



## The Supply and Use Framework - understanding its importance

*Supply and Use Tables are one of the building blocks of economic and environmental accounting and a quality assurance tool for computing reliable GDP figures and other macroeconomic aggregates. This Stats Brief introduces the main concepts and definitions concerning the Supply and Use Framework and gives a snapshot of current compilation of Supply and Use Tables in the Asia-Pacific region.*

The Supply and Use Tables (SUTs) are an essential part of the System of National Accounts (SNA)<sup>1</sup> and System of Environmental-Economic Accounts (SEEA).<sup>2</sup> Annual compilation of SUTs is one of the recommended data sets according to the 2008 SNA.<sup>3</sup> In addition, the SUTs can be extended to take into consideration the environment (e.g. materials, energy and water supply and use).

### Supply and Use Tables: Building Blocks

Figure 1 below shows a simplified Supply and Use table for a given economy. The total *Supply* of goods and services of an economy in a given period is shown on the left-hand side while the total *Uses* of these goods and services are displayed on the right-hand side, both compiled in monetary terms.

The total *Supply* of goods and services in the economy comprises:

- ‘Output,’ i.e. domestic production of goods and services at basic prices. The total production of the economy is classified according to products and industries; and
- ‘Total imports,’ which are classified by products, including residents’ consumption abroad. Imports are

ideally valued at basic prices although in practice CIF (cost, insurance, freight) prices are used.

- Three adjustment columns: taxes less subsidies by products, trade and transports margins by products, and CIF/FOB (Cost, Insurance & Freight / Free on Board) adjustments to make imports and exports comparable.

The total *Uses* of goods and services comprise:

- ‘Intermediate consumption,’ as the value of the goods and services consumed as inputs by a process of production (excluding consumption of fixed assets), classified according to products and industries;
- ‘Final consumption,’ broken down to household final consumption expenditure, final consumption expenditure of non-profit institutions serving households (NPISH),<sup>4</sup> and Government final consumption expenditure;
- ‘Gross capital formation,’ that consists of gross fixed capital formation<sup>5</sup> and changes in inventories, either a positive or negative entry,<sup>6</sup> and acquisition less disposal of valuables; and
- ‘Exports’ of goods and services at FOB prices.

**Figure 1: A simplified supply and use framework**

		Supply table			Use table						Total
		Products			Industries			Final Uses			
		Agricultural products	Industrial products	Services	Agriculture	Industry	Service activities	Final consumption	Gross capital formation	Exports	
Products	Agricultural products	= not applicable			Intermediate consumption by product and by industry			Final uses by products and by category			Total use by product
	Industrial products										
	Services										
Industries	Agriculture	Output of industries by product			= not applicable			= not applicable			Total output by industry
	Industry										
	Service activities										
Value Added		= not applicable			Value added by component and by industry			= not applicable			Total value added
Imports		Total imports by product			= not applicable			= not applicable			Total imports
Total		Total supply by product			Total output by industry			Total final uses by category			

Source: Eurostat (2008). Eurostat Manual of Supply, Use and Input-Output Tables. Eurostat Methodologies and Working papers, Luxembourg.

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The *Value Added* component measures the value created by a process of production, and is the balancing item between output and intermediate consumption. As such, the *Value Added* comprises: compensation of employees; taxes less subsidies on production and imports; consumption of fixed capital; and net mixed income / operating surplus.

The total use in the use table must be equal to the total supply in the supply table for each product, so that the following equation holds:<sup>7</sup>

$$\text{Output} + \text{Imports} + \text{Net taxes on Products} = \text{Intermediate Consumption} + \text{Final Consumption} + \text{Capital Formation} + \text{Exports}$$

Rearranging terms, we get the fundamental “GDP Equation”:

$$\text{Output} - \text{Intermediate Consumption} + \text{Net taxes on Products} = \text{Final Consumption} + \text{Capital Formation} + \text{Exports} - \text{Imports}$$

In this equation, the left-hand side is GDP by production approach while the right-hand side is GDP by expenditure method. This equation shows a key property of the supply and use framework: it produces GDP by these two approaches simultaneously and ensures that the alternative measures of GDP converge to the same value, enhancing the quality of national account estimates.

- For the *production* approach, total industry intermediate consumption and output are derived from the quadrants of the use and supply tables respectively, while taxes less subsidies on products are available in the supply table, when deriving total supply at purchasers’ prices;
- For the *income* approach, the different components of value added are directly taken from the value added quadrant of the use table;
- For the *expenditure* approach, the use table provides all the information regarding final uses of goods and services by resident institutional units.<sup>8</sup>

## Building Supply and Use Tables

### 1) Data Sources

A large collection of data is required in order to compile SUTs and for many national statistical systems this remains a challenging task.

For the *Supply* table, the following gives an indication of the range of data sources:

- **Official statistical sources:** agricultural census, economic census, annual enterprise surveys covering all non-agricultural economic activities, construction and/or investment surveys, labour force surveys, wholesale and retail trade surveys, price statistics surveys, special surveys for imports, balance of payments statistics; and
- **Administrative records:** administrative data on utilities, construction permits, government budget statements on

revenues and expenditures, financial statements of non-financial units, tax data disaggregated by product imports of goods provided by customs, VAT.

For the *Use* table the relevant data sources include:

- **Official statistical sources:** household income-expenditure surveys, retail trade surveys, price statistics surveys, economic census and enterprise surveys, special surveys for exports, balance of payment statistics; and
- **Administrative records:** government budget statements (revenues and expenditures), tax data on selected products such as alcohol, tobacco, motor vehicles, financial statements of NPISHs, construction building permits, government expenditures on investment, exports of goods provided by customs.

### 2) Valuation

The *Supply* side is valued at basic prices while the *Use* side is valued at the purchaser’s price and it is thus necessary to bring them to a consistent valuation basis.

The *basic price* is the amount received by the producer from the purchaser for a unit of good or service produced as output. It includes subsidies on products and other taxes on production. It excludes taxes on products, other subsidies on production, suppliers’ retail and wholesale margins, and separately invoiced transport and insurance charges.

The *purchaser’s price* is the amount paid by the purchaser in order to take delivery of a unit of a good or service at the time and place required by the purchaser. It excludes any VAT (or similar deductible tax on products) which the purchaser can deduct from his or her own VAT liability invoiced to customers. It includes the supplier’s retail and wholesale margins, separately invoiced transport and insurance charges and any VAT (or similar deductible tax on products) that the purchaser cannot deduct from his or her own VAT liability.

The adjustment proceeds as follows:

$$\begin{aligned} & \text{Supply (basic prices)} + \text{Taxes less subsidies on products} \\ & \text{(including non-deductible VAT)} + \text{Trade and Transport Margins} \\ & = \text{Supply (purchaser’s prices)} = \text{Use (purchaser’s prices)} \end{aligned}$$

### 3) International Statistical Classifications for SUTs

The items collected in the SUT framework need to be classified according to classifications of economic activities (industries), products, and of expenditures according to the type of final user. Statistical classifications are in general a basic tool for studying economic phenomena, fostering international comparability of data, providing guidance for the development of national classifications and for promoting the development of sound national statistical systems.

#### Classification of economic activities

*International Standard Industrial Classification (ISIC)*<sup>9</sup> – The main purpose of ISIC is to provide a set of economic activity

categories that can be utilized for the collection and reporting of statistics by activity. For example ‘C1102 – Manufacture of wines’ is an activity under the Manufacturing section of ISIC Rev.4, which was released in 2008 and is recommended in the 2008 SNA. Most countries use ISIC as their national activity classification or have derived national classifications from it. ISIC is an important tool for comparing statistical data on economic activities at the international level.

#### Classifications of products

*Central Product Classification (CPC)*<sup>10</sup> – CPC constitutes a comprehensive classification of all products, including goods and services. For example ‘41114 - Ferro-nickel’ is a product under the ‘Metal products, machinery and equipment’ section of CPC Ver.2. It presents categories for all products that can be the object of domestic or international transactions or that can be entered into stocks. CPC classifies products based on the physical characteristics of goods or on the nature of the services rendered. The latest revision, CPC Ver.2, was released in 2008, but CPC Ver.2.1 is in final stages of preparation.

*Harmonized Commodity Description and Coding System (HS)*<sup>11</sup> – HS was developed by the World Customs Organization (WCO) as a multipurpose international product nomenclature. For example ‘2711.11 – Natural gas’ is a product code under ‘Mineral products’ section. HS is internationally accepted as the classification system of internationally traded goods and contributes to the harmonization of customs and trade procedures, and the non-documentary trade data interchange in connection with such procedures, thus reducing the costs related to international trade. HS is not directly used in the SUT, but some input data may be classified according to HS.

#### Classifications of expenditure

*Classification of individual consumption by purpose (COICOP)*<sup>12</sup> – This classification is used to classify and analyze individual consumption expenditures incurred by three institutional sectors, namely households, NPISHs and general government, according to their purpose. For example ‘03.1.2 – Garments’ is a consumption class under ‘Clothing and footwear.’

*Classification of the functions of the government (COFOG)*<sup>13</sup> – This classification is used to distinguish between the individual and collective services provided by general government and identifies consumption expenditures that benefit individual households. For example ‘02.2.0 - Civil defence’ is a class under “defence” division. COFOG is more suitable than ISIC to classify government expenditures, since its list of functions is much more detailed, being developed specifically to take account of the different government activities.

SUT compilation is performed in national accounts classifications, but some input data may be collected and

compiled in accordance with other classifications. Thus, correspondence tables between these classifications will also be needed.

#### 4) Balancing (Equating) Supply and Use

Once both the supply and use sides of the table are compiled, they need to be balanced to derive the macroeconomic indicators. This procedure can be manual or automatic. The manual method is the preferred to ensure utmost reliability of the estimates taking into account the quality of the various source data. The most widely used automatic procedure, the RAS method, on the other hand, takes the margin totals as correct and adjust all or selected matrix entries accordingly.<sup>14</sup>

#### Extension to the environment

The SNA supply and use framework can be extended to include the environment by compiling the SUTs in physical terms and augmenting the product block with a block for *natural inputs* and *residuals*, as well as adding the environment as an additional “supplier” goods and services. The natural inputs block describes the flows of natural resources from the environment to the economy as a part of economic production processes and the residuals block describes the flows of materials discarded, discharged or emitted to the environment (e.g. emission to air, wastewater) by establishments and households through processes of production, consumption or accumulation.

The supply and use identity applies to both monetary and physical flows, including the residuals.<sup>15</sup> In addition to the supply and use identity, the SUT in physical terms incorporates the input-output identity, implying that the total flows into the economy either are returned to the environment or accumulate in the economy.

There are a number of benefits in taking into account environmental considerations during the regular annual compilation of SUTs. By knowing upfront the environmental domain of interest, e.g. water, energy, etc., the appropriate relevant industries and products can be identified during the compilation process. Also, by compiling simultaneously physical and monetary SUTs the quality and consistency of the basic information is greatly enhanced and thus improving the overall data quality. Finally, by integrating environmental information, the analytical uses of the tabulation are greatly increased.

#### Uses of SUTs

The uses of SUTs can be presented from a statistical and an analytical perspective.

From a *statistical* perspective:

- SUTs provide a quality assurance framework for the consistent computation of GDP based on the production,

expenditure and income approaches, and as such enhance the quality of other important macroeconomic aggregates;

- SUTs ensure integration and coherence between the three main accounts of the system of national accounts: Goods and Services Accounts; Production Accounts by industry and sectors; and Generation of Income Accounts by industry and sectors; and when compiled also in physical units, they provide coherence and consistency within environment related flows and between environment and economic statistics;
- SUTs represent an integrating framework, allowing estimates from various official statistical and administrative data sources to be combined, thereby enabling confrontation of data; and
- SUTs constitute the basis for compiling satellite accounts within the SNA.<sup>16</sup>

From an *analytical* perspective:

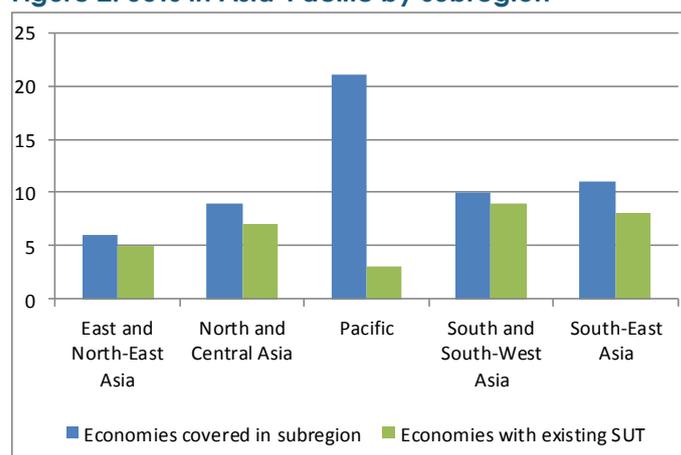
- SUTs enable analytical extensions to the SNA such as Social Accounting Matrices (SAM);<sup>17</sup>
- SUTs are the first building block for the deriving Input-Output Tables (IOTs), that allow understanding the interaction between domestic industries and the structure of imports in a given economy;
- SUTs are also used in the construction of international or regional SUTs and IOTs. Merged with other tables, such as bilateral international trade data in goods and services, SUTs are important for estimating, for instance, trade in value added.<sup>18</sup>
- SUTs allow for analyses of the interactions between the environment and the economy; and
- SUTs inform policy making, planning and forecasting, e.g. budgeting and national socio-economic development plans.

To summarize, Supply and Use Tables not only help produce national accounts statistics of high quality and consistency but also facilitate integrated analyses of economic, environmental and social statistics.

### Status of SUTs in Asia and the Pacific and future developments

A desk review on the status of SUTs compilation among economies of the ESCAP region was carried out by the authors. The review aimed to identify economies compiling at least one SUT in the last 15 years. It showed that among the 57 economies for which information was obtained, 32 compiled at least one SUT during this period. The review also found that 33 economies had compiled at least one IOT; this means that 29 economies in Asia and the Pacific have compiled both SUT and IOT at least once in this period.

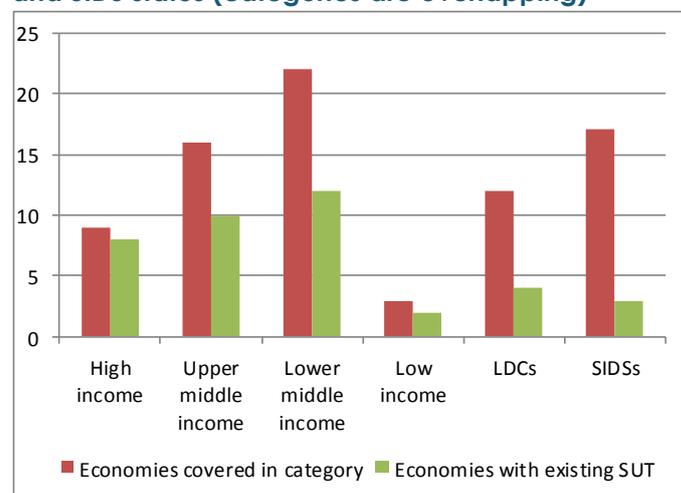
Figure 2: SUTs in Asia-Pacific by subregion



Looking at the compilation of SUTs by subregion (Figure 2) it is clear that the biggest deficiency of SUTs is in the Pacific subregion. The analysis by World Bank income groupings<sup>19</sup> (Figure 3) reveals that the greatest gaps are among lower and upper middle income economies. The gap is particularly wide for most Least Development Countries (LDCs) and Small Island Developing States (SIDS).

The frequency of SUT compilation varies considerably in the region; however, this information is not available for all the economies reviewed. It was possible to identify at least 10 economies that compile SUTs on a regular basis; generally every one to five years. On the other hand, at least 14 economies have compiled only one SUT until now. Most of these economies have participated in an Asian Development Bank (ADB) technical assistance project that helped the participating economies adopt the supply and use framework.<sup>20</sup> However, the majority of these economies have not updated their SUT since their first production. ADB launched a new technical assistance project in 2014 that will enable these economies to update their SUTs and align them with the 2008 SNA concepts.<sup>21</sup>

Figure 3: SUTs in Asia-Pacific by income group, LDC and SIDS status (categories are overlapping)



At the regional level, the Regional Programme on Economic Statistics (ESCAP region),<sup>22</sup> focuses on the improvement of a basic set of economic statistics, and as such supports the development of SUTs by improving the underlying data.

At the international level, the United Nations Statistics Division is preparing compilation guidance on Supply and Use tables and Input-Output tables based on the recommendations of the 2008 SNA. As part of this project, a Primer on Supply and Use Tables and Input Output Tables is also being prepared

which provides a short and simple overview of SUT and IOT and the main steps for their compilation.

*For more information regarding ESCAP's work in statistics development please visit:*

<http://www.unescap.org/our-work/statistics>

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## References

<sup>1</sup> European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank (2009). *System of National Accounts (SNA) 2008*. Available at: <http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf>

<sup>2</sup> United Nations, European Union, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, The World Bank (2014). *System of Environmental-Economic Accounting 2012 — Central Framework*. Available at: [http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA\\_CF\\_Final\\_en.pdf](http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf)

<sup>3</sup> See *Extract of the Report of the Intersecretariat Working Group on National Accounts to the forty second session (2011) of the United Nations Statistical Commission*. Available at: <http://unstats.un.org/unsd/nationalaccount/docs/guidelines.pdf>

<sup>4</sup> NPISH units are non-market producers of goods and services that are not controlled by government and are not households. This item includes many trade unions, political parties, religious and charitable organizations, sporting and recreational associations. In many economies, NPISH is included in HFCE but the SNA explicitly recommends showing it in a separate column. Source: *System of National Accounts 2008*.

<sup>5</sup> GFCF is usually broken down into its main components: residential and non-residential buildings, other construction, machinery and equipment, and other GFCF.

<sup>6</sup> If a negative entry, it represents goods and services that were produced or imported in an earlier period and used in the current period.

<sup>7</sup> Asian Development Bank (ADB) (2012). *Supply and Use Tables for Selected Economies in Asia and the Pacific: A research study*. Mandaluyong City: ADB. Available at: <http://www.adb.org/sites/default/files/publication/30121/supply-and-use-tables-research-study.pdf>

<sup>8</sup> "An institutional unit is an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities." Source: *System of National Accounts 2008*, para. 4.2.

<sup>9</sup> See <http://unstats.un.org/unsd/cr/registry/isic-4.asp>

<sup>10</sup> See <http://unstats.un.org/unsd/cr/registry/cpc-2.asp>

<sup>11</sup> See <http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx>

<sup>12</sup> See <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=5&Lg=1>

<sup>13</sup> See <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=4&Lg=1>

<sup>14</sup> See, for example, Asian Development Bank (ADB) (2012). *Supply and Use Tables for Selected Economies in Asia and the Pacific: A research study*. Mandaluyong City: ADB.

<sup>15</sup> For each product measured in physical terms (e.g., cubic metres of timber), the quantity of output and imports (total supply of products) must equal the quantity of intermediate consumption, household final consumption, gross capital formation and exports (total use of products). The equality between supply and use also applies to the total supply and use of natural inputs and the total supply and use of residuals.

<sup>16</sup> Satellite accounts while being consistent with the central framework of the System of National Accounts, are distinct and may not be consistent with each other. Satellite accounts may take two forms: (i) rearrangement of the central framework elements with extensions by adding complementary elements and (ii) elaboration of alternative concepts to those covered in the central framework. Most satellite accounts are of the first type, e.g. System of Environmental-Economic Accounting (SEEA), health sector accounts, tourism accounts, etc. Examples of the second type of satellite accounts may be variations on the underlying SNA concepts such as the production boundary, fixed assets, etc. Source: *System of National Accounts 2008*.

<sup>17</sup> Social Accounting Matrices are an alternative presentation of national accounts in matrix form allowing flexibility in the level and focus of disaggregation to respond to specific policy analysis needs. For example, SAMs have been used for disaggregating the household sector with the purpose of linking consumption and income generation. Source: *System of National Accounts 2008*.

<sup>18</sup> For further details on this issue see Javorsek and Camacho (2015). *Trade in Value Added: Concepts, Estimation and Analysis*. ESCAP Statistics Division Working Paper. Available at: [http://www.unescap.org/sites/default/files/SD\\_Working\\_Paper\\_May2015\\_3.pdf](http://www.unescap.org/sites/default/files/SD_Working_Paper_May2015_3.pdf)

<sup>19</sup> See: <http://data.worldbank.org/about/country-and-lending-groups>

<sup>20</sup> See <http://www.adb.org/data/icp/reta-6483>

<sup>21</sup> See [http://adb.org/projects/details?proj\\_id=48387-001](http://adb.org/projects/details?proj_id=48387-001)

<sup>22</sup> More on the Regional Programme on Economic Statistics (RPES) can be found at: <http://communities.unescap.org/economic-statistics>