Constructing Adjusted Net National Income

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Date: April 6-8, 2015

Adjusting National Accounts Aggregates

How can the costs of using up or damaging the environment be reflected in national accounts aggregates (e.g., GDP, GNI, Gross Saving)?

One measure that the World Bank calculates:

- **Adjusted Net National Income** (ANNI)

Adjusted Net National Income

ANNI =

Gross National Income
- – Consumption of Fixed Capital
- – Depletion of Natural Capital *(Energy, Minerals, Timber)*

ANNI is a measure of the available income that can be consumed or invested to increase the nation's future consumption

ANNI is within the SNA asset boundaries

Measuring Adjusted Net National Income

Gross National Income	Sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.	
Consumption of Fixed Capital	Replacement value of capital used up in the process of production.	
Depletion of Natural Capital	Subsoil Depletion (10 minerals, 4 energy resources)	Estimated directly
	Net Forest Depletion	Estimated directly
Adjusted Net National Income (ANNI)	ANNI = Gross National Income – Consumption of Fixed Capital – Depletion of Natural Capital	

Gross National Income

Definition: GNI (formerly GNP) is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.

Data Requirements	Data Source
Gross National Income	*World Development Indicators, WDI http://data.worldbank.org/indicator/NY.GNP.MKTP.CD. Source: World Bank national accounts data, and OECD National Accounts data files.*

Gross National Income

GNI vs. GDP

- GNI = GDP + net income from abroad.
- GNI includes the value of all goods and services produced by nationals whether in the country or not.

WB uses national income rather than domestic product, as GNI is a more appropriate income measure in countries where largely foreign-operated extractive industries are substantial because payments to foreign-owned factors are often considerable

Gross National Income: Philippines

Philippines: GNI data available for 1960-2013

Metadata from *WDI* for the Philippines:

- Source for GNI and net income from abroad is changed to national statistical office from central bank.
- April 2012 database update: National accounts data were revised for 1998 onward. Because intellectual property products are now reported as a part of gross fixed capital formation, gross domestic product (GDP) in current prices averaged 4 percent higher than previous estimates.

Consumption of Fixed Capital

Definition: Replacement value of capital used up in the process of production.

- A standard item in the SNA, consumption of fixed capital (CFC) represents the "decline…in the current value of the stock of fixed assets owned and used by a producer as a result of physical deterioration, normal obsolescence or normal accidental damage" (UN 2008: 123). Fixed assets are limited to manufactured capital used in the production process and exclude natural assets such as land.

Data Requirements	Primary Data Source
Consumption of Fixed Capital	*UN Statistics Division, National Accounts Official Country Data, Tables 1.3 and 4.1, http://data.un.org*

Consumption of Fixed Capital: Philippines

Philippines: CFC data available (*UNData Table 1.3*) for 1963-2012

- WB gap-fills estimate for year 2013 by mimicking year-on-year trends in the Penn World Table (PWT) estimates of CFC/GDP.

World Bank Methodology for Gap-Filling

- Country-reported data from the UN and OECD are given first priority.
- Where UN/OECD data are unavailable, the Penn World Table (PWT) estimates are used.
- Where PWT estimates are unavailable, regression-based estimates are used.

Depletion of Natural Capital

What natural resources are included in the 2008 SNA asset boundary?

- Land
- Mineral and energy resources
- Non-cultivated biological resources (e.g., timber, fisheries)
- Water resources
- Other natural resources (e.g., radio spectra)

World Bank approach for ANNI covers:

- Mineral and energy resources (i.e., subsoil assets)
- Timber resources

What is Depletion?

(Monetary) depletion of natural resources:

- (Non-Renewable) The depletion of natural resources covers the reduction in the value of deposits of subsoil assets as a result of the physical removal and using up of the assets.

- (Renewable) The depletion of natural forests, fish stocks in the open seas and other uncultivated biological resources included in the asset boundary as a result of harvesting, forest clearance, or other use beyond sustainable levels of extraction should be included here.

Source: SNA 2008.

Why Measure Depletion?

- The SNA treats the gradual using up of produced capital - buildings, structures, machines and other equipment - as a **cost of production**

- However, in standard measures of income, the using up (depletion) of natural capital (e.g., mineral resources, forests, fish stocks), is not regarded as a cost of production

- Incomes generated from exploiting natural capital may appear high in the short term, but may not be sustainable in the long run

Depletion, a Component of Resource Rent

Table 5.4.1 Relationships between different flows and income components

Output (sales of extracted environmental assets at basic prices, includes all subsidies on products, excludes taxes on products)	
Less Operating costs	
Intermediate consumption (input costs of goods and services at purchasers' prices, including	
Compensation of employees (input costs for labour)	
Other taxes on production plus Other subsidies on production	
Equals **Gross Operating Surplus – SNA basis***	
Less Specific subsidies on extraction	
Plus Specific taxes on extraction	
Equals **Gross Operating Surplus – for the derivation of resource rent**	
Less **User costs of produced assets**	
Consumption of fixed capital (depreciation) + Return to produced assets	
Equals **Resource rent**	
Depletion + Net return to environmental assets**	

Source: SEEA, 2012

Natural Capital Depletion: WB Approach

As illustrated in following slides, WB takes a simplified approach to measuring depletion of natural capital.

- **WB methodology is constrained by the following objectives:**
  - Produce annual estimates
  - Global country coverage
  - Publically available datasets

[WB] Energy and Mineral Resources

Energy Resources

- Oil
- Natural Gas
- Hard Coal
- Soft Coal

Note on omitted resources:
We are limited by data availability, especially information on reserves and production costs, as well as time constraints in producing a global and annual data series.

Metal and Mineral Resources

- Bauxite
- Copper
- Gold
- Iron Ore
- Lead
- Nickel
- Phosphate
- Silver
- Tin
- Zinc

[WB] Energy/Mineral: Methodology

Calculations per commodity:

- **Resource Rents** = Production x Unit Rent
  = Production x (Unit Price – Unit Cost)
  - If Unit Rent < 0, then cap at 0.
- **Exhaustion time =** years to depletion (or, life of resource) (reserves/current production), capped at 25 years
- **"Wealth"** = Net Present Value of Resource Rents, discounted at 4%, over exhaustion time
  - Assumes that future rents are constant and equal to current rent
- **Depletion = "Wealth" / Exhaustion time**

[WB] Energy/Mineral : Data, Assumptions

Data Requirements (Annual)	Data Source (WB Methodology)
Production	*See following slides.*
Unit price	
Unit cost of production	
Cost trend	
Proven reserves	

Assumptions	WB Methodology
Cap on exhaustion time of resource	Twenty-five years (consistent across all wealth components)
Discount rate	4%

[WB] Energy/Mineral : Excel Exercise

See tab "Oil Exercise" [*ANNI_Philippines.xlsx*]

Instructions: With data provided, calculate <u>oil depletion</u>

- Helpful tip: Use Excel's PV function

- **Question**: What is the impact of capping the exhaustion time or keeping as is?

See tab "Phosphate Exercise" [*ANNI_Philippines.xlsx*]

Instructions: With data provided, calculate <u>phosphate depletion</u>

- What issues arise in this example?

[WB] Energy/Mineral : Data – Production

PRODUCTION	Frequency	Coverage	*Data Source(s)*
Oil, Natural Gas	Updated annually	Country-specific	*International Energy Agency (IEA), British Petroleum (BP), United Nations Monthly Bulletin of Statistics (UNMBS)*
Hard Coal, Soft Coal	Updated annually	Country-specific	*IEA, UNMBS*
Metals and Minerals: *Bauxite, Copper, Gold, Iron Ore, Lead, Nickel, Phosphate, Silver, Tin, Zinc*	Updated annually	Country-specific	*USGS Minerals Yearbook*

[WB] Energy/Mineral : Data – Price

UNIT PRICE	Frequency	Coverage	*Data Source(s)*
Oil, Natural Gas	Updated annually	World price	*World Bank's Global Economic Prospects (DEC)*
Hard Coal, Soft Coal	Updated annually	World price	*World Bank's Global Economic Prospects (DEC)*
Metals and Minerals: *Bauxite, Copper, Gold, Iron Ore, Lead, Nickel, Phosphate, Silver, Tin, Zinc*	Updated annually	World price	*World Bank's Global Economic Prospects (DEC)*

[WB] Energy/Mineral : Data – Cost

UNIT COST	Frequency	Coverage	*Data Source(s)*
Oil, Natural Gas	Estimates derived from lit review; not updated	Country-specific (limited), and region-specific	*OPEC Review Al-Attar and Alomair (2005), IMF World Economic Outlook 2005*
Hard Coal, Soft Coal	Estimates derived from lit review; not updated	Country-specific (limited), and region-specific	*Various country case studies*
Metals and Minerals: *Bauxite, Copper, Gold, Iron Ore, Lead, Nickel, Phosphate, Silver, Tin, Zinc*	Estimates derived from lit review; not updated	Country-specific (limited), and region-specific or country proxy	*U.S. Bureau of Mines: various country estimates*
Cost trend (Energy): Trend in average costs from 5 major oil and gas companies	Updated annually		*OPEC Annual Statistical Bulletin*
Cost trend (Minerals): Manufactures Unit Value (MUV) index	Updated annually	World index	*World Bank's Global Economic Prospects*

[WB] Energy/Mineral : Data – Reserves

RESERVES (proven)	Frequency	Coverage	*Data Source(s)*
Oil, Natural Gas	Updated annually	Country-specific (major producers); missing countries use regional figures	*BP Statistical Review of World Energy*
Hard Coal, Soft Coal	Years 2005, 2008, 2011	Country-specific	*U.S. Energy Information Administration (EIA)*
Metals and Minerals: *Bauxite, Copper, Gold, Iron Ore, Lead, Nickel, Phosphate, Silver, Tin, Zinc*	Updated annually	Country-specific (major producers); missing countries use "Other" category	*USGS Minerals Yearbook/ Commodity Summaries*

Energy/Mineral Reserves

SEEA: Mineral deposits are classified according to:

- Economic and social viability
- Field project status and feasibility
- Geological knowledge

Knowledge deposits are categorized into three classes:

- Class A: Commercially Recoverable Resources
- Class B: Potentially Commercially Recoverable Resources
- Class C: Non-Commercial and Other Known Deposits

For valuation, SEEA methodology uses **Class A: Commercial Recoverable Resources**. WB also uses proven reserves

[WB] Energy and Mineral Depletion: Suggested Improvements

Extraction costs ideally assessed at the mine-level

- Problems with unit cost (average) approach
- But significant data challenges for WB objectives of annual estimates

Expand beyond proven reserves for estimation of exhaustion time

- BUT careful to be consistent with SEEA

Remove 25 year cap on exhaustion time

Expand list of commodities (e.g., diamonds, platinum metals)

Further analysis and recommendations:

- *Recent Scoping Report*

Energy and Mineral Depletion: Philippines

In WB database, production data (therefore valued) for:

Oil, natural gas, hard coal, soft coal

Copper, gold, nickel, phosphate, silver, zinc

WAVES: Mineral Accounts

Status and progress?

Timber Resources

Forest resources are renewable, making them fundamentally different from non-renewable resources.

- Because forests can regrow, the extraction of wood is not necessarily a disinvestment in the future.
- What is a disinvestment is **unsustainable extraction of wood** beyond natural rates of forest growth and resource replacement

Depletion of Timber Resources

Depletion of forest resources is the value of that portion of wood extraction which exceeded natural incremental growth in the country for a particular year.

- If natural incremental growth is greater than timber harvest in a given year, then net forest depletion is zero.

Forest depletion should not be confused as being a monetary value of deforestation. The harvesting of timber is different from deforestation, which represents a permanent change in land use.

[WB] Net Forest Depletion: Methodology

Calculations:

Revenue ($) = Production x Unit Price

Resource Rent ($) = Revenue x Rental Rate, where

- Rental Rate = (Unit Price – Unit Cost) / Unit Price

Unit rent ($/m3) = Resource Rent / Production

Natural Growth (m3) = annual commercial increment x forest productive area

Overharvest (m3) = Production – Natural Growth

- If negative, then replaced with 0.

Depletion ($) = Overharvest x Unit Rent

[WB] Net Forest Depletion: Data

RENT	Frequency	Coverage	Data Source(s)
Annual Production (3 categories: industrial roundwood (coniferous), industrial roundwood (non-coniferous), wood fuel) (m3)	Updated Annually	All countries	*FAO*
Unit Price per wood category (export value/ export quantity) ($/m3)	Updated Annually	All countries	*FAO*
Rental Rate **(PHL: 39.2%)**	Based on previous literature review	Regional (derived averages of country case studies)	*Fortech, 1997; Whiteman, 1996; Tay et al, 2001; Lopina et al, 2003: Haripriya, 1998; Global Witness, 2001; Eurostat, 2002.*

[WB] Net Forest Depletion: Data

NATURAL GROWTH	Frequency	Coverage	Data Source(s)
Forest Productive Area (ha)	Updated every five years	All countries	*Table 7: Designated functions of forest – total area with function 2005. Source: Global Forest Resources Assessment (FRA), FAO*
Annual Commercial Increment (m3/ha/yr) **(PHL: 1.5)**	Based on previous literature review; not updated since	All countries	*Source: "Potential Productivity" map (Figure 2.3, A. Mather, Global Forest Resources, Belhaven Press, London, 1990) and other country specific studies and data sources; under the guidance of a WB forestry expert.*

[WB] Net Forest Depletion: Excel Exercise

See tab "Net Forest Exercise" [*ANNI_Philippines.xlsx*]

Instructions: With data provided, calculate net forest depletion

- **Question**: If countries have zero net forest depletion by our methodology, does this mean there is zero deforestation?
- **Question**: Within this simple framework, what actions (aside changes in prices and costs) would reduce net forest depletion?

[WB] Net Forest Depletion: Suggested Improvements (near future)

Improve price estimates associated with timber production

- Use country domestic prices

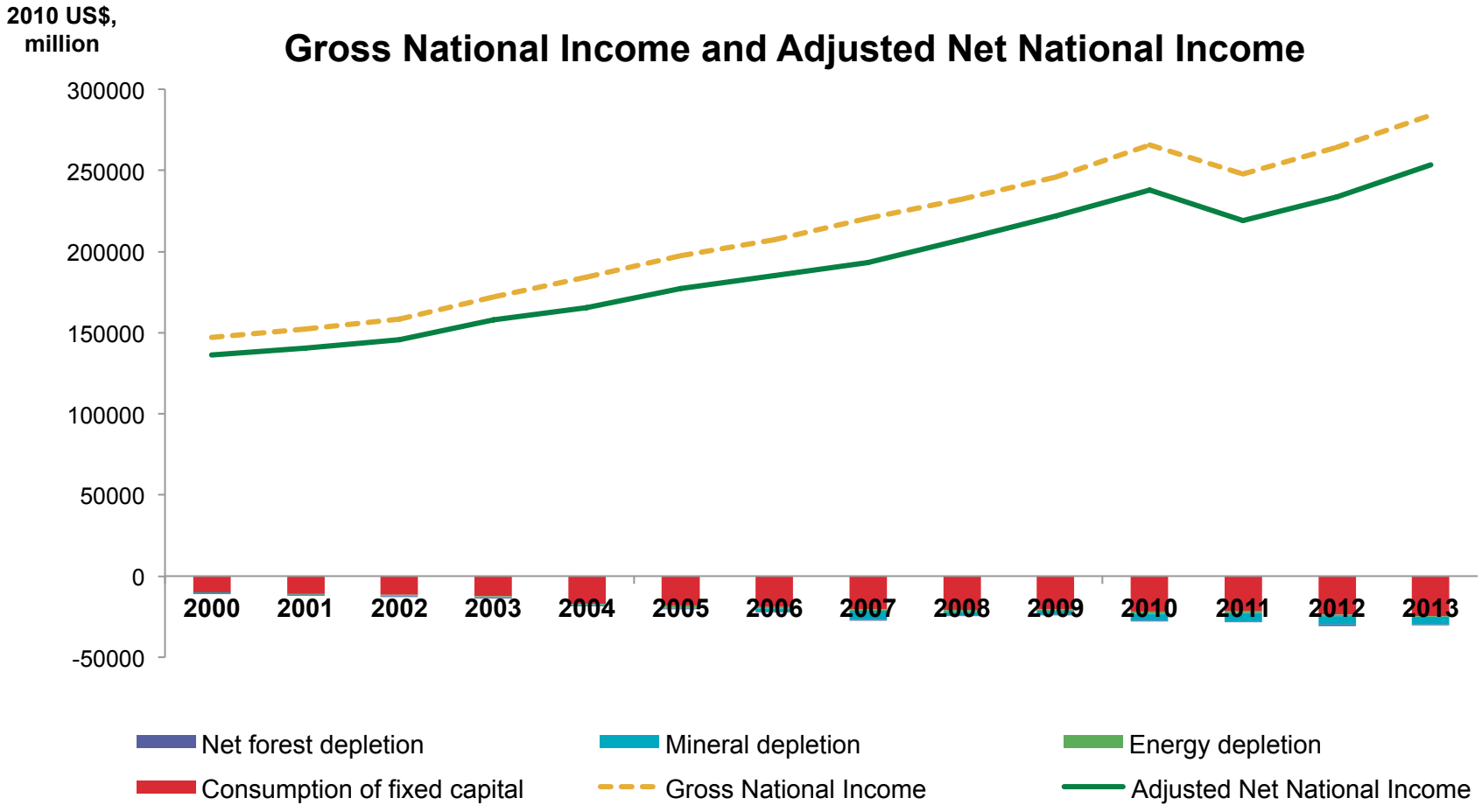
Improve country-specific rental rates

- GTAP model results

***Further analysis and recommendations**:*

- *Recent Scoping Report*

WB Estimates for Philippines (prelim)



Questions?