6	451.2	14.0	61.9

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 7
Physical Asset Account for Mineral Resources, Copper, Class A, Ore form, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	73,346.9	64,500.0	54,000.0	72,100.0	63,900.0	54,700.0	69,200.0
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	-	26,904.4	931.9	-	22,683.7	30,368.9
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	-	26,904.4	931.9	-	22,683.7	30,368.9
Reductions in stock							
Extractions	8,846.9	8,639.2	8,804.4	9,131.9	8,973.5	8,183.7	9,368.9
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	1,860.8	-	-	226.5	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	8,846.9	10,500.0	8,804.4	9,131.9	9,200.0	8,183.7	9,368.9
Closing stock of mineral resources	64,500.0	54,000.0	72,100.0	63,900.0	54,700.0	69,200.0	90,200.0

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 7 continued
Physical Asset Account for Mineral Resources, Copper, Class A, Ore form, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	90,200.0	80,800.0	73,500.0	66,000.0	59,700.0	69,700.0
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	77.6	-	229.9	3,204.9	19,195.3	-
Reclassifications	...	...	...	...	...	...
Total additions to stock	77.6	-	229.9	3,204.9	19,195.3	-
Reductions in stock						
Extractions	9,477.6	5,607.9	7,729.9	9,504.9	9,195.3	9,341.7
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	1,692.1	-	-	-	658.3
Reclassifications	...	...	...	...	...	...
Total reductions in stock	9,477.6	7,300.0	7,729.9	9,504.9	9,195.3	10,000.0
Closing stock of mineral resources	80,800.0	73,500.0	66,000.0	59,700.0	69,700.0	59,700.0

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 8
Physical Asset Account for Mineral Resources, Copper, Class A, Metal Content, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	13,180.4	11,590.6	10,181.9	15,001.7	14,891.4	10,866.7	14,609.3
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	220.2	6,651.8	2,017.8	-	5,470.3	5,461.7
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	220.2	6,651.8	2,017.8	-	5,470.3	5,461.7
Reductions in stock							
Extractions	1,589.8	1,629.0	1,831.9	2,128.1	1,782.7	1,727.7	1,888.6
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	2,242.0	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	1,589.8	1,629.0	1,831.9	2,128.1	4,024.7	1,727.7	1,888.6
Closing stock of mineral resources	11,590.6	10,181.9	15,001.7	14,891.4	10,866.7	14,609.3	18,182.4

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 8 continued
Physical Asset Account for Mineral Resources, Copper, Class A, Metal Content, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	18,182.4	14,281.5	13,458.9	11,943.7	10,922.9	12,643.7
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	-	204.3	-	718.2	3,388.9	-
Reclassifications	...	...	...	...	...	...
Total additions to stock	-	204.3	-	718.2	3,388.9	-
Reductions in stock						
Extractions	1,675.2	1,026.9	1,398.9	1,739.1	1,668.0	1,665.6
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	2,225.7	-	116.4	-	-	333.9
Reclassifications	...	...	...	...	...	...
Total reductions in stock	3,900.8	1,026.9	1,515.2	1,739.1	1,668.0	1,999.5
Closing stock of mineral resources	14,281.5	13,458.9	11,943.7	10,922.9	12,643.7	10,644.3

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 9
Physical Asset Account for Mineral Resources, Copper, Class B, Ore form, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	-	-	-	-	-	-
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	-	-	-	-	-	-	-
Closing stock of mineral resources	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 9 continued
Physical Asset Account for Mineral Resources, Copper, Class B, Ore form, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...
Total additions to stock	-	-	-	-	-	-
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	-	-	-	-	-	-
Closing stock of mineral resources	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0	63,000.0

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 10
Physical Asset Account for Mineral Resources, Copper, Class B, Metal Content, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	12,350.3	12,350.3	12,029.2	12,289.0	12,766.7	12,361.1	12,382.0
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	-	259.8	477.7	-	20.9	27.8
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	-	259.8	477.7	-	20.9	27.8
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	321.0	-	-	405.6	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	-	321.0	-	-	405.6	-	-
Closing stock of mineral resources	12,350.3	12,029.2	12,289.0	12,766.7	12,361.1	12,382.0	12,409.9

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 10 continued
Physical Asset Account for Mineral Resources, Copper, Class B, Metal Content, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	12,409.9	12,430.2	12,360.2	12,160.9	12,075.1	12,410.9
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	20.3	-	-	-	335.8	650.7
Reclassifications	...	...	...	...	...	...
Total additions to stock	20.3	-	-	-	335.8	650.7
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	69.9	199.4	85.8	-	638.4
Reclassifications	...	...	...	...	...	...
Total reductions in stock	-	69.9	199.4	85.8	-	638.4
Closing stock of mineral resources	12,430.2	12,360.2	12,160.9	12,075.1	12,410.9	12,423.2

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 11
Physical Asset Account for Mineral Resources, Copper, Class C, Ore form, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	-	-	-	-	-	-
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	-	-	-	-	-	-	-
Closing stock of mineral resources	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 11 continued
Physical Asset Account for Mineral Resources, Copper, Class C, Ore form, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...
Total additions to stock	-	-	-	-	-	-
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	-	-	-	-	-	-
Closing stock of mineral resources	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1	122,978.1

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 12
Physical Asset Account for Mineral Resources, Copper, Class C, Metal Content, CAR: 2004-2016 (in thousand MT)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	56,264.8	56,252.3	54,790.0	55,973.4	58,149.0	56,301.7	56,396.9
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	-	1,183.4	2,175.6	-	95.3	126.8
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	-	1,183.4	2,175.6	-	95.3	126.8
Reductions in stock							
Extractions	..	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	12.5	1,462.3	-	-	1,847.4	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	12.5	1,462.3	-	-	1,847.4	-	-
Closing stock of mineral resources	56,252.3	54,790.0	55,973.4	58,149.0	56,301.7	56,396.9	56,523.8

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 12 continued
Physical Asset Account for Mineral Resources, Copper, Class C, Metal Content, CAR: 2004-2016 (in thousand MT)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	56,523.8	56,616.2	56,297.7	55,389.6	54,998.9	56,528.4
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	92.4	-	-	-	1,529.4	56.2
Reclassifications	...	...	...	...	...	...
Total additions to stock	92.4	-	-	-	1,529.4	56.2
Reductions in stock						
Extractions	..	..	..	..	..	..
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	318.5	908.0	390.7	-	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	-	318.5	908.0	390.7	-	-
Closing stock of mineral resources	56,616.2	56,297.7	55,389.6	54,998.9	56,528.4	56,584.6

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 13
Monetary Asset Account for Mineral Resources, Gold, Class A, at 12 percent discount rate in metal form, CAR: 1999-2016 (in Thousand
Peso)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	5,770,786.8	4,768,988.5	6,467,534.5	16,378,614.8	21,267,506.0	22,271,262.1	13,436,292.0
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	604,834.4	1,970,552.3	6,709,907.2	1,770,593.1	3,499,699.0	-	5,529,952.9
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	604,834.4	1,970,552.3	6,709,907.2	1,770,593.1	3,499,699.0	-	5,529,952.9
Reductions in stock							
Extractions	701,965.6	727,071.2	1,808,445.4	2,467,854.3	2,027,256.7	1,946,741.9	2,516,104.2
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	11,573,893.0	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	701,965.6	727,071.2	1,808,445.4	2,467,854.3	2,027,256.7	13,520,634.9	2,516,104.2
Revaluation of the stock	(904,667.1)	455,064.9	5,009,618.5	5,586,152.3	(468,686.2)	4,685,664.8	6,215,182.5
Closing stock of mineral resources	4,768,988.5	6,467,534.5	16,378,614.8	21,267,506.0	22,271,262.1	13,436,292.0	22,665,323.2

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 13 continued
Monetary Asset Account for Mineral Resources, Gold, Class A, at 12 percent discount rate in metal form, CAR: 1999-2016 (in Thousand
Peso)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	22,665,323.2	45,091,460.3	25,837,152.5	25,391,499.4	18,226,806.2	19,401,517.6
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	31,809,485.4	5,792,295.8	890,594.7	-	-	4,367,383.8
Reclassifications	...	...	...	...	...	...
Total additions to stock	31,809,485.4	5,792,295.8	890,594.7	-	-	4,367,383.8
Reductions in stock						
Extractions	2,608,976.7	1,607,902.5	2,264,107.8	898,314.3	1,212,462.2	426,672.0
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	-	-	12,805,694.1	3,415,580.8	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	2,608,976.7	1,607,902.5	2,264,107.8	13,704,008.4	4,628,043.0	426,672.0
Revaluation of the stock	(6,774,371.6)	(23,438,701.0)	927,860.0	6,539,315.3	5,802,754.4	(9,051,849.8)
Closing stock of mineral resources	45,091,460.3	25,837,152.5	25,391,499.4	18,226,806.2	19,401,517.6	14,290,379.7

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 14
Monetary Asset Account for Mineral Resources, Gold, Class A, at 15 percent discount rate in metal form, CAR: 1999-2016 (in Thousand
Peso)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	5,212,812.7	4,389,775.4	5,842,192.3	14,436,728.5	18,745,981.5	19,489,301.5	12,367,885.4
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	556,740.1	1,780,020.7	5,914,365.1	1,560,667.5	3,062,542.6	-	5,041,225.4
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	556,740.1	1,780,020.7	5,914,365.1	1,560,667.5	3,062,542.6	-	5,041,225.4
Reductions in stock							
Extractions	646,147.7	656,771.1	1,594,031.9	2,175,259.8	1,774,026.9	1,791,943.9	2,293,735.3
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	-	10,653,577.8	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	646,147.7	656,771.1	1,594,031.9	2,175,259.8	1,774,026.9	12,445,521.6	2,293,735.3
Revaluation of the stock	(733,629.7)	329,167.3	4,274,203.1	4,923,845.2	(545,195.8)	5,324,105.6	5,546,826.2
Closing stock of mineral resources	4,389,775.4	5,842,192.3	14,436,728.5	18,745,981.5	19,489,301.5	12,367,885.4	20,662,201.6

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 14 continued
Monetary Asset Account for Mineral Resources, Gold, Class A, at 15 percent discount rate in metal form, CAR: 1999-2016 (in Thousand
Peso)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	20,662,201.6	37,944,035.1	21,419,855.1	21,195,822.5	15,950,048.9	17,233,253.9
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	26,767,379.5	4,802,005.0	743,433.3	-	-	3,771,929.3
Reclassifications	...	...	...	...	...	...
Total additions to stock	26,767,379.5	4,802,005.0	743,433.3	-	-	3,771,929.3
Reductions in stock						
Extractions	2,195,429.1	1,333,004.4	1,889,988.0	786,103.6	1,076,960.5	368,499.1
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	-	-	-	11,206,101.9	3,033,864.3	-
Reclassifications	...	...	...	...	...	...
Total reductions in stock	2,195,429.1	1,333,004.4	1,889,988.0	11,992,205.5	4,110,824.8	368,499.1
Revaluation of the stock	(7,290,117.0)	(19,993,180.5)	922,522.0	6,746,431.9	5,394,029.8	(8,294,672.5)
Closing stock of mineral resources	37,944,035.1	21,419,855.1	21,195,822.5	15,950,048.9	17,233,253.9	12,342,011.7

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 15
Monetary Asset Account for Mineral Resources, Copper, Class A, Metal Content, at 12 percent discount rate, CAR: 2004-2016 (in thousand peso)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	1,788,672.2	1,073,070.8	6,152,069.5	23,927,932.9	25,210,110.1	11,238,558.7	11,177,225.9
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	133,047.7	10,609,654.5	3,416,042.6	-	4,185,167.3	6,815,172.6
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	133,047.7	10,609,654.5	3,416,042.6	-	4,185,167.3	6,815,172.6
Reductions in stock							
Extractions	147,183.4	984,241.2	2,921,939.5	3,602,739.8	1,843,682.5	1,321,833.4	2,356,603.7
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	2,318,736.2	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	147,183.4	984,241.2	2,921,939.5	3,602,739.8	4,162,418.7	1,321,833.4	2,356,603.7
Revaluation of the stock	(568,418.1)	5,930,192.2	10,088,148.4	1,468,874.3	(9,809,132.7)	(2,924,666.7)	7,052,550.1
Closing stock of mineral resources	1,073,070.8	6,152,069.5	23,927,932.9	25,210,110.1	11,238,558.7	11,177,225.9	22,688,344.9

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 15 continued
Monetary Asset Account for Mineral Resources, Copper, Class A, Metal Content, at 12 percent discount rate, CAR: 2004-2016 (in thousand peso)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	22,688,344.9	21,312,549.4	10,229,374.8	10,010,702.9	8,850,267.6	9,650,564.6
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	-	155,251.9	-	581,954.3	2,586,630.6	-
Reclassifications	-	-	-	-	-	-
Total additions to stock	-	155,251.9	-	581,954.3	2,586,630.6	-
Reductions in stock						
Extractions	2,499,892.1	780,474.6	1,172,456.3	1,409,065.3	1,273,163.5	778,758.4
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	3,321,390.7	-	97,521.0	-	-	156,105.3
Reclassifications	...	...	...	...	...	...
Total reductions in stock	5,821,282.8	780,474.6	1,269,977.3	1,409,065.3	1,273,163.5	934,863.8
Revaluation of the stock	4,445,487.3	(10,457,952.0)	1,051,305.4	(333,324.2)	(513,170.0)	(3,738,869.7)
Closing stock of mineral resources	21,312,549.4	10,229,374.8	10,010,702.9	8,850,267.6	9,650,564.6	4,976,831.1

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 16
Monetary Asset Account for Mineral Resources, Copper, Class A, Metal Content, at 15 percent discount rate, CAR: 2004-2016 (in thousand peso)

	2004	2005	2006	2007	2008	2009	2010
Opening stock of mineral resources	1,630,592.5	978,234.7	5,662,878.6	21,428,075.7	22,576,298.2	10,344,908.1	10,009,491.6
Additions to stock							
Discoveries	...	...	...	...	...	...	...
Upward reappraisals	-	122,468.2	9,501,216.9	3,059,153.5	-	3,747,924.3	6,007,150.0
Reclassifications	...	...	...	...	...	...	...
<i>Total additions to stock</i>	-	122,468.2	9,501,216.9	3,059,153.5	-	3,747,924.3	6,007,150.0
Reductions in stock							
Extractions	134,175.5	905,977.8	2,616,671.5	3,226,345.6	1,697,079.3	1,183,735.6	2,077,199.3
Catastrophic losses	...	...	...	...	...	...	...
Downward reappraisals	-	-	-	-	2,134,358.5	-	-
Reclassifications	...	...	...	...	...	...	...
<i>Total reductions in stock</i>	134,175.5	905,977.8	2,616,671.5	3,226,345.6	3,831,437.8	1,183,735.6	2,077,199.3
Revaluation of the stock	(518,182.3)	5,468,153.5	8,880,651.7	1,315,414.5	(8,399,952.2)	(2,899,605.2)	6,058,920.2
Closing stock of mineral resources	978,234.7	5,662,878.6	21,428,075.7	22,576,298.2	10,344,908.1	10,009,491.6	19,998,362.5

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix Table 16 continued
Monetary Asset Account for Mineral Resources, Copper, Class A, Metal Content, at 15 percent discount rate, CAR: 2004-2016 (in thousand peso)

	2011	2012	2013	2014	2015	2016
Opening stock of mineral resources	19,998,362.5	19,085,932.9	9,240,302.3	9,125,974.5	8,068,096.4	8,717,457.0
Additions to stock						
Discoveries	...	...	...	...	...	...
Upward reappraisals	-	140,240.7	-	530,522.2	2,336,530.7	-
Reclassifications	...	...	...	...	...	...
Total additions to stock	-	140,240.7	-	530,522.2	2,336,530.7	-
Reductions in stock						
Extractions	2,238,717.3	705,010.9	1,068,836.6	1,284,534.6	1,150,062.1	716,834.3
Catastrophic losses	...	...	...	...	...	...
Downward reappraisals	2,974,390.3	-	88,902.3	-	-	143,692.4
Reclassifications	...	...	...	...	...	...
Total reductions in stock	5,213,107.6	705,010.9	1,157,738.9	1,284,534.6	1,150,062.1	860,526.7
Revaluation of the stock	4,300,678.0	(9,280,860.3)	1,043,411.1	(303,865.6)	(537,108.1)	(3,275,839.3)
Closing stock of mineral resources	19,085,932.9	9,240,302.3	9,125,974.5	8,068,096.4	8,717,457.0	4,581,091.0

Source: PSA-CAR

Notes: Values may not add-up due to rounding.

(...) Data not available

(..) Not applicable

(-) Nil or Zero

Appendix B – United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009)

SEEA Classes		Corresponding UNFC-2009 Project Categories		
		E	F	G
		Economic and social viability	Filed project status and feasibility	Geological knowledge
Known Deposits	Class A: Commercially Recoverable Resources	E1: Extraction and sale have been confirmed to be economically viable	F1: Feasibility of extraction by a defined development project or mining operation has been confirmed.	Quantities associated with a known deposit that can be estimated with a high (G1), moderate (G2) or low (G3) level of confidence
	Class B: Potentially Commercially Recoverable Resources	E2: Extraction and sale is expected to become economically viable in the foreseeable future	F1: Feasibility of extraction by a defined development project or mining operation has been confirmed.	
			F2.1: Project activities are ongoing to justify development in the foreseeable future Or	
	Class C: Non-Commercial and Other Known Deposits	E3: Extraction and sale is not expected to become economically viable in the foreseeable future, or evaluation is at too early a stage to determine economic viability	F2.2: Project activities are on hold and/or where justification as a commercial development may be subject to significant delay Or	
			F2.3: There are no current plans to develop or to acquire additional data due to limited potential Or	
			F4: No development project or mining operation has been identified	

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