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NATURAL RESOURCES ACCOUNTING AND THE SYSTEM OF NATIONAL ACCOUNTS *

by

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Abstract

This paper looks at current efforts on building into the System of National Accounts (SNA) framework the emerging environmental and natural resources concerns. The paper also provides a draft framework for adjusting the economic measures provided for in the Philippines System of National Accounts (PSNA) for the use of non-marketed environmental and natural resource assets.

1. INTRODUCTION

The System of National Accounts (SNA) has long been accepted as one of the most important inventions of the twentieth century. The SNA integrates into one rationale framework the complex interaction among various economic factors.

In recent years, however, criticisms have been made regarding the weaknesses of the SNA. One group, primarily concerned with welfare measurements, has pointed out that the economic measures derived from the system (GDP, GNP, NDP, NNI, NDI, etc.) do not provide an accurate account of the real extent of welfare that accrues to the individual members of society. This group, represented by Pyatt and Thorbecke (1976), came out in the mid-70's with some concrete proposals to extend the SNA framework. Suggested was the inclusion of certain target groups and provision of constructs that will help monitor changes in their living standards over time. This extended SNA framework is the Social Accounting Matrix (SAM).

Another group, consisting mostly of resource economists, environmentalists and ecologists, argued that the GNP or GDP, as a measure of growth and development, sometimes provides wrong information to policy and decision makers. This is particularly true for economies which are highly dependent on the exploitation of resources coming from nature. This new school of thought noted that the present SNA structure is confined to providing purely economic indicators. As such, 'policy advice based on measurements produced under SNA can be faulty to the extent that GDP does not adequately reflect environmental and natural resource erosion' (EL Serafy 1989). This group has actively pursued this argument during the past two decades. Starting in the mid-eighties, the number of literature on environmental accounting has literally flourished.

While both schools express the same concern about incorporating the environmental factors into the economic arena in order to come up with a more realistic measure of 'sustainable income', students of the

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new school have yet to come to a common ground to achieve a real breakthrough. Norgaard (1989) surmised that the solution will be in sight as soon as the three dilemmas besetting the integration of the environmental system with the economic accounts are resolved. He identified these three dilemmas: a) inconsistent SNA, b) value-aggregation, and c) bounded knowledge-synthesis. He argued that the desired modification and/or supplemenatation of the SNA will come about through an evolutionary process. He thus encourages more experimentation using multiple approaches and sharing of experiences until a consensus on the 'best' method is reached.

2. A CURSORY REVIEW OF RECENT EFFORTS TOWARDS INTEGRATING ENVIRONMENTAL ACCOUNTS INTO THE SNA

The more active disciples of this new idea, Repetto (1989), El Serafy (1989; 1991), Peskin (1989, 1990, 1991), Vanoli (1991) and Boo et al. (1991) have each come up with their own concrete proposals on how to modify the SNA to account for effects of the environmental concerns on the economic development of the country. (There are other notable authors who have come up with excellent discussion on how environmental depletion and degradation could be integrated with the SNA. The above authors however, are singled out here because of the closeness of their ideas to what the Natural Resources Accounting Project (NRAP) wants to pursue.)

Peskin and Vanoli appear to have the edge in that they were able to demonstrate how the environmental concerns could be integrated into the overall SNA framework (in the Production Accounts, most especially). Peskin has the distinct advantage of coming up with proposals on how to monetize the effects of the environment thus facilitating its integration with the traditional SNA measurements.

Boo *et al.* (1991), on the other hand, attempted to demostrate a more comprehensive approach of integrating the environmental account into the SNA. The interesting aspect of their work is their attempt to use the SAM approach in suggesting a solution to the subject matter on hand. They demonstrated the integration through the use of a system of matrix which they call the National Accounts Matrix with the Environmental Account (NAMEA). The authors also provided a satellite make and use matrix showing the flows of the various environmental control costs from one economic transactor to the other. Unfortunately, the authors, in their illustration of the NAMEA, limited themselves to showing the 'physical' transactions for the environmental account. They did not attempt to impute any monetary value to these transactions. Thus, in a way, the 'integration' is still considered incomplete/inadequate.

Repetto and his World Resources Institute group, in their work in Indonesia, China and Costa Rica, attempted to come up with a suitable approach to estimate depreciation costs for the exploitation of natural resources in order to correct the NDP.

El Serafy (1991) meanwhile, advanced a different view on the treatment of exploitation of natural resources. He argued that natural resources should be treated more as a stock rather than as a capital asset. He advanced three arguments to pursue his point. First, he said that natural resources like forests, mineral and water resources are there to be exploited. Secondly, while fixed capital is a product of previous income flows (savings converted into investment), natural capital is by its very nature a creation of nature. The human contribution in discovering and locating it is not at all on a comparable scale to the human cost incurred in the formation of fixed capital. Finally, he said that fixed capital is not normally intended to be sold but is only used as a means to produce new goods and services. Resources like forest trees, minerals and fishes are considered inventories from nature which are either used up or traded in the normal course of business operations.

Thus, if El Serafy's thesis is accepted, the exploitation of the assets from nature could be directly traced in the flow of output in the SNA matrix as a change in the inventory, not as depreciation as espoused by Repetto. This will result in the direct adjustment of the GDP instead of the NDP as in the Repetto model.

There is however, one disturbing aspect in El Serafy's thesis. If he considers depletable resources as inventories instead of fixed capital and thus exploitation of the resource will result in the withdrawal from the inventories, this will be registered as a negative change in stocks in the accumulation account of the SNA. An examination of his model however, tends to indicate that the amount that enters into the accumulation account should always be positive as shown below (El Serafy 1991; p.7):

$$1\text{-}X/R = 1/(1+r)^{n+1}$$

where: X = true income
R = receipts from sale (net extraction costs)
r = interest rate
n = life expentancy of the resource at current extraction rates

The ratio X/R under normal conditions will be less than unity and as such the left side of the identity will almost always yield a positive number. The same condition can be said with respect to the right side of the identity.

Peskin, meanwhile has a more comprehensive approach to the accounting of the environment. Instead of focusing only on the the estimation of the depreciation of the environment, he added an entirely new dimension to the role of the environment on the economic accounts. Aside from the traditional components of the Production Account, Peskin (1990) added a new set of account which he calls the Nature Account. He accomplishes this by simply looking at the environment as an independent transactor which provides and makes use of (absorbs) services. In his model he shows Nature as the primary source of all environmental asset services and the final consumer of environmental damages. In so far as the other transactors are concerned, environmental services being 'free' are treated as if they are a subsidy in their respective accounts. Similarly, environmental damages are reflected as negative entries in the use side of the account. Since environmental services and environmental damages are not of the same magnitude, a balancing item is included in the account in the form of net environmental benefit.

Vanoli (1991) also pursues an idea parallel to Peskin's. However, while Peskin views environmental services and environmental damages as not exerting an equal effect on the economic factors, Vanoli, on the other hand, treats these two factors as co-equal.

In a later paper, Peskin (1991) made a distinction between environmental waste disposal service and 'final consumption' of non-marketed environmental services. The latter consists mostly of the value of the recreational benefits derived by the consumer (e.g. household) from the environment resource.

Peskin looks at environmental depreciation as simply the change in the values of the environmental and natural resource assets over the accounting period which is synonymous to the concept of revaluation as proposed in the 1991 revision of the SNA.

What makes Peskin's approach more attractive than that espoused by Repetto is that, similar to the thrust of the development efforts of El Serafy, Peskin has apparently succeeded in coming up with a workable scheme that will correct the GDP instead of the NDP. He approaches the issue by taking a view that environmental services is not, in general, equal to environmental damages. In his Nature Account, he introduces the Net Environmental Benefit (NEB) as the balancing item between services and damages. Under Peskins's approach, this NEB together with the environmental depreciation will provide the measure that will correct the GDP to account for the contribution of the environment to the economic system. This is an important consideration because as El Serafy (1989) pointed out GDP is often used as a denominator for crucial macroeconomic rations (for numerators like money supply, debt service, external trade, capital formation,etc.).

3. PROPOSED MODIFIED NATIONAL ACCOUNTS MATRIX WITH THE ENVIRONMENTAL ACCOUNTS (NAMEA)

While there is no universally accepted approach on how the environment could be reconciled with the economy, the new sets of literature on this subject provide various options for proceeding with the research. For the Philippine exercise, an option that is being considered is to try to combine the good aspects of the Boo *et al.*, Peskin and El Serafy models.

In order to immediately appreciate the interrelationships of the SNA and the NRA, the NRAP is presenting the Philippine version of a modified SNA with the NRA through a matrix format. The Philippines National Accounts Matrix with Natural Resources Accounts (Phil-NAMNRA) will be built up by adopting the combined features of the ideas presented by Boo *et al.* (1991), the Peskin approach and El Serafy's views on the exploitation of natural resources. The 19x19 Phil-NAMNRA is presented in the accompanying table. This model is highly flexible and may be expanded to a larger matrix during the Phase II of the Project.

Consistent with the focus of Phase I of the NRAP, the draft Philippine NAMNRA will highlight Forestry. Once all conceptual gray areas are cleared, the Phil-NAMNRA may be expanded to provide a framework for monitoring the effects of economic developments and exploitation of natural resources on selected target population groups as demonstrated in the experimental SAM tried by the now defunct Statistical Coordination Office of NEDA in 1978.

The Phil-NAMNRA highlights five major transaction accounts, namely:

a. Goods and Services Account
b. Production Account
c. Income Distribution and Use Account
d. Accumulation Account
e. Environment Account

The framework also provides for the extension into a national balance sheet. Indirect taxes are separately shown in matrix form to show how these taxes impact on the different transactions. In addition, a notional sector is added to accommodate the concept of user cost espoused by El Serafy.

Goods and Services Account

The Goods and Services Account (**rows and columns 2-5**) are partitioned into four sub-accounts: Forestry Product Account (**row and column 2**), Other Goods and Services Account (**row and column 3**), Household Produced Goods and Services Account (**row and column 4**) and Environmental Goods and Services Account (**row and column 5**).

The summation of cell entries in any given column represents the total output of goods and services attributable to said column (source). The distribution (use) of total goods and services is shown in the flow across a particular row. Thus, total forestry output is traced as the sum of all cell entries in **column 2** while the outflow of this same output is reflected in the **row 2** transactions.

The total forestry output (**col 2**) comes from four sources: the forestry industry (**6,2**), the household (**8,2**), the rest of the world (**12,2**) and the environment (**18,2**). The forestry industry provides the bulk of the forestry products resulting from forest cultivation activities such as reforestation, afforestation and harvesting including all man-made damages and deforestation. Aside from forestry products, the industry

THE PHILIPPINES NATIONAL ACCOUNTING MATRIX WITH NATURAL RESOURCES ACCOUNT

Account (Classification)			Opening Balance Sheet	Goods & Services				Producers			Income Distribution and Uses		
				Forestry Products	Other Goods & Services	Household Produced Goods & Services	Environmental Goods & Services	Forestry	Other Production Activities	Household Activities	Primary Income Distribution	Secondary Income Distribution	Use of Income
			1	2	3	4	5	6	7	8	9	10	11
Opening Balance Sheet		1											
Goods and Services	Forest Product	2		Trade & Transport Margins				Man-made Damages and warsare	Intermediate Consumption				Personal & Government Consumption
	Other Goods and Services	3											
	Household Produced Goods & Services	4											
	Environmental Goods & Services	5											Net Environment Benefit
Production	Forestry	6		Forestry Output (basic prices)	Non-forest output								
	Other Production Activities	7			Other Output (basic prices)								
	Household Activities	8		Firewood & Fuel		Other Household Output							
Income Distribution and Use	Primary Distribution of Income	9						Net Domestic Product (factor cost)					
	Secondary Distribution of Income	10						Consumption of Fixed Capital			Net National Income (mkt price)		
	Use of income	11										Gross Disposable Income	
Rest of the World		12		Imports							Factor Income to ROW	Current Transfers to ROW	
Indirect Taxes Less Subsidy		13		Net Gross Prod Tax (Value Added Tax)				Net Other Production Tax					
Accumulation	National	14	Net Worth										Gross Savings
	Rest of the World	15											
	Financial Asset	16	Liabilities										
National Sector		17						User Cost					
Environmental Resources		18		Natural Growth			Environmental Services						
Balance Sheet Closing Stock		19											

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THE PHILIPPINES NATIONAL ACCOUNTING MATRIX WITH NATURAL RESOURCES ACCOUNT(Cont .)

Account (Classification)			Rest of the World	Indirect Taxes Net of Subsidy	Accumulation: National	Accumulation: Rest of the World	Accumulation: Financial Asset	National Sector	Environmental Resources	Balance Sheets Closing Stocks
			12	13	14	15	16	17	18	19
Opening Balance Sheet		1			Nonfinancial Asset		Financial Assets		Environmental Assets	
Goods and Services	Forest Product	2	Exports		Aforestation				Stand Mortality Other natural causes	
	Other Goods and Services	3			Gross Capital Formation					
	Household Produced Goods & Services	4								
	Environmental Goods & Services	5							Environmental Damages	
Producties	Forestry	6						Capital Reserve		
	Other Production Activities	7								
	Household Activities	8								
Income Distribution and Use	Primary Distribution of Income	9	Factor Income from ROW	Net Indirect Tax						
	Secondary Distribution of Income	10	Current Transfers from ROW							
	Use of Income	11								
Rest of the World		12								
Indirect Taxes Less Subsidy		13	Specific Taxes		Net Investment Tax					
Accumulation	National	14				Capital Transfers from ROW	Borrowing			Net Worth
	Rest of the World	15	Balance of Payments		Capital Transfers to ROW		Net Lending to Abroad			
	Financial Asset	16			Lending					Liabilities
National Sector		17								
Environmental Resources		18							Environmental Depreciation	
Balance Sheet Closing Stock		19			Non-financial Assets		Financial Assets		Environmental Assets	

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also produces non-forestry products (e.g., agricultural goods and services) (**6,3**). Likewise, the household as a producer, contributes to the forestry output mostly in the form of firewood and other minor forest products. The rest of the world through imports provides additional supply of forest products to the domestic market. Finally, the environment itself, contributes additional forest outputs via natural growths of trees. All these outputs are valued at basic prices. These are brought to market prices through the addition of production taxes (**13,2**) and trade and transport margins (**2,2**).

The distribution of the total forestry output is presented in the outflow transactions (**row 2**). **Row and column 2** reflects the trade and transport margin. However, since the outflow transactions are valued at purchasers price, the trade and transport margin cell is zero (**2,2**). Cell (**2,6**) shows the portion of the forestry output absorbed by the forestry industry. This will principally consist of forestry products used as intermediate input, logging wastes and other man-made forestry damages which are left in the forest by the loggers. Final consumption of forest products takes the form of households and government consumption (**2,11**); exports of forest products (**2,12**); and capital accumulation in terms of afforestation, change in forest inventories and fixed capital formation (**2,14**). Stand mortality and other reduction due to natural causes are reflected as absorbed by the environmental resources (2,18).

The Other Goods and Services (**row and column 3**) and the Household Produced Goods and Services (**row and column 4**) Accounts would have similar entries as in the Forest Product Account except for exclusion of any input from the environmental resources. It may also be noted that the non-forest product output of the forestry industry is added on as additional source of other goods and services. Gross capital formation (**3,14**) is limited to fixed capital formation and change in stocks.

The Environmental Goods and Services Account will reflect the source and use of environmental resources. Cell (**18,5**) shows the principal output of the environment as environmental services. Peskin (1991) distinguishes two kinds of services. The first principally consists of environmental waste services and the other is a group of non-marketed environmetal services generally used for recreational and/or aesthetic purposes. Part of this output from the environment will be used by the producing sectors of the economy in the form of intermediate input **[(5,6),(5,7),(5,8)]**. Some industries actually pay for the use of this environmental output which may result in the depletion of resources or deterioration of the quality of the environment. The industrial expenditures that help arrest the deterioration of the environment is known as defensive expenditures and are incorporated in the industry's intermediate input costs. As a result of the absorption by the industry, government and households of the environmental services, the environment suffers stresses resulting ultimately in the depletion, deterioration or degradation of the environment. These "bads" are reflected as environmental damages which are all absorbed by the environment itself (**5,18**). The difference between the environmental sources of goods and services and the disposition is balanced by a net environmental benefit entry (**5,11**) under the Income Distribution and Use Account. If this item is positive, it is an indication that the using sectors positively harness the environmental resources they exploit during the accounting period. A negative NEB indicates net environmental deterioration for the period. These Accounts basically follow the concepts articulated by Peskin in his papers on this subject.

Production Accounts

The Production account matrix of the Phil-NAMNRA (**rows and columns 6-8**) distinguishes, initially, three production sectors: forestry, household, and other producers.

Forestry industry (**row 6**) generates both forest (**6,2**) and nonforest (**6,3**) goods and services. In addition, a capital reserve (**6,17**) is deemed to accrue to the notional sector. This capital reserve is the contra entry of the user cost (**17,6**) in the notional sector row. This is treated in the same fashion that consumption for fixed capital is treated in the standard accounting practices. The capital reserve is a negative entry which effectively reduces the level of output of the forestry industry. In the course of producing these goods and services, the forestry industry (**column 6**) absorbs goods and services from

other producers and are registered as intermediate inputs **[(2,6), (3,6), (4,6), (5,6)]**. The industry absorbs additional output from itself aside from those that are used as intermediate input in the form of logging wastes and other man-made damages **(2,6)**. The industry also makes use of the factors of production (land, labor, capital) and pays for them (compensation, rent and other operating surplus) as the industry's contribution to the domestic product at factor cost **(9,6)**. An amount is set aside for the consumption of fixed capital **(10,6)** which when added to the forestry NVA will convert it to GVA at factor cost. The production tax net of subsidy is reflected in cell **(13,2)**. If this is added to the forestry GVA as described above one will get the GVA at market price. The sum of the GVAs valued as such from the other producing sectors will give the country's Gross Domestic Product (GDP).

Following El Serafy's thesis, a user cost is charged against the forestry output to provide for 'sustainable' forestry growth. In the Phil-NAMNRA this user cost is credited as an output of a notional sector and is considered as a subsidy to the forestry industry. It is therefore included as a negative entry in the forestry industry column **(17,6)**. This will result in the desired correction by El Serafy on the economic contribution of industries dependent on the exploitation of depletable resources as the user cost will result in the lowering of the forestry GVA. As pointed out in the preceding paragraph, the user cost is counterbalanced by the capital reserve entry in cell **(6,17)**. The capital reserve has the same effect as the consumption of fixed capital.

Recalling El Serafy's formula, the user cost is equal to the capital reserve and is also expressed, in the case of the forestry sector, as:

$$\text{Forestry GVA (R) - true forestry income (X)} = \text{forestry GVA} / (1 + r)^{(n+1)}$$

where: r is the rate of discount and
n is the number of periods the resource is to be liquidated.

In El Serafy's papers he assumes r to be an arbitrary value (he suggests the use of 5 percent). The NRAP does not necessarily believe this to be so. If r is made analogous to the cost of money at any given point in time, then r could be made equivalent to the change in the GDP IPIN.

The household as an economic producer is highlighted in the Phil-NAMNRA in view of the perceived important role it plays in the economy in general, and in the forestry sector, in particular. However, unlike in Boo *et al.* (1991) where a household was treated to be producing goods and services purely for own consumption, the Phil-NAMNRA looks at the household in a broader perspective. The household here represents the unorganized sector of the economy which generates goods and services on commercial as well as subsistence levels. The household (row 8) is shown here as contributing to the forestry industry by producing forest products consisting mostly of firewood and minor forest products (8,2). In addition, it also produces other goods and services credited as household produced goods and services (8,4). The valuation of the output of the household as a producer follows the same pattern as the other services that compete with the outputs of the organized industries. The cost structure of the household production processes may however differ form their counterpart industries.

Income Distribution and Use Accounts

This submatrix of the Phil-NAMNRA presents the income flows. The new SNA distinguishes distribution between primary income and secondary income. The aggreagate of the primary income row **(row 9)** represents total origin of primary income while the column total **(column 9)** shows destination of primary income. Along the primary income row, the major component is the net domestic product (NDP) valued at factor cost. NDP here is the sum of the different NVAs of the resident economic

transactors [(9,6) + (9,7) + (9,8)]. The rest of the primary income come from factor income flows between resident units (9,9) (suppressed in the Phil-NAMNRA model), factor income from the rest of the world (9,12), and net indirect taxes (9,13) which accrue to the government. This is balanced in the disposition column (**column 9**) as follows: factor income flows between resident units (9,9), net national income at market price (NNI) (10,9) and factor income flow to the rest of the world (12,9). NNI here is equal to NDP plus net indirect tax plus net factor income from abroad.

The NNI reappears in the row of secondary income flow together with the allowance for consumption of fixed capital [(10,6), (10,7)], current transfer between resident units (10,10) (suppressed in the Phil-NAMNRA) and current transfers from the rest of the world (10,12). The disposition of secondary income (**column 10**) consists of the current transfers between the resident units (10,10), current transfer to the rest of the world (12,10) and the gross disposable income (GDI) (11,10). GDI is equal to NNI plus net current transfers from the rest of the world plus capital consumption allowance.

GDI is credited along the use of income row (**row 11**). The contra entries for the same column (**column 11**) represent expenditures against GDI consisting of final household and government consumption expenditures [(2,11), (3,11), (4,11)], gross savings (14,11) and net environmental benefit (5,11). Gross savings is the balancing item for this account.

3.4 Accumulation Accounts

The accumulation accounts consist of three sub-accounts, namely: the domestic (national) economy, rest of the world and financial sector. Sources of total nonfinancial accumulation for the national economy (**column 14**) comes from gross capital formation including afforestation [(2,14), (3,14)], capital transfers to the rest of the world (15,14), domestic lending (16,14) and net invest tax (13,14). These accumulation are financed (**row 14**) through savings (14,11), capital transfers from the rest of the world (14,15), and domestic borrowing (14,16).

Environmental (Nature) Account

The Environmental Account follows closely the Nature Account of Peskin except for the inclusion of the Stand Mortality (2,18) and Natural Growth (18,2) in the Source and Use sides of the Account, respectively. Stand mortality and natural growth, while forming part of the disposition and output of the forestry sector, are distinguished from the traditional economic forces that affect the production and disposition of forestry goods and services. These two items represent the environment's inherent contribution to the forestry goods and services accounts.

The basic environmental goods and services output of the environmental resource is represented by the environmental service (18,5). Peskin (1991) describes environmental service as consisting of waste disposal service coming from air, water and land and other non-marketed services which have recreational and/or aesthetic values. In the case of the forestry sector, some of its environmental services are: a) the role of forestry as a watershed area, b) forest trees as natural filter to provide the citizenry with clean air, c) wildlife sanctuary, d) recreational services for nature lovers, etc. Similarly, some of the environmental/ ecological values of mangroves are: a) nearshore nutrient enrichment, b) breeding grounds for aquatic and marine resources, c) shoreline stabilization and protection (Zamora 1981).

As a consequence of the use of these environmental services, the environment absorbs as its final consumption environmental damages in the form of air and water pollution, soil erosion, ecological imbalances, etc. All these stresses are reflected in the Phil-NAMNRA as environmental damages (5,18).

Following an analogy with capital assets, the use of environmental resources will result in changes in the environmental balance resulting in the change in the value of the environment. Peskin views this

Consolidated Account I. GROSS DOMESTIC PRODUCT AND EXPENDITURE	
1. Compensation of employees	8. Personal consumption expenditures
2. Operating surplus	9. Government consumption expenditures
NET DOMESTIC PRODUCT	10. Gross capital formation
(factor cost)	a. fixed capital formation
3. Net indirect taxes	b. increase in stock
NET DOMESTIC PRODUCT	11. Exports of goods & services
(market price)	12. less: imports of goods and services
4. Consumption of fixed capital	
GROSS DOMESTIC PRODUCT	EXPENDITURE ON THE GROSS DOMESTIC PRODUCT
5. User cost for natural resources (-)	13. Natural resource capital reserves (-)
MODIFIED GROSS DOMESTIC PRODUCT (I)	MODIFIED EXPENDITURE ON THE GROSS DOMESTIC PRODUCT (I)
6. Environmental Services (-)	14. Environmental Damage (-)
7. Environmental depreciation	15. Net environmental benefit
	16. Environmental depreciation
MODIFIED GROSS DOMESTIC PRODUCT (II)	MODIFIED EXPENDITURE ON THE GROSS DOMESTIC PRODUCT (II)

Consolidated Account II. NATIONAL DISPOSABLE INCOME AND ITS APPROPRIATION	
1. Personal Consumption expenditures	5. Compensation of employees
	a. from resident producers
2. Government consumption expenditures	b. from rest of the world
	c. less: to rest of the world
3. Saving	6. Net operating surplus
	a. from resident producers
	b. from rest of the world
	c. less: to rest of the world
	7. Net indirect taxes
	8. Current transfer
	a. from rest of the world
	b. less: to rest of the world
APPROPRIATION OF NATIONAL DISPOSABLE INCOME	NATIONAL DISPOSABLE INCOME
4. Net environemental benefit	9. Net environmental benefit
MODIFIED APPROPRIATION OF NATIONAL DISPOSABLE INCOME	MODIFIED NATIONAL DISPOSABLE INCOME

Consolidated Account III: GROSS ACCUMULATION			
1.	Gross capital formation	5.	Institutional savings
	a. fixed capital formation		a. Corporation
	b. Increase in stock		b. General government
2.	Net lending to ROW		c. Households and uninc. enterprises
	GROSS ACCUMULATION		FINANCE OF GROSS ACCUMULATION
3.	Natural resources capital reserves (-)	6.	User cost for natural resources (-)
4.	Environmental depreciation	7.	Environemental depreciation
	MODIFIED GROSS ACCUMULATION		MODIFIED GROSS ACCUMULATION

change in the value of the environment as equivalent to the depreciation charges for fixed capital assets and he consideres this as the environmental depreciation. Following Peskin's model, environmental depreciation will appear on both sides of the Account.

Using the conventional T-account format, the proposed modifications in the three major consolidated accounts of Philippine System of National Accounts are presented in the following tables.

4. MODIFICATIONS IN THE FORESTRY ACCOUNT OF THE PSN

A major contribution of the NRAP to the PSNA work is the expansion of the details for the Forestry Sector of the Accounts. Hence, given the experiences gained from the NRAP, modification of the details of presentation of the Forestry Sector in the PSNA is therefore recommended. The modification will allow a more disaggregated forestry production account. The disaggregation will be along industrial subsectoring as currently followed in the other economic sectors included in the national account. The modified forestry production account will thus show separate gross value added estimates for a) dipterocarp forests, b) pines, c) plantations, d) mangrove and e) rattan. Moreover, households as distinct production unit will also be highlighted. As such, the contribution of households to the forestry industry via firewood gathering and production of minor forestry products will be separately shown.

The modified forestry production account will have the following suggested format:

GVA Forestry

1. Dipterocarp forest
   a. Red lauan
   b. White lauan
   c. Heavy woods
   d. Other dipterocarp logs
2. Pine forest
3. Mangrove forest
4. Rattan
5. Plantation forest
6. Fuel and firewood, nes
7. Other forest products

Dipterocarp forest is the major industrial subdivision of the forestry sector. It provides the bulk of logs and timber supply available in the domestic market. Prior to the restriction on exports, the dipterocarp forest also provided the major source of foreign revenues for the country through the foreign exchange earnings realized from log exports. The tree families found in dipterocarp forests are represented by 6 genera, 39 species and 9 subspecies. The commercial logs produced from the trees are grouped into three major types, namely:

Red lauan group. These are species prominent for their dark red to light pink color. They are more popularly known as the Philippine Red Mahogany. Among the major species under this group are the red lauan (*shorea negrosensis*), tanguile (*shorea polysperma*), tiaong (*shorea agsaboensis*) and mayapis (*shorea squamata*).

White lauan group. These species are characterized by their white to grayish color. White lauan (*pantacme contorta*), almon (*shorea almon*), and bagtikan (*parashorea plicata*) are the major species in the Philippine forests that belong to this group.

Heavy woods. The logs derived from this group are known for their durability and hardness; thus, they are best suited as construction materials. Among the species that belong to this group are: guijo (*shorea guiso*), manggasinoro (*shorea philippinensis*), and apitong (*dipterocarpus grandilorous*).

Pine forest consists of logs and resins derived from the Benguet and Mindoro pine species.

Mangrove forest includes forest products derived from bakauan, pototan, langarai, api-api, nipa palm and other related species. These forest products include timber/log, fuelwood and charcoal, nipa shingles, leaf midribs, nipa-based vinegar and others.

Rattan has in recent years, been a popular source of raw material for the furniture industry. Rattan exports has boosted the foreign exchange coffers of the Philippines. There are four known genera in the Philippines: calamus (48 species), daemonorops (14 species), korthalsia (5 species), and pletocomia (2 species).

Plantation forest includes forest products derived from cultivated forests. The species generally planted in the plantation areas are: fast growing (e.g., gmelina, moluccan sau), premium (narra, mahogany, apitong), and endemic species (kakawate, acacia).

Other forest products are all other marketable products found in the forest. These include buri midribs; diliman, nito and logtong vines; hingiw vines; honey; orchids; salago bark; palma brava leaves and trunks and miscellaneous firewood.

The expansion in the details for the forestry sector will inevitably exert pressure on the statistical system to provide a more detailed production statistics for these forestry subsectors. Moreover, the availability of periodic cost structures will also become a necessity in order that more meaningful value added ratios for each subsector could be computed and periodically updated. Even the forestry price data will need further expansion.

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