



METHODOLOGICAL GUIDELINES FOR THE COMPILATION OF NATIONAL ACCOUNTS STATISTICS IN SADC REGION

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ACRONYMS

AfDB	African Development Bank
CFC	Consumption of fixed capital
CI	Changes in inventories
C.I.F	Cost, insurance and freight
COFOG	Classification Of Functions Of Government
COICOP	Classification Of Individual Consumption according to Purpose
CPC	Central Product Classification
CPI	Consumer Price Index
FAO	Food and Agriculture Organisation
FISIM	Financial Intermediation Services Indirectly Measured
F.O.B	Free on board
GDDS	General Data Dissemination System
GDP	Gross Domestic Product
GFCE	Government Final Consumption Expenditure
GFCF	Gross Fixed Capital Formation
GFS	Government Finance Statistics
GNDI	Gross National Disposable Income
GNI	Gross National Income
GOS	Gross Operating Surplus
GVA	Gross Value Added
HFCE	Household Final Consumption Expenditure
IC	Intermediate Consumption
IMF	International Monetary Fund
IMTS	International Merchandise Trade Statistics
ISIC	International Standard Industrial Classification of All Economic Activities
ISWGNA	Inter-Secretariat Working Group on National Accounts

MRDS	Minimum Requirement Data Set
NDP	Net Domestic Product
NNDI	Net National Disposable Income
NNI	Net National Income
NOE	Non-Observed Economy
NPISH	Non-Profit Institutions Serving Households
OECD	Organisation for Economic Cooperation and Development
PIM	Perpetual Inventory Method
PPI	Producer Price Index
R&D	Research and Development
ROSC	Reports on the Observance of Standards and Codes
SADC	Southern African Development Community
SBR	Statistical Business Register
SDDS	Special Data Dissemination Standard
SNA	System of National Accounts
UN	United Nations
UVI	Unit Value Index
VA	Value Added
VAT	Value Added Tax

1 INTRODUCTION

1.1 Document objective

The main objective of this guide is to provide producers of official statistics of Southern African Development Community (SADC) Member States with practical guidelines for implementing the 2008 System of National Accounts (SNA), more specifically for compiling Gross Domestic Product (GDP) according to production and expenditure.

The main challenges encountered by countries in implementing the 2008 SNA are how to adapt the methodological requirements to the country's specificities and with the available resources such as data sources, human resources and financial support, along with the political will and the economic capacity to create the general framework. This raises the question of what is the best strategy to adopt to implement the framework and to satisfy the needs of both national and international users.

A realistic approach consists of a gradual compilation of the accounts required for addressing policy needs that are deemed of highest priority for the country. For this, the main reference framework is the six-milestones measures developed by the Inter-Secretariat Working Group on National Accounts (ISWGNA) and approved by the UN Statistical Commission in 2001 to assess the scope of the implementation of the 1993 SNA. The framework also identifies a defined benchmark, the Minimum Requirement Data Set (MRDS), consisting of a set of annual accounts that groups the accounts recommended in milestones 1 and 2.

The six milestones were adjusted later in 2011 to the scope and compliance measures of the 2008 SNA, with the broadening of the MRDS to include some quarterly accounts reflecting the need for more timely information to facilitate appropriate policy responses.

In order to implement the SNA in line with the MRDS, priority should be given at the first stage to compiling GDP data according to production and expenditure and by industry for the overall economy and external counterpart sector. This enables countries to produce estimates of the major national aggregates.

Implementation of the SNA and its integration into the national statistical operations require a transformation of the system of production of socio-economic statistics. It entails developing new data collection instruments and identifying appropriate data sources, changes and improvements in statistical areas linked to the SNA or integrated with it, such as government finance statistics, banking statistics, balance of payments, statistics based on household surveys, etc. It involves the introduction of new economic classifications closely linked to the 2008 SNA, such as the International Standard Industrial Classification of All Economic Activities (ISIC) Rev.4, the Central Product Classification (CPC) Ver.2, and the Classification of the Functions of Government (COFOG).

2 INSTITUTIONAL REQUIREMENTS FOR THE PRODUCTION OF NATIONAL ACCOUNTS

2.1 Implementation Strategy

The 2008 System of National Accounts (SNA) serves as the general conceptual framework for the compilation of national accounts. The ways of implementing the system vary greatly among countries and depend largely on the general strategy adopted for the statistical system.

Generally, a strategy for implementing the SNA comprises the following phases (Figure 1):

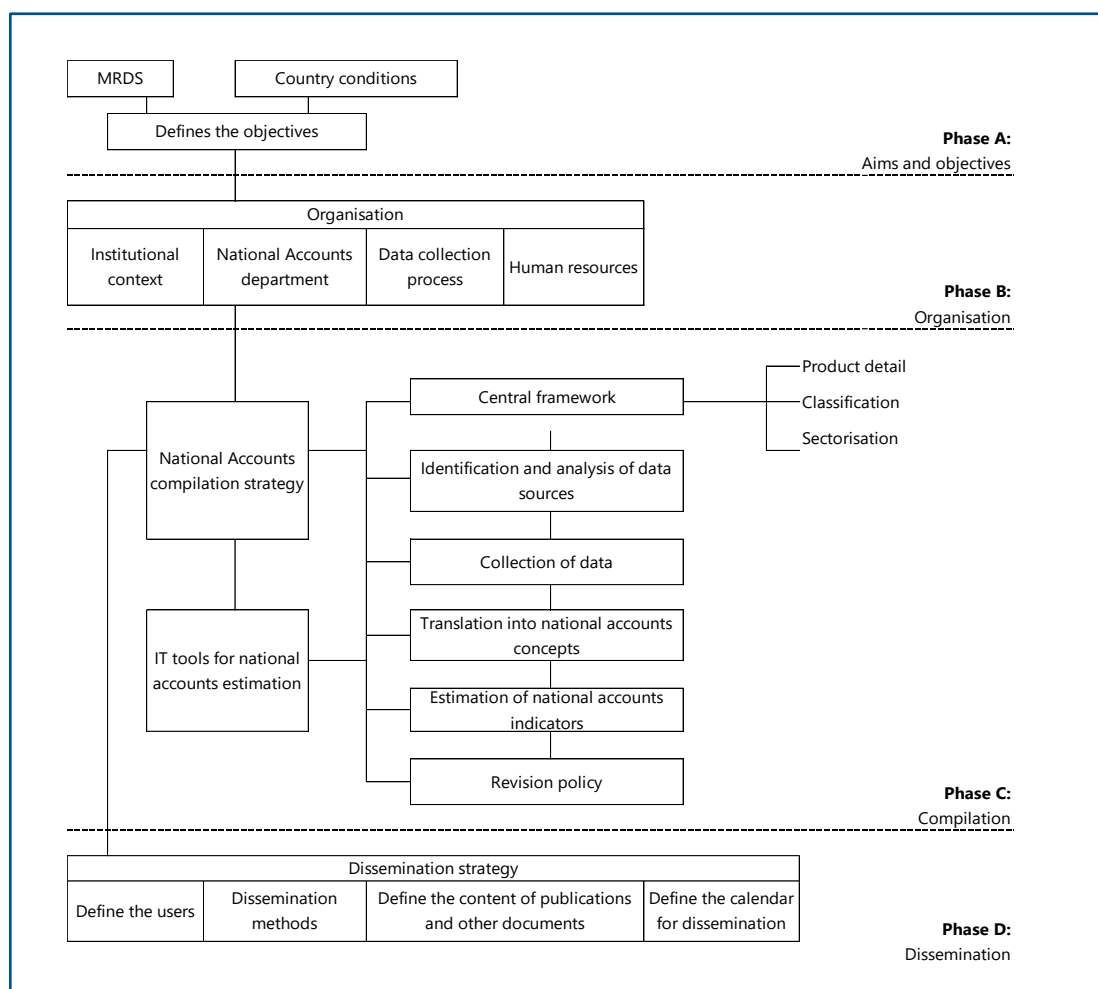
Phase A: Aims and objectives

Phase B: Organization

Phase C: Compilation

Phase D: Dissemination

Figure 1 – The SNA implementation strategy



Source: Essential SNA: Building the basics (Eurostat)

A. Defining aims and objectives

Defining the objectives of the strategy requires an in-depth analysis of the local situation. Factors such as the country's statistical capability to provide the required data sources, human resources both in terms of numbers and knowledge, the possibility of using business accounts data from the formal sector and the ability to translate these information into national accounts concepts, and the structure of the economy in particular the extent of the informal sector will determine largely the objectives of the strategy.

Generally, most countries start with the compilation of Gross Domestic Product (GDP) by production and expenditure, because some of the data sources needed already exist, and the result, the GDP, represents one of the most important indicators of an economy. For many countries, full implementation of the SNA is not feasible due to the unavailability of some or many of the above elements.

The six 'milestones' measures developed by the Inter-Secretariat Working Group on National Accounts (ISWGNA) provide a reference framework that guides the gradual implementation of the SNA. Three data sets have been developed to assess the scope of national accounts implementation according to the 1993 SNA. The first data set of the framework defines the benchmark, 'the Minimum Requirement Data Set' (MRDS) which is essentially a set of annual accounts under milestones 1 and 2. The second data set is the recommended data set which are annual accounts 'recommended' for compilation by all countries plus some 'recommended' quarterly accounts. The third data set is the desired data set, which comprises useful data that should be compiled if possible.

The need for more timely data to facilitate appropriate policy responses highlights the importance to include also the compilation of quarterly national accounts. The MRDS defined for the 2008 SNA takes into account these requirements and includes quarterly accounts for the nominal and volume measure of GDP by industry or by expenditure components and the quarterly compilation of the integrated accounts until net lending for the total economy and the rest of the world. The data sets to assess the scope of the 2008 SNA implementation MRDS are presented in Annex 1.

B. Ensuring institutional conditions are in place;

- *Institutional context*

In many countries, the national accounts fall under the responsibility of the national statistical office, backed by a statistical law which specifies the responsibility for collecting, processing and disseminating statistics. The law also assigns the coordinating role to the national statistical office and allows for data sharing among data producing agencies under specific conditions of confidentiality.

- *Organisational aspect*

The organisation of the activity requires that the national accounts processes from data collection, data analysis, translation to national accounts concepts and compilation of the main indicators are properly organised, and that conditions in place are conducive to the successful implementation of the SNA. These include amongst others (i) the organization of the national accounts department, identifying main tasks to be performed and assigning responsibilities, setting up of business registers, classification and nomenclature; (ii) mobilizing human resources and building capacity; and (iii) organizing and establishing cooperation and communication channels within the statistical agency and with other administrative institutions for data collection or sharing.

C. Designing a compilation strategy;

The compilation process should take into account resources, policy issues such as continuity and stability in the compilation process, priorities with respect to national accounts, professional independence, professional skills of the staff, and access to statistical and administrative data sources. The main phases of a compilation strategy are:

- a. designing the central framework;
- b. identifying data sources: inventory of data sources (administrative sources and new surveys), collaboration with administrative institutions, analysis of quality and coverage;
- c. data collection;
- d. translation into national accounts concepts;
- e. estimation of indicators, reconciliation of data, and ensuring coherence of results;
- f. data revision policy covering routine revisions, benchmark revisions and methodological revisions; and
- g. identifying appropriate IT tools for compiling national accounts.

D. Drawing up the dissemination strategy to meet users' needs:

The dissemination of national accounts results is as important as the compilation of indicators. Particular attention should therefore be given to the way national accounts indicators are presented to the public. Adding an analysis, providing useful economic interpretations and helping in understanding the methodology used are an important part of national accountants' tasks. The main steps involved in defining the dissemination strategy are summarized below:

a. *User identification*

Users can be grouped into two categories with respect to the intensity of statistical use since the demand for national accounts data is different for each category of users. To meet these different demands, dissemination of national accounts can be made using different channels including press releases; detailed information presented in the annual yearbook; special publications with time series of indicators, with detailed data accompanied by metadata and short economic analysis; and electronic dissemination to reduce costs and to make information more usable and accessible.

b. *Providing quality data that meet users' expectations*

The dissemination of national accounts should be integrated into the general statistical dissemination strategy of the institution, taking into consideration the following amongst others:

- Quality data defined in terms of accuracy, relevance, timeliness, consistency and availability
- Details of information disseminated according to target audience;
- Presentation of results in a comprehensive structure; and
- Provision of methodological explanations to help users understand national accounts concepts.

Dissemination of data without economic analysis and interpretation of the results is not advised, even if this imposes additional work on national accountants.

c. *Establishing a calendar for dissemination*

As general framework for their dissemination strategy, **countries are recommended to adopt the International Monetary Fund's 'Special Data Dissemination Standard' (SDDS) and 'General Data Dissemination System' (GDDS)** with respect to key dimensions, namely data coverage, periodicity and timeliness; access; and integrity and quality. For each dimension, the SDDS prescribes best practices referred to as 'monitorable elements' that can be observed, or monitored (Annex 2).

The GDDS was developed to assist countries that are not able to subscribe to the SDDS to develop a sound statistical system as the basis for timely dissemination of data to the public. The purposes of the GDDS are to encourage countries to improve data quality; provide a framework for evaluating needs for data improvement and setting priorities; and guide countries in disseminating comprehensive, timely, accessible, and reliable economic, financial, and socio-demographic statistics.

2.2 Statistical Requirements

2.2.1 Business register

Statistical Business Registers (SBR) play an essential role in the construction and maintenance of an integrated economic information system. They primarily aim at supplying a frame for all economic surveys and provide a means of coordinating the coverage of business surveys and of achieving consistency in classifying statistical reporting units. They also serve as a data source for compiling demographic statistics of businesses.

The starting point for the construction of an SBR is invariably administrative records showing the enterprises created and maintained for supporting administrative regulations. In order to answer statistical needs, information from administrative registers is adapted and included in an SBR. The administrative data sources that can be used include:

- a. Company registrations;
- b. Business licenses;
- c. Tax records;
- d. Import and export records;
- e. Social security systems; and
- f. Trade associations.

Each data source has its own coverage and may complement each other. While overlapping can assist in providing additional information on the businesses such as closures and inactivity, there is need to check for duplication.

Small businesses and informal production carried out by households is generally not covered by such sources. Different sources have to be looked into.

The main issue in managing an SBR is its maintenance and update, given the constantly changing demography of businesses. Registers must therefore be updated at least once a year. The most effective method of updating an SBR is to combine information from

- a. *administrative sources* which have the advantage of covering the entire universe of the units in question and of being up-to-date. It is essential that a standardised activity classification system is used by the statistical and administrative bodies. The use of conversion tables to adapt the classification of the administrative data source to the one employed by the statistical body is not recommended, because this process can result in major quality losses. To avoid this problem, statistical offices should attempt to persuade the administrative bodies to use statistical classification framework.
- b. *business surveys* which offer more complete information, albeit for a more restricted population; and
- c. *register maintenance surveys*, particularly important for small and informal sector operators.

Inter-agency cooperation is essential since there can be strong mutual benefits among all parties that motivate such work. However, as with any data source, compilers must take care to ensure that any sensitive data are treated confidentially so as to build trust.

Typical units in a business register can be legal units and local units, whereas for statistical purposes, these must be transformed into units such as enterprises and establishments.

Legal units include: (i) legal persons whose existence is recognised by law; and (ii) natural persons engaged in an economic activity in their own right. A legal unit always forms, either by itself or in combination with other units, the legal basis for a statistical unit, the 'enterprise'.

A local unit is an enterprise or part thereof (e. g. a workshop, factory, warehouse, office, or depot) situated in a geographically identified place. At or from this place, an economic activity is carried out for which one or more persons work for one and the same enterprise.

The units in a register could be described according to the type of unit (legal unit, local unit and enterprise) using three categories of variables:

- a. Identification variables (identity number, name of enterprise, name of the owner, address, legal status);
- b. Stratification variables (economic activity, number of employees, sales turnover, geographical location); and
- c. Demographic variables (births, date of changes in economic activity, deaths).

It is important to use standardised statistical units in an SBR as it guarantees time consistency in surveys, and avoids duplications and omissions in data collection. It also helps to improve the quality of results through greater coordination between surveys.

Furthermore, the use of a unique identifier, usually a legal code attributed by relevant authorities (registration department or the tax administration department), will largely help in the integration of information from the various administrative sources, besides enhancing coordination between the various agencies.

2.2.2 Classifications

Classifications are a key element in the compilation of statistical indicators. The SNA uses several classifications; some of them are specific to the compiling of national accounts, such as classifying units into institutional sectors, goods and services, or transactions. Others are common to national accounts and other statistical domains. The premise used for compiling national accounts is that data sources should be adapted and collected in accordance with international classifications.

Classifications organise units, such as persons, enterprises, activities, etc. into groups according to a standard format based on specific principles and criteria that have been used to construct them.

International standard statistical classifications are developed and adopted by international institutions to ensure correct implementation of international agreements and to standardise national and international communication, promoting comparability of international statistics. They can be adopted as national classifications or used as a guide for adapting national classifications to international standards.

Main classifications used in the SNA are:

- a. *Standard Industrial Classification of All Economic Activities Revision 4 (ISIC, Rev.4)* is the international classification for productive activities. It groups activities according to homogeneous production technologies for a range of products and provides a comprehensive framework within which economic data can be collected and reported in a format designed for economic analysis, decision-taking and policy-making.
- b. *Central Product Classification Version 2 (CPC, Ver.2)* is a classification based on the physical characteristics of goods or on the nature of services rendered. It includes products that are an output of an economic activity, including transportable goods, non-transportable goods and services. CPC presents categories for all products that can be the object of domestic or international transactions or that can be stocked.
- c. *Standard International Trade Classification (SITC Rev.4)* classifies commodities according to the nature of the merchandise and the materials used in their production as well as according to their stage of production. The origin of SITC is the Harmonised Commodity Description and Coding System (HS07). SITC is the aggregated classification of transportable goods both for international trade statistics and for analytical purposes.

- d. *Classification by Broad Economic Categories (BEC) Rev.3* was initially developed by *UNSD* to reclassify merchandise imports (reported in terms of *SITC*) into the product categories relevant to the *SNA*. Over time, many countries started to use *BEC* for a variety of purposes including economic analysis and setting tariffs. In addition, it serves as a means of converting external trade data into end-use categories that are meaningful within the framework of the *SNA*, namely capital goods, intermediate goods and consumption goods.
- e. The *SNA* uses special classifications to analyse consumption or outlays by different sectors depending on the purpose for which the expenditure is undertaken. These classifications are referred to as functional classifications or as Classifications of Expenditure According to Purpose. They are: *Classification of Individual Consumption According to Purpose (COICOP)*, *Classification of the Functions of Government (COFOG)*, *Classification of the Purposes of Non-Profit Institutions, Serving Households (COPNI)*, and *Classification of the Outlays of Producers According to Purpose (COPP)*.

2.2.3 Data sources

One important phase of the *SNA* implementation strategy is the identification and analysis of data sources needed for compiling national accounts. The national statistical office, in charge of building the base for meeting the national accounts requirements, must develop and implement essential statistical surveys and identify possible administrative data sources to meet the data requirements associated with compiling GDP by production and expenditure approaches at current and constant prices.

The data sources may be for specific statistics (such as producer sales and production costs, investment, employment, wages and salaries, household expenditures, consumer prices, producer prices and interest rates, imports and exports, etc.) or administrative records (government revenue and expenditure, financial statements of units, balance of payments, etc.).

Existing data sources have to be analysed with respect to national accounts requirements before the process of collecting data can start.

The production of national accounts statistics relies essentially on two main sources: statistical sources (censuses and surveys) and administrative sources.

A *census* is a complete enumeration of a given population. Censuses though complete have many disadvantages:

- a. It is very costly to enumerate all objects and process all data.
- b. Censuses do not provide timely results. These are available many months after the data collection.
- c. Censuses are usually carried out every five to ten years.

A *survey* is an investigation about the characteristics of a given population by collecting data from a sample of that population and estimating their characteristics through the use of statistical methodology. Surveys provide more up-to-date statistics, are less costly than a census, and are normally carried out at a higher frequency (monthly, quarterly or annually).

Administrative data emanate from fiscal, taxation, supervisory or other authorities' systems, created to facilitate the administration or operation of government programmes, or to supervise and oversee compliance with legal obligations by certain segments of society. Administrative sources contain information that is not primarily collected for statistical purposes, but is used by statistical offices. They are cheaper than censuses and surveys, and are very often free.

Administrative data sources provide complete, or almost complete, coverage of the population to which the administrative process applies. Their use helps to reduce the response burden on businesses.

More details are at Annex 3.

3 BASIC CONCEPTS

The 2008 SNA is a system of macroeconomic accounts based on a set of concepts, definitions, classifications and registration rules. It provides a framework within which economic data can be collected and analysed to assist decision-makers and provide guidance on economic policies.

National accounts aim to describe the economic activity measurable in monetary terms of every unit of a national economy. The basic concepts of the SNA are used to analyse and aggregate the numerous aspects of the elementary actions in the economy, and are capable of answering the following questions:

- Who takes action in the economy?
- What do they do?
- Why do they take action?
- How are the actions known?

The definitions, classifications and accounting rules in the SNA give answers to these questions as below.

Figure 2 – Main concepts of the 2008 SNA

QUESTION	EXPLANATION	THE 2008 SNA CONCEPTS
Who?	Refers to the economic agents (institutions, firms, individuals) that perform activities in the economy.	Institutional units Institutional sectors Total economy and the rest of the world
What?	Refers to the transactions and other flows and stocks, which are the objects of the economy.	Transactions and other flows Assets and liabilities Products and producing units
Why?	Refers to the reason why an economic agent takes an action	Classifications by purposes of expenditure
How?	Refers to the recording of who, what and why.	Accounting rules: <ul style="list-style-type: none">– recording– time of recording– valuation– consolidation and netting

Source: Essential SNA: Building the basics (Eurostat)

3.1 Institutional Units and Sectors

The SNA is designed to represent the economy in a simplified way. However, given the complexity of an entire economy, aggregations using specific classifications are required:

- a. Classification by industry, called ‘functional classification’ represents the production process and the flows experienced by goods and services produced in the economy, i.e., it shows the balance between supply and demand. In this case, units are defined according to their technical-productive profile. The units are therefore units of production in the strict sense of the term.
- b. Classification by institutional sector also represents the production process. In this case, the units are defined according to their economic behaviour, economic function and economic objectives. This classification highlights how income is obtained and distributed in an economy, how share capital is generated and how this is financed.

An institutional unit is defined as an economic entity that is capable, in its own right, of owning assets, incurring in liabilities and engaging in economic activities and in transactions with other entities. The SNA distinguishes between two types of institutional units: (i) legal entities, defined as those entities whose existence is recognized by law. Three main categories are identified in the SNA: corporations, non-profit

institutions, and government units, and (ii) persons or a household, including groups of persons staying in hospitals, retirement homes, prisons for long periods of time.

Institutional units are grouped together into institutional sectors on the basis of their principal functions, behaviour and objectives. The 2008 SNA includes five main institutional sectors:

- a. non-financial corporations;
- b. financial corporations;
- c. general government;
- d. households; and
- e. non-profit institutions serving households (NPISHs).

Transactions between residents and non-residents, such as claims by residents on non-residents, and vice versa are recorded in the rest of the world. However, *the rest of the world is not a sector* for which complete sets of accounts have to be compiled. The rest of the world includes certain institutional units that may be physically located within the geographical boundary of a country; e.g., embassies, consulates or military bases, and international organisations.

The allocation of a unit to an institutional sector is based on the following questions:

- Is the unit resident?
- Is it a household, institutional household (ex. a hospital) or a legal unit?
- Is the unit a non-market or market producer?
- Is the unit controlled by the government?
- Does the unit provide financial services?
- Is the unit foreign-controlled?

Institutional units can also be grouped according to ownership (public, national private and foreign-controlled corporations). National private and foreign-controlled corporations belong to the private sector. General government belongs to the public sector in its entirety. Households and NPISHs belong to the private sector. Corporations are classified as public if government, through ownership of more than half of the voting shares, controls them through government units or other public corporations.

Total economy is defined as the entire set of resident institutional units.

The *residence* of an institutional unit is the economic territory with which it has the strongest connection, in other words, its centre of predominant economic interest.

The *economic territory* of a country does not coincide exactly with its geographical territory. The economic territory refers to the geographical territory administered by the government of the country, as well as international waters declared as an exclusive economic zone of that country. Enclaves in foreign countries, such as embassies, consulates and military bases, are included. On the other hand, enclaves in the country used by foreign governments and international organisations are excluded.

3.2 Enterprises, establishments and industries

Units engaged in production are recognised by the 2008 SNA as enterprises. An enterprise may be a corporation, a quasi-corporation, a non-profit institution or an unincorporated enterprise.

An institutional unit such as a corporation may be engaged in different kinds of production activities in different locations, producing various kinds of goods and services. Thus, some institutional units must be divided into smaller and more homogeneous units.

Homogeneous activity is one criterion for dividing an enterprise into kind-of-activity units (KAU).

An enterprise engaged in different activities can have one or more locations and for the purposes of differential analysis it is useful to divide it accordingly into local units. *The combination of location and kind of activity of an enterprise result in the 'establishment' concept.*

Establishments are also called 'local kind-of-activity units' (LKAU). Establishments allow for the possibility of carrying out *one or more secondary activities* which should be on a small scale compared to the principal activity. The main activity of an enterprise may also involve *ancillary* activities that facilitate the efficient running of the enterprise. These activities do not normally result in goods and services that can be marketed (e.g., keeping records, repair and maintenance of machinery and equipment, cleaning and maintenance of buildings and premises, etc.) and cannot be separately identified.

An enterprise may have one or more establishments. On the other hand, an establishment can belong to one and only one enterprise. An establishment may usually be identified with an individual workplace in which a particular kind of activity is carried out (e.g., an individual farm, shop, construction site, transport depot, garage, bank, office, clinic, etc.). A complete set of accounts, including balance sheets, *cannot* be compiled for an establishment because it cannot have own assets, incur liabilities or engage in transactions with other entities in its own right.

The SNA distinguishes between establishments that are market producers, producers for own final use and non-market producers.

Market establishments produce goods and services mostly for sale at prices that are economically significant. Producers for own final use produce goods and services mostly for final consumption or fixed capital formation by the owners of the enterprises in which they are produced. Non-market establishments supply most of the goods and services they produce without charge or at prices that are not economically significant.

Groups of establishments engaged in the same, or similar kinds of activity are classified into industries according to ISIC, Rev. 4. The classification refers to the principal activity of the establishments where the principal activity is the one with the highest value added of the units.

The enterprise is the main unit for national accounts because it represents the institutional unit for which production accounts are prepared and value added is estimated. Aggregating value added over activities is the one of the main activities of national accountants since this yields GDP.

3.3 Flows and Stocks

Institutional units have various economic functions: they produce, consume, save, invest, etc. When they produce, they can be engaged in various types of production as entrepreneurs, providers of labour or suppliers of capital. The actions they undertake are aimed at creating, transforming, exchanging, transferring economic value, or changing the volume, composition or value of assets and liabilities. These actions are *economic flows*. There are two broad categories of economic flows: *transactions* and *other economic flows*.

Transactions are economic flows that result from interaction between institutional units by mutual agreement and can take place within institutional units or between establishments belonging to the same enterprise.

Other economic flows arise from non-economic phenomena, recorded only in accumulation accounts. They include consumption of fixed capital, revaluation of assets and liabilities, economic appearance and disappearance of assets, natural growth of non-cultivated biological assets, uncompensated seizure and catastrophic losses of assets. Other accumulation entries cover transactions and other economic flows not previously taken into account, that change the quantity or value of assets and liabilities.

Stocks are a position in, or holdings of, non-financial (produced or non-produced) assets and the financial assets and liabilities at a point in time. They must be subject to ownership rights (economic ownership prevailing over legal ownership) and must also be used in some kind of economic activity. Consumer durables are excluded, as are natural resources that are not owned.

Flows and stocks are recorded on both sides of accounts and balance sheets. A balancing item is derived as the difference between the sums of the entries on both sides of an account or balance sheet. As a matter of fact, many important variables in national accounts are calculated as balancing items, e.g., value added.

The time of recording in the SNA is different for flows and stocks. Flows are recorded over a certain period of time and stocks are recorded at a certain point in time, namely the beginning (opening balance) and at the end (closing balance) of the accounting period. The accounting period in national accounts usually corresponds to the calendar year or a quarter of a year.

There are three moments when flows can take place:

- a. 'Cash basis' which records cash flows at the time these payments occur;
- b. 'Due for payment basis' which records flows at the time they are due to be paid;
- c. 'Accrual basis' which records flows at the time economic value is created, transformed, exchanged, transferred or extinguished.

Transactions between institutional units in the SNA are recorded when claims and obligations arise, are transformed, or are cancelled, that is on the 'accrual basis'.

The SNA favours accrual accounting because the timing is consistent with the way economic activities and other flows are defined in the SNA. This allows the profitability of productive activities to be evaluated correctly without the disturbing influence of leads and lags in cash flows, and a sector's net worth to be calculated correctly at any point in time.

3.4 Accounts and Main Aggregates

The sequence of accounts in the SNA describes how income is generated, distributed, redistributed and used for consumption or the acquisition of assets and when assets are disposed of, or a liability is incurred, in order to acquire other assets or undertake more consumption than current income permits.

The accounts of the economy in the SNA are:

- a. *Current accounts* consist of a production accounts and accounts showing the primary distribution of income, the secondary distribution of income and the use of income. In addition, the entries in the rest of the world account show the value of goods and services that reach the national economy from the rest of the world and those that are produced in the national economy but are provided to the rest of the world.

The accounts are: (i) production account (*VA*); (ii) generation of income account (*GOS and mixed income*); (iii) an allocation of primary income account (including an entrepreneurial income account and an allocation of other primary income account) (*GNI*); (iv) a secondary distribution of income account (*GNDI*); (v) a use of income accounts (including a use of disposable income account and a use of adjusted disposable income account) (*Savings*).

- b. *Accumulation accounts* are represented by four accounts dealing with changes in the values of assets held by institutional units, recording transactions in non-financial and financial assets and the other changes in the volume of assets. They are: (i) capital account; (b) financial account; (c) other changes in assets account; and (d) revaluation account.
- c. *Balance sheets* present with respect to a particular point in time, the values of assets owned and the liabilities owed by an institutional unit or group of units. A balance sheet may be drawn up for

institutional units, institutional sectors and the total economy. It includes: (a) an opening balance sheet; (b) total changes in assets; (c) a closing balance sheet.

- d. *Goods and services account* captures the idea that all output plus imports must be accounted for in one of the two basic activities of the SNA (consumption of goods and services or accumulation of goods and services).

The total amount of goods and services supplied to the economy must be equal to the total use made of those goods and services:

$$\text{Output} + \text{imports} + \text{taxes less subsidies on products} = \text{Intermediate consumption} + \text{final consumption} + \text{exports} + \text{capital formation}$$

It is necessary to add those goods and services supplied from outside the economy (imports) and those goods and services used by other economies (exports), since no economy is entirely closed

- e. *The accounts for the rest of the world*. The entries in the integrated accounts for the rest of the world correspond to the entries in the balance of payments.

Aggregates in national accounts are summary indicators for the purposes of macroeconomic analysis and comparisons over space and time. For user needs, the aggregates of the SNA provide a simplified but complete and detailed picture of an economy.

Some aggregates can be obtained directly as totals of particular transactions in the SNA, such as total production, final consumption, gross fixed capital formation, etc. Others result from aggregating balancing items of institutional sectors accounts: value added, balance of primary incomes, disposable income and savings, etc. Balancing items in sector accounts are as below.

Table 1: Balancing items and net worth in the SNA

Account	Balancing items
Production account	Value added/Domestic product
Generation of income account	External balance of goods and services
	Operating Surplus
	Mixed Income
Allocation of primary income account	Balance of primary income account / National Income
Entrepreneurial income account	Entrepreneurial income
Allocation of other primary income account	Balance of primary income account / National Income
Secondary distribution of income account	Disposable Income
Redistribution of income in kind account	Adjusted disposable Income
Use of disposable income account	Saving
	Current external balance
Capital account	
Changes in assets	Net lending (+) / net borrowing (–)
Change in liabilities and net worth	Change in net worth due to saving and capital transfers
Financial account	Net lending (+) / net borrowing (–)
Other change in the volume of assets account	Changes in net worth due to other changes in volume of assets
Revaluation account	Changes in net worth due to nominal holding gains/losses
Balance sheets	Changes in net worth, total Net worth
	Net worth

The main aggregates of the 2008 SNA used as key indicators for assessing economic performance are:

- a. Gross Domestic Product (GDP);
- b. Gross National Income (GNI) and Net National Income (NNI);
- c. Gross National Disposable Income (GNDI) and Net National Disposable Income (NNDI).

The concept 'domestic product' is basically a production concept. It measures the total value created in the production of goods and services. On the other hand, national income and national disposable income are income concepts designed to measure different aspects of the total income receivable in the economy.

The ways of calculating the main aggregates using different approaches are presented Table 2 below.

Table 2: Main aggregates in SNA

Production Approach (1)	Expenditure Approach (2)	Income Approach (3)
+ Sum of value added at basic prices of all producers + Taxes on products - Subsidies on products	+ Final Consumption expenditure + Gross fixed capital formation + Changes in inventories + Exports of goods and services - Imports of goods and services	+ Compensation of employees + taxes on production and imports - Subsidies on production and imports + Operating surplus / mixed income
= Gross Domestic Product (GDP) at market prices (I) - Consumption of fixed capital = Net domestic product		
(I) + Primary income receivable from the rest of the world - Primary income payable to the rest of the world		
= Gross national income (GNI) at market prices (II) - Consumption of fixed capital = Net national income at market prices		Can also be calculated as the sum of the balance of primary incomes of all institutional sectors
(II) + Current transfers receivable from the rest of the world + Current transfers payable to the rest of the world		
= Gross national disposable income (GNDI) at market prices (III) - Consumption of fixed capital = Net national disposable income at market prices		Can also be calculated as the sum of the disposable incomes of all institutional sectors

Source: *System of National Accounts 1993, Training manual, SADC, 1999*

Primary incomes generated in the production activity of resident producer units are distributed mostly to other resident institutional units. Part of them may go to non-resident units while some primary incomes generated in the rest of the world may go to resident units.

Primary income includes:

- a. Compensation of employees;
- b. Net taxes on production and imports;
- c. Operating surplus / Mixed income;
- d. Property income:
 - i. Interest (excluding financial intermediation service charges indirectly measured – (FISIM));
 - ii. Distributed income from corporations:
 - Dividends;
 - Withdrawals from income of quasi-corporations;
 - iii. Reinvested earnings on direct foreign investments;

- iv. Other investment income;
 - Investment income attributable to insurance policy holders
 - Investment income payable on pension entitlements
 - Investment income attributable to investment fund shareholders
- v. Rent on land and sub-soil assets

To convert GDP into GNI, it is necessary to add the primary incomes receivable from non-residents and deduct primary incomes payable to non-resident units. In other words, *GNI is equal to GDP less net taxes on production and imports, compensation of employees and property income payable to the rest of the world plus the corresponding items receivable from the rest of the world.*

Primary incomes receivable by resident institutional units may be used in part to make transfers to non-resident units and resident units may receive transfers originating from primary incomes in the rest of the world. Thus, *GNDI is equal to GNI less current transfers (other than taxes less subsidies on production and imports) payable to non-resident units, plus the corresponding transfers receivable by resident units from the rest of the world.*

Current transfers include:

- a. Current taxes on income, wealth, etc.;
- b. Net social contributions;
- c. Social benefits other than social transfers in kind; and
- d. Other current transfers
 - Net non-life insurance premiums (i.e., excluding insurance service charge);
 - Non-life insurance claims;
 - Current transfers within general government;
 - Current International cooperation; and
 - Miscellaneous current transfers
 - o Current transfers to NPISHS
 - o Current transfer between resident and non-resident households
 - o Other

A distinction is also made between GDP and Net Domestic Product (NDP). In order to produce goods and services ('the output'), at least three factors are required: labour, goods and services (intermediate consumption) and capital (machinery). These represent the 'inputs' in the production process.

To arrive at a genuine measurement of the new wealth created during the period, a deduction has to be made for the cost of using up capital (such as the 'wear and tear' on machinery) or consumption of fixed capital. When this consumption is deducted, the result is net value added. Net Domestic Product (NDP) is the sum of these net value added:

$$\text{NDP} = \Sigma \text{ Net Value Added.}$$

Similarly, removing consumption of fixed capital from Gross National Income and Gross National Disposable Income will yield Net National Income and Net National Disposable Income respectively.

4 PRODUCTION, OUTPUT AND GDP

The central concept in a national accounting system is economic production.

Production is an activity carried out under the control, responsibility and management of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods and services.

Output is the total of goods and services created during an accounting period.

Goods are physical, produced objects over which ownership rights can be established and whose ownership can be transferred by engaging in transactions.

Services are the result of a production activity that changes the conditions of the consuming units, or facilitates the exchange of products or financial assets.

It is often necessary to understand which products are treated as goods and which are treated as services. Some manufacturing industries also produce services. For example, when goods dispatched to another unit for processing do not change ownership, the work done on them by the processing unit constitutes a service even though it is undertaken by a manufacturing industry (*manufacturing services*).

Similarly, some service-producing industries may produce products that have many of the characteristics of a good. The products of these industries are described as knowledge-capturing products. *Knowledge-capturing products* (whether on paper or electronic media) provide, store, or communicate information, advice, and entertainment, in such a way that the consumer can access the knowledge repeatedly. Examples of knowledge-capturing products include books, computer programs, movies, and music. They are an output of services industries, but the products have many of the characteristics of goods in that ownership can be established and can be traded like ordinary good.

Gross domestic product (GDP) is a measure of the total economic activity taking place on an economic territory. It measures the total value of goods and services that are newly produced in the economy during an accounting period, without double counting the intermediate goods and services used up to produce them, that generate net incomes to the economy, and that are available for domestic final uses or for exports.

4.1 The Production Boundary

Production includes:

- a. the production of all goods and services that are supplied to units other than their producers;
- b. the own-account production of all goods that are retained by the producers for their own final consumption or gross fixed capital formation.
- c. the own-account production of dwelling services by owner-occupiers;
- d. domestic and personal services produced by employing paid domestic staff;
- e. volunteer activities that result in goods. Volunteer activities that do not result in goods, e.g., care-taking and cleaning without payment, are excluded.

Activities are considered as production irrespective of their being illegal or not-registered at tax, social security, and other public authorities.

4.1.1 Household production boundary

Production excludes the production of domestic and personal services that are produced by households and consumed within the same households. Domestic services produced by households themselves that *are excluded* are:

- a. cleaning, decoration and maintenance of the dwelling as far as these activities are also common for tenants;
- b. cleaning, servicing and repair of household durables;
- c. preparation and serving of meals;
- d. care, training and instruction of children;
- e. care of sick, infirm or old people; and
- f. transportation of members of the household or their goods.

Domestic and personal services produced by employing paid domestic staff (maids, gardeners, drivers, etc.) and *the services of owner-occupied dwellings are however included in production*.

'Do-it-yourself' repairs and maintenance to consumer durables and dwellings carried out by households constitute the own-account production of services and are excluded from the production boundary. The materials purchased are treated as final consumption expenditure. However, more substantial repairs, such as repairing roofs, carried out by owners, are intermediate inputs in the production of housing services.

The SNA production boundary, however, includes goods that households produce for their own consumption. Own-account production of goods by households generally pertains to own-account construction of dwellings; production and storage of agricultural products; processing of agricultural products; preservation of fruit by drying and bottling, production of dairy products, production of other primary products such as cutting peat and carrying water; and other kinds of processing, like weaving cloth, the production of pottery and making furniture.

Own-account production of goods by households is recorded when this type of production is significant, i.e., when it is quantitatively important in relation to the total supply of that good in a country. *Otherwise, it may not be worthwhile trying to estimate it in practice*. In many countries, the only own-account production of goods by households included is the construction of dwellings, and the production, storage and processing of agricultural products.

4.1.2 The Non-Observed Economy

The non-observed economy (NOE) refers to all productive activities that may not be captured in the basic data sources used for compiling national accounts. The following activities are included: underground, informal (including those undertaken by households for their own final use), illegal, and other activities omitted due to deficiencies in the basic data collection program. The term 'non-observed economy' encompasses all of these activities and the related statistical estimation problems.

It is important to note that concerns about the non-observed economy do not lead to defining a separable way of measuring it, but should aim at improving the overall quality of national accounts data.

The non-observed part of the economy refers to the following activities:

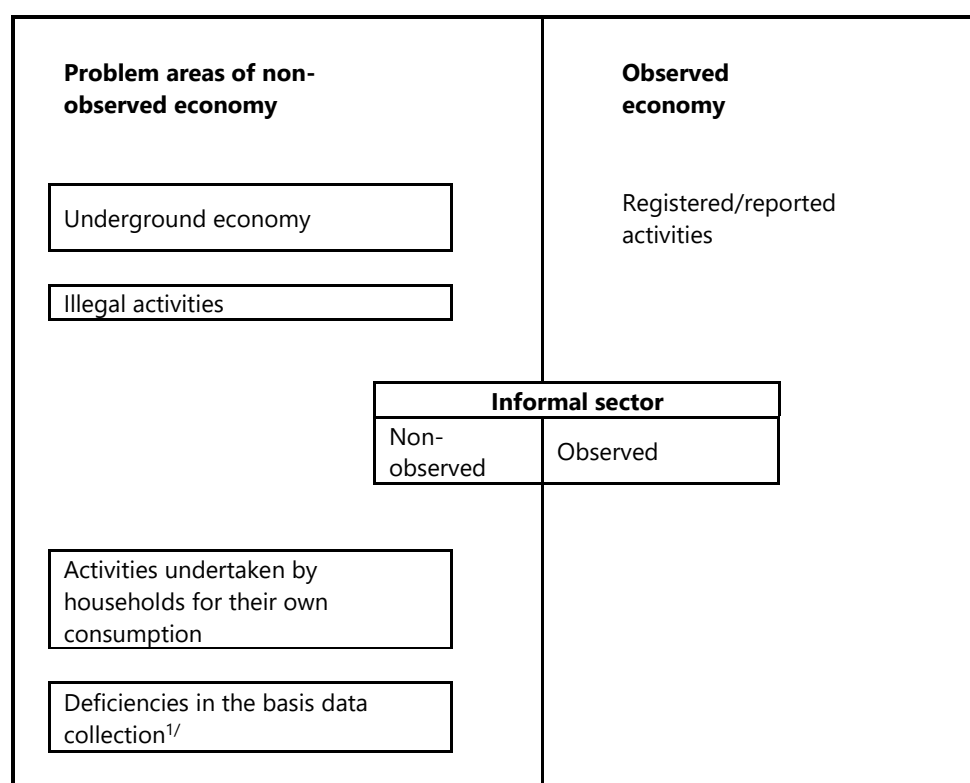
- a. *illegal activities*, defined as those productive activities covered by the SNA production boundary that
 - generate goods and services forbidden by law (e.g., production and distribution of illegal drugs); and
 - that are usually legal but become illegal when carried out by unauthorized producers (e.g., unlicensed practice of medicine).

- b. *hidden and underground activities* defined as those activities that are productive and legal, but are deliberately concealed from public authorities to avoid official scrutiny such as
- payment of income, value added or other taxes;
 - payment of social security contributions;
 - having to meet certain legal standards such as minimum wages, safety or health standards, etc.;
 - complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms.
- c. *production of households for own final use*, defined as those productive activities that result in goods or services consumed or capitalised by the households that produced them, such as:
- production of crops and livestock;
 - production of other goods for their own end use;
 - construction of own houses and other own-account fixed capital formation;
 - imputed rents of owner- occupiers, and services of paid domestic servants.
- d. *non-observed activities described as 'informal'*, being part of the informal sector. In general, they are those productive activities conducted by unincorporated enterprises in the household sector that are unregistered and/or are less than a specified size in terms of employment, and that have some market production.

Illegal activities that are transactions between willing buyers and sellers are treated the same way as legal activities. For example, the production and sale of illegal narcotics are included in the production boundary.

Illegal activities where either of the parties are not willing participants (e.g., theft) are not economic transactions and so are not included in the production boundary.

Figure 3 - Delimiting the observed from the non-observed economy in the 2008 SNA



Source: Essential SNA: Building the basics

1/ such as under-coverage of enterprises, non-response by enterprises, and under-reporting by enterprises

Measurement methods for the non-observed economy vary across countries. Several data sources are quite common, such as agricultural censuses, business statistics, household surveys, demographic data/population censuses, Labour Force Survey/labour statistics, taxation and fiscal data, police records, social security records and foreign trade statistics. Some surveys are ad-hoc, for example to capture specific activities such as tobacco smuggling. Other sources such as Labour Force Surveys and employment data, structural business surveys, household budget/expenditure surveys, and taxation data are widely used.

The main methods used in estimating the NOE are:

- a. Statistical methods
 - (i) direct estimations based on direct surveys (surveys on expenditure, income, labour, time use or opinion, etc).
 - (ii) indirect estimation based on available data sources:
 - Supply based approach (including the labour input approach): it relies on data on the supply of inputs (major raw material, labour, fixed capital stock, etc.) that are used for producing goods and services. Input/output and input/value added ratios are used to calculate output and value added estimates from the input data.
 - Demand based approach: it aims to assess production by using indicator data on specific uses of goods and services that sufficiently describe their production (e.g., final consumption expenditures for some commodity such as health and personal services, use of raw materials such as processing of agricultural products, etc).
 - Income-based approach: it is based on available data from administrative sources in some categories of income, which can be used to obtain an indication of production covered by the administrative system (income taxes, social security contributions paid by self-employed persons or private entrepreneurs, etc.)
 - Commodity flow approach: it involves balancing total supplies and uses of individual products, using accounting equations. For example, the commodity flow method to calculate the output of the retail trade from supply of commodities.
- b. Methods based on modelling techniques. Macro-economic models (such as monetary models, global indicator method) provide some estimation of the NOE but should be avoided

To note that there is no unique standard method that is applied internationally. Several methods or combinations of methods are usually applied depending on the characteristics of countries.

See Annex 4 on the Informal Sector

4.2 Valuation

4.2.1 Basic and producers' prices

The SNA utilizes two kinds of prices to measure output, namely, basic prices and producers' prices.

The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output, minus any tax payable (including deductible value added taxes) plus any subsidy receivable, as a result of its production or sale. It excludes any transport charges invoiced separately by the producer.

Basic price measures the amount retained by the producer and is, therefore, the price most relevant to the producers' decision taking. Subsidies that the producer receives from government artificially reduce the sale price while taxes on products received by the producer from the purchaser and passed on to government,

if included, would artificially increase the price. Therefore, subsidies are included and taxes on products are excluded to reflect the true amount retained by the producer.

The producers' price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any value added tax (VAT), or similar deductible tax, invoiced to the purchaser. It excludes any transport charges invoiced separately by the producer.

The producers' price includes taxes on products (taxes payable per unit of output) and excludes subsidies on products (subsidies receivable per unit of output). It is the price, excluding VAT, that the producer invoices to the purchaser.

Neither the producers' nor the basic price includes any amounts receivable in respect of VAT, or similar deductible tax, invoiced on the output sold.

4.2.2 Purchasers' price

The purchasers' price is the amount the purchaser pays to take delivery of the goods or services. It includes any taxes payable (less any subsidies receivable) on production and imports, transport charges paid separately by the purchaser to take delivery, and the margins of wholesalers and retailers. Value added taxes are included in purchasers' prices unless they are deductible from the purchasers' value-added tax liability.

Purchasers' prices are also referred to as market prices. A purchaser can buy directly from a producer, or from a wholesaler or retailer. If he buys from a producer, the purchasers' price will exceed the producers' price by the value of any non-deductible VAT, payable by the purchaser and the value of any transport charges on a good paid separately by the purchaser. If he buys from a wholesaler or retailer, the trade margins will have to be added.

Relationship between basic, producers', and purchasers' price

Basic prices

- + Taxes on products excluding invoiced VAT
- Subsidies on products

= Producers' prices

- + VAT not deductible by the purchaser
- + Separately invoiced transport margins
- + Wholesalers' and retailers' margins

= Purchasers' prices

Example 1: Evaluation at basic, producers' and purchasers' prices

An enterprise produces cigarettes. The value of the production costs of one packet of cigarettes including the enterprise' profit is 200 units. The enterprise pays an excise duty of 20% on the value of each packet. The packet of cigarettes is sold to a retail trader. The transport cost is 10 units and the trade margin is 20 units. Value added tax (VAT) in the country is at 20%.

The final consumer of the packet of cigarettes pays 324 units, as below:

Production at basic price = 200 units.

Production at producers' price = production at basic price + taxes on products
= 200 + (20% x 200)
= 200 + 40 = 240 units.

Cost at purchasers' price = production at producers' price + transport cost + trade margin + VAT
= 240 + 10 + 20 + [(240 + 10 + 20) x 20%]
= 324 units.

Taxes on production and imports

Taxes on production and imports consist of compulsory, unrequited payments, in cash or in kind, which are levied by general government, in respect of the production and importation of goods and services, the employment of labour, the ownership or use of land, buildings or other assets used in production. Such taxes are payable irrespective of profits made.

Taxes on production and imports are described as unrequited because the government provides nothing in return to the individual unit making the payment.

Taxes on production and imports are disaggregated into two components:

- a. Taxes on products, which include:
 - value added type taxes;
 - taxes and duties on imports, excluding VAT
 - taxes on products, except VAT, import and export taxes
- b. Other taxes on production

Taxes on Products

Taxes on products is taxes payable per unit of good or service produced or transacted.

The tax may be a specific amount of money per unit of quantity of the good or service, or it may be calculated as a specified percentage of the price per unit or value of the goods or services transacted. Examples of taxes on products are VAT, import duties, sales taxes, and excise taxes.

A value-added type tax (VAT) is a tax on goods or services collected in different stages by enterprises, but is ultimately charged in full to the final purchasers.

Taxes and duties on imports are compulsory payments levied by government on imported goods, excluding VAT, in order to admit them to free circulation on the economic territory, and on services provided to resident units by non-resident units.

Export taxes consist of taxes on goods or services that become payable by government when the goods leave the economic territory or when the services are delivered to non-residents.

Taxes on products, excluding VAT, import and export taxes, consist of taxes on goods and services that become payable as a result of the production, sale, transfer, leasing or delivery of those goods or services, or as a result of their use for own consumption or own capital formation.

They include excise duties and consumption taxes other than those included in taxes and duties on imports; stamp taxes on the sale of specific products (such as alcoholic beverages and tobacco); taxes on financial and capital transactions payable on the purchase or sale of non-financial and financial; car registration taxes; taxes on entertainment; taxes on lotteries, gambling and betting, etc.

Other taxes on production

Other taxes on production consist of all taxes that enterprises incur *as a result of engaging in production*, independent of the quantity or value of the goods and services produced or sold.

Examples are taxes on the ownership or use of land, buildings, or other structures utilised by enterprises in production (including owner-occupiers of dwellings); taxes on the use of fixed assets (such as vehicles,

machinery and equipment) for purposes of production; taxes on the total wage bill and payroll taxes; taxes on international transactions (e.g., travel abroad, foreign remittances, or similar transactions with non-residents) for purposes of production; taxes paid by enterprises for business and professional licences, and taxes on pollution resulting from production activities.

Subsidies

Subsidies are current unrequited payments that government units, including non-resident government units, make to resident enterprises on the basis of the levels of their production activities or the quantities or values of the goods or services that they produce, sell, or import. *Subsidies are not payable to households.*

Subsidies are disaggregated into two components: subsidies on products (import subsidies and other subsidies on products) and other subsidies on production.

Subsidies on products

A subsidy on a product is a subsidy payable per unit of a good or service produced, sold, or imported. It may be a specific amount per unit of quantity of a good or service, a specific percentage of the price per unit, or the difference between a specific target price and the market price paid by a buyer. Some examples are subsidies on agricultural products and subsidies on exports.

Other subsidies on production

Other subsidies on production consist of subsidies other than those on products which resident producer units may receive as a consequence of engaging in production. Examples include subsidies on payroll or workforce and subsidies to reduce pollution.

Margins

Most goods are distributed by wholesalers and retailers and sold at shops or other retail establishments. The wholesalers and retailers add margins onto the price of goods sold to cover the services supplied to their customers by storing and displaying a selection of goods in convenient locations and making them easily available for customers to buy. The purchasers' price includes the trade margin, reflecting the prices actually paid by purchasers.

Transport margin

When transport costs are invoiced separately, the transport costs are known as '*transport margins*' and should be included in the purchasers' price of the good. Conversely, if transport is provided without an explicit fee, the sales price will include delivery cost which is an intermediate consumption of the supplier.

4.3 The three measures of GDP

There are three approaches for compiling gross domestic product (GDP): the production approach, the income approach, and the final expenditure approach.

- a. *GDP (P) : the production approach*, also called the output approach, measures GDP as the sum of the gross value added of all resident producer units, plus taxes on products less subsidies on products. The compilation formula is:

$$\begin{aligned}\text{GDP at market prices} = & \text{gross value added (GVA) at basic prices} \\ & + \text{taxes on products} \\ & - \text{subsidies on products}\end{aligned}$$

Value added represents a measure of the additional value created in the process of production and it is equal to:

Gross value added = production – intermediate consumption

- b. *GDP (E) : the expenditure approach* measures GDP as the total of all final expenditures made in either consuming the final output of the economy, or in adding to wealth, plus exports less imports of goods and services. The compilation formula is:

GDP at market prices = Final consumption expenditure (of Households, NPISHs, and Government)
+ Gross capital formation (Gross fixed capital formation and Change in inventories)
+ Exports of goods and services
- Imports of goods and services

- c. *GDP (I) : the income approach* measures GDP as the total of all incomes earned in the process of producing goods and services plus taxes on production and imports less subsidies, and is calculated as follows:

GDP at market prices = Compensation of employees
+ Taxes on production and imports
- Subsidies on production
+ Operating surplus / mixed income

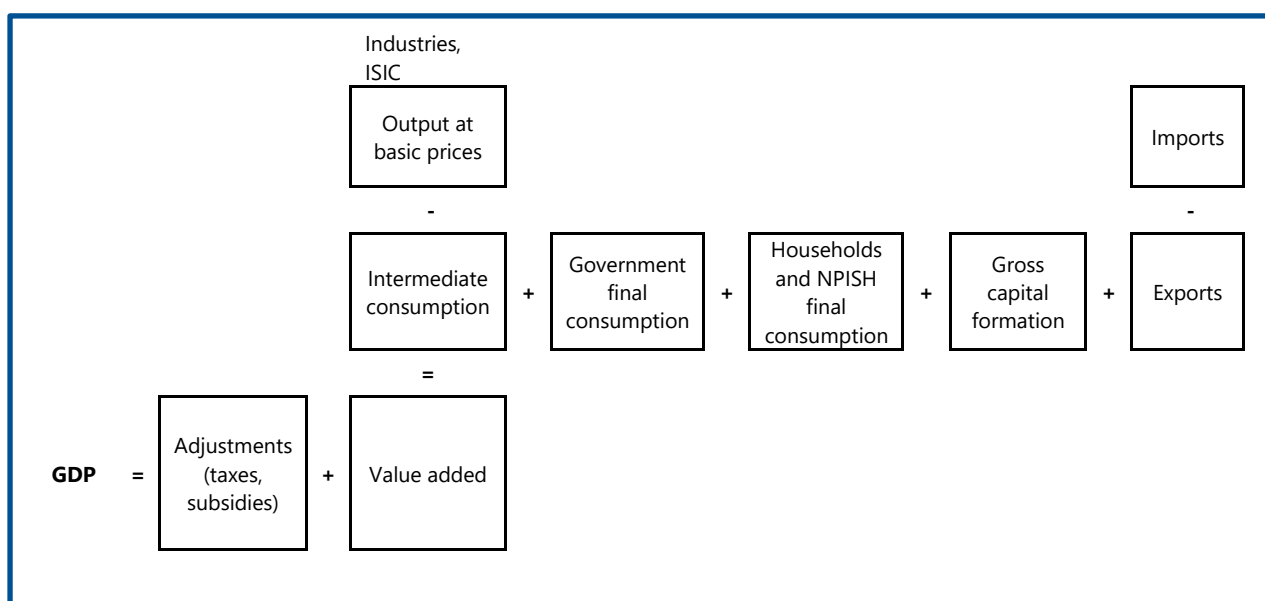
The production-expenditure-income approaches constitute the basic ways of compiling national accounts and correspond to the objectives of milestones 1 and 2. These simplest approaches to national accounting aim at estimating GDP and its alternative breakdowns by economic activity or industry, by expenditures, and by income. The scope of this approach is represented in Figure 4.

Although conceptually each measure should result in the same estimate of GDP, in practice different estimates of GDP are obtained since the three measures are compiled independently using different data sources.

In order to achieve the best estimate of GDP, it is a good practice to feed the elements of these three approaches into a Supply and Use framework. This enables value added and income estimates by industry to be reconciled, and supply and demand for products to be balanced. This integrated approach ensures consistency between the components of GDP, and a better estimate of the level of GDP than from only one of the three approaches.

Compiling Supply and Use tables requires exploiting all available data and information on the economy in a systematic way. The end result is a reliable and balanced set of national accounts, including the estimation of key aggregates like GDP in current prices and in prices of the previous year.

Figure 4 - Production, expenditure, income approaches to national accounts compilation



Source: A system approach to national accounts compilation, Studies in methods, Series F, No. 77, UN 1999

This guide will not cover the methodology for the compilation of supply and use tables which in practice is very laborious, requires detailed administrative and statistical data, a large investment of human resources and a deep knowledge of the economy.

Below is an example of the computation of GDP from the three approaches and reconciliation.

Table 3: GDP of the Republic of South Africa - 3 approaches, 2015

(a) Goods and services accounts, 2015

Uses	R million	Resources	R million
Output	8,766,617	Intermediate consumption	4,784,859
Taxes on products	449,367	Final consumption expenditure	3,654,501
Subsidies on products	(10,332)	Private consumption expenditure	2,815,210
Imports of goods and services	1,282,606	Government consumption expenditure	839,291
		Gross capital formation	823,735
		Gross fixed capital formation	796,138
		Changes in inventories	27,597
		Exports of goods and services	1,225,162
Total resources	10,488,258	Total uses	10,488,257

(b) Production accounts, 2015

Uses	R million	Resources	R million
Intermediate consumption	4,784,859	Output	8,766,617
		Taxes on products	449,367
		Subsidies on products	(10,332)
Gross Domestic product	4,420,793		

(c) Generation of income account, 2015

Uses	R million	Resources	R million
Compensation of employees	2,168,500	Gross Domestic product	4,420,793
Taxes on production and imports	540,527		
Taxes on products	449,367		
Other taxes on production	91,160		
Subsidies on production and imports	(21,705)		
Subsidies on products	(10,332)		
Other subsidies on production	(11,373)		
Gross operating surplus / mixed income	1,733,471		

Source: National Accounts: Sources and Methods / Statistics South Africa

GDP (E) =

Household final consumption expenditure
+ Government final consumption expenditure
+ Gross capital formation
+ Exports
– Imports.
= 2,815,210 + 839,291 + 823,735 + 1,225,162 – 1,282,606
= **4,420,793 R million**

GDP (P) =

Output
– Intermediate consumption
+ taxes less subsidies on products.
= 8,766,617 – 4,784,859 + (449,367 – 10,332)
= **4,420,793 R million**

GDP (I) =

Compensation of employees
+ Taxes on production and imports
- Subsidies on production and imports
+ Gross operating surplus
= 2,168,500 + 540,527 - 21,705 + 1,733,471
= 4,420,793 R million

Table 4: GDP of the Republic of Mauritius: reconciliation, 2021 (MUR million)

[illegible]

Source: Digest of National Accounts, Year 2021 (Statistics Mauritius)

5 MEASURING GDP: PRODUCTION APPROACH

Production accounts record the activity of producing goods and services, where production is defined by the SNA production boundary.

They show the output of production and the various inputs used in production. The balancing item in the production account is *value added*, defined as the value of output less the value of intermediate consumption and is a measure of the contribution to GDP made by an individual producer, industry or sector.

Value added can be measured either gross or net, that is, before or after deducting consumption of fixed capital.

- Gross value added is the value of output less the value of intermediate consumption
- Net value added is the value of output less the values of intermediate consumption and consumption of fixed capital.

Gross value added = Output – Intermediate Consumption

**Gross value added = Output – Intermediate Consumption
– Consumption of fixed capital**

Example 2: Calculating GVA at basic prices

Output (excluding taxes less subsidies)	= 2,000
Material cost (excluding deductible VAT)	= 600
Services (excluding deductible VAT)	= 200

Gross Value added at basic prices =
Output at basic price
- Intermediate consumption at purchasers' prices
= 2000 – (600 + 200)
= 1,200

GDP derives from the concept of value added. The economy-wide production account is the aggregation of a similar account for each production unit. It is the sum of gross value added of all resident producer units, plus taxes on products less subsidies on products. This derivation is referred to as GDP measured by the production approach (GDP(P)).

$$\text{GDP} = \sum \text{Gross Value Added} + \text{Taxes less subsidies on products}$$

5.1 Output

Output is defined as the goods and services produced by an establishment,

- excluding the value of any goods and services used in an activity for which the establishment does not assume the risk of using the products in production (e.g., oil refinery processing crude oil that belongs to another unit), and
- excluding the value of goods and services consumed by the same establishment, except for goods and services produced and used for capital formation (fixed capital or changes in inventories) or own final consumption.

Output in basic prices = Sales or revenues + Change in inventories of goods manufactured (including finished and semi-finished goods)

The SNA recognizes three types of output:

- a. Market output
- b. Output for own final use
- c. Non-market output

Market output

Market output consists of output intended for sale at economically significant prices. It includes:

- a. products sold at economically significant prices;
- b. products bartered;
- c. products used for payments in kind (including compensation of employees in kind and mixed income in kind);
- d. products supplied by one establishment to another within the same institutional unit to be used as intermediate inputs or for final uses;
- e. products added to the inventories of finished goods and work-in-progress intended for one or other of the above uses.

Economically significant prices are prices that have a significant effect on the amount that producers are willing to supply and on the amount that purchasers wish to buy. *A price is considered economically significant, when price of the goods and services cover at least 50% of the costs of production.*

Output for own final use

Output for own final use consists of products retained by the producer for his own use, either as final consumption or capital formation.

Products retained for own final consumption can only be produced by the household sector. They include:

- a. agricultural products retained by farmers;
- b. dwelling services produced by owner-occupiers; and
- c. household services produced by employing paid staff.

Products used for own capital formation can be produced by any sector. Examples of such products are:

- a. machine tools produced by engineering enterprises;
- b. dwellings or extensions to dwellings produced by households;
- c. own-account construction, including communal construction undertaken by groups of households;
- d. own-account software; and
- e. own-account research and development.

Nonmarket output

Non-market output is output that is provided to other units for free, or at prices that are not economically significant. It consists of goods and individual or collective services produced by non-profit institutions serving households (NPISHs) or government that are supplied free, or at prices that are not economically significant, to other institutional units or the community as a whole.

Time of recording and valuation of output

Output is to be recorded and valued when it is generated by the production process.

The distinction between market, own-final use and non-market output determines the valuation principles to be applied to output.

All output is to be valued at basic prices, but specific conventions hold for:

- a. the valuation of non-market output;
- b. the valuation of total output of a non-market producer; and
- c. the valuation of the total output of an institutional unit of which an establishment is a non-market producer.

Goods and services produced for sale on the market at economically significant prices are valued *at basic prices*.

The value of goods or services bartered is recorded when the ownership of the goods is transferred or the services are provided. *The output of goods bartered is valued at the basic prices that would have been received if they had been sold.*

Similarly, the value of goods or services provided to employees as compensation in kind or other payments in kind is recorded when the ownership of the goods is transferred or the services are provided. *They are also valued at the basic prices that would have been received if they had been sold.*

When intra-enterprise deliveries are recorded, they should be valued at the basic prices that would have been received if they had been sold.

Output for own final use is valued at the basic prices of similar products sold on the market. When basic prices of similar products cannot be obtained, the value of the output produced for own final use is valued at the costs of production plus a mark-up for net operating surplus or mixed income; i.e., as the sum of:

- a. Intermediate consumption
- b. Compensation of employees
- c. Consumption of fixed capital;
- d. A net return to fixed capital; and
- e. Other taxes (less subsidies) on production.

No net return to capital is included when own-account production is undertaken by a non-market producer.

Additions to work-in-progress are valued at the current basic price of the finished product. A provisional value of output treated as work-in-progress can be estimated based on the actual costs incurred, plus a mark-up (except for non-market producers) for the estimated operating surplus or mixed income. The provisional estimates are subsequently replaced by the actual value (once known) of the finished products distributed over the period of work-in-progress.

The total output of an institutional unit is the sum of the total output of its constituent establishments. Similarly for non-market producers.

The total output of a non-market producer is valued by summing the costs of production (intermediate consumption, compensation of employees, consumption of fixed capital, and other taxes on production less other subsidies on production). No net return to capital is included, nor is the imputation for rental value of non-residential buildings owned and used in non-market production.

In the case of secondary market output by the non-market producer, the non-market output is valued as a residual item, i.e., as the total costs of production as above minus the revenues from market output.

Market output by non-market producers is valued at basic prices.

For a non-market establishment covering market, non-market and own final use output, its total output is valued by the sum of production costs. The value of its market output is equal to the receipts from sales of market products, and the value of its non-market output is obtained residually as the difference between

the value of its total output and the sum of its market output and output for own final use. Any receipts from the sale of non-market goods or services at prices that are not economically significant are part of the value of its non-market output.

5.2 Intermediate Consumption

Intermediate consumption consists of the value of goods and services consumed as inputs in the production process, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods and services may be either transformed (e.g., flour may be transformed into bread) or completely consumed or used up (e.g., electricity and most services) in the production process.

Intermediate consumption is calculated from data on the purchases of goods and services for use in production minus the change in inventories of materials and supplies.

$$\begin{aligned} \text{Intermediate consumption} &= \text{Cost of materials purchased} \\ &\quad - \text{Change in inventories of raw materials} + \text{Cost of services purchased} \end{aligned}$$

Goods and services consumed as an intermediate input are recorded and valued at the time they enter the process of production. They are valued at the purchasers' prices for similar goods or services at the time of use.

It includes the value of goods and services used as inputs into ancillary activities, the latter being undertaken within an enterprise for the sole purpose of supporting the main and secondary activities. The output of an ancillary activity is not intended for use outside the enterprise.

Intermediate consumption does not include valuables consisting of works of art, precious metals and stones and articles made out of them, that are acquired as stores of value. However, intermediate consumption does include precious stones and metals when used in the production of jewellery and similar items.

Rentals paid on buildings and on fixed assets (e.g., operating leases of machines, cars, software, etc.) are included as part of intermediate consumption, along with fees for short-term contracts, leases and licences of non-produced assets, FISIM and non-life insurance service charges.

Boundary between intermediate consumption and compensation of employees

Certain goods and services used up by producers do not enter directly into the production process but are consumed by employees working on that process. If employees use the product at their own discretion to satisfy their needs or wants, it is compensation of employees (compensation in kind).

However, expenditure by employers which is to their own benefit as well as to that of their employees because it is necessary for production is treated as intermediate consumption. For example, protective clothing or uniforms, or reimbursement for transportation and hotel services while travelling on business.

Boundary between intermediate consumption and gross fixed capital formation

Intermediate consumption excludes items treated as gross fixed capital formation.

Regular expenditure on small durables, such as hand tools, is regarded as intermediate consumption even if the tool lasts more than one year, while expenditure on large items of machinery and equipment is recorded as gross fixed capital formation.

Regular and ordinary maintenance and repairs of fixed assets used in production constitute intermediate consumption while major renovations that extend an asset's service life or enhance its performance, reconstructions or enlargements of fixed assets are to be treated as gross fixed capital formation. Routine maintenance that is required to keep an airplane in operation is intermediate consumption. Examples of

work to be considered as gross fixed capital formation and not intermediate consumption are: extending or enlarging existing buildings or structures, and refitting or restructuring the interior of a ship.

Research and development is treated as gross fixed capital formation except where it is clear that the activity does not entail any economic benefit for its owner in which case it is treated as intermediate consumption.

Expenditures on mineral exploration and evaluation are not treated as intermediate consumption. Whether successful or not, they are needed to acquire new reserves and so are all classified as gross fixed capital formation.

Expenditure on major military equipment (such as weapon delivery systems) is treated as gross fixed capital formation. Expenditures on durable military items such as boots, bombs and bullets, torpedoes and spare parts, are recorded as increases in inventories on acquisition and decreases in inventories on use or disposal, and as intermediate consumption as they are used up.

Treatment of operating leases and financial leases

Operating leases are leases that provide for the renting of machinery or equipment for specified periods of time. An operating leasing is a production activity in which the owner of the machinery or equipment (the lessor) provides a service to the user (or lessee). The lessor is usually responsible for the maintenance and repair of the equipment as part of the service provided to the lessee. Rentals services are treated as intermediate consumption of the lessee.

Under a financial lease, a change of ownership from the lessor to the lessee is deemed to have taken place, even though the leased machinery or equipment legally remains the property of the lessor. Financial leasing is a method of financing the acquisition of the machinery and equipment where the lessor makes a loan to the lessee to enable the latter to finance the acquisition of the equipment. Financial leases are treated as a combination of loan repayments and interest payments, and not as part of intermediate consumption.

Outsourcing

It is increasingly common for producers to change the way in which a production activity is completed. Different stages in the process or different support activities such as office cleaning, auditing, or assembly of electronic components may be contracted out to another producer in the same country or abroad.

The processing fee or outsourcing fee is treated as intermediate consumption of the unit having recourse to outsourcing, and as output of the processor.

Also, the pattern of inputs for an establishment processing goods on behalf of another unit is different from the pattern of inputs when the establishment is manufacturing similar goods on their own account.

An example is a petroleum refinery. A unit refining on own account has intermediate consumption of crude oil and output of refined petroleum products. A unit processing on behalf of another unit has similar inputs, but shows neither the crude petroleum nor the refined products in its production account. The value added and other inputs will be comparable and when the process is carried out for a non-resident, imports will exclude the crude oil and exports will exclude the refined products but include the processing fee.

5.3 Output of specific industries

5.3.1 Agriculture

"Agriculture" refers broadly to ISIC Rev.4, section A, "Agriculture, forestry and fishing," and includes the following divisions:

- 01: Crop and animal production, hunting and related service activities;
- 02: Forestry and logging; and
- 03: Fishing and aquaculture.

Only the growth and regeneration of crops, trees, livestock, or fish which are controlled by, managed by, and are under the responsibility of institutional units are included in the SNA production boundary.

Production is a continuous process in which goods and services are converted into other goods and services. This process may extend over months or even years, covering different accounting periods. This characterisation of agricultural production, combined with accrual principles, results in the recording of output as work-in-progress. Thus, the output of agricultural products is recorded as being produced continuously over the period of production, not only when the crops are harvested or animal slaughtered.

Many agricultural crops are annual with most costs incurred at the beginning of the season when the crop is sown and again at the end when it is harvested. The value of the output has to be spread over the year and treated as work-in-progress. When the crop is harvested, the cumulated value of work-in-progress is converted to inventories of finished goods that is then run down as it is used by the producer, sold or is lost to vermin. During the production process, the value to be recorded during each period as output under work-in-progress can be obtained by distributing the value of the finished product in proportion to the costs incurred during each period.

For farm products with production cycle shorter than the reference accounting period, it may not be necessary to record the output as work-in-progress. The recording of the output at the end of the production process (harvest) maintains the consistency between the output and the production costs. Similarly, for short-cycle crop production whose production process spans over two calendar years, since a balance can be established as far as the expenditure in a given period is offset by output of the previous period. This assumes no substantial change in the production process or very poor harvests. Otherwise, the recording of output as work-in-progress is indicated.

Usually, a part of the agricultural output for an economy is not sold but retained by the producers for own consumption. These products should still be recorded as output.

Some plants and many animals take some years to reach maturity. In this case, the increase in their value is shown as output and treated as increases in fixed capital or inventories depending on whether the plant or animal yields repeat products or not.

Cultivated biological resources – repeat yield

Cultivated biological resources cover animal resources yielding repeat products such as breeding stocks, dairy cattle, draft animals, and sheep reared for wool production; and tree, crop and plant resources yielding repeat products such as fruit trees, vines, rubber tree, and palm trees.

Two cases need to be distinguished: the production of cultivated products by specialized producers and the own-account production of cultivated assets by their users.

In the case of the specialist producers, animals or trees whose production is not yet complete and are not ready for sale or delivery are recorded as **work-in-progress**. Examples are one-year-old horses bred for sale as two-year-old race horses, or young fruit trees that need further growth before being marketable.

However, when animals or trees intended to be used as fixed assets are produced on own account, incomplete assets in the form of immature animals, trees, etc. that are not ready to be used in production are treated not as work-in-progress **but as gross fixed capital formation** by the producer unit in its capacity of eventual user. Once the plant or animal reaches maturity, it will decline in value and recorded as consumption of fixed capital.

Single yield

Single-use livestock (animals raised for slaughter, including poultry) produce an output only once when the livestock are slaughtered. Single-use livestock are treated as work-in-progress.

Similarly, trees grown for timber that yield a finished product once only when they are ultimately felled, are not fixed assets, just as cereals or vegetables that produce only a single crop when they are harvested cannot be fixed assets.

5.3.2 Crops

Measuring the output

Output is mainly estimated based on the formula '**quantity * price**', due to scarcity of data and difficulties of compiling estimates based on representative samples of business accounts.

Crop production can be calculated according to resources (that is, estimates of quantities produced or harvested based on estimates of areas under cultivation and yields), or on uses (purchases by the user branches of agricultural products, exports net of imports, changes in producers' stock, and final household consumption). The second method can be highly appropriate when buyers are readily identifiable and the other components of uses are limited. Nevertheless, there is need to verify the consistency and reliability of the data.

Output (resources) is estimated as follows:

$$\text{Output at current prices} = \text{quantity of crop harvested during the crop year} * \text{average basic price during the harvest season}$$

where quantity of crop harvested = land area under cultivation * yield rate per unit of land, and average basic prices are average ex-farm gate prices.

Land area under cultivation, yield or yield rates, and ex-farm gate prices for each type of crops by region are usually available from government agricultural services.

Details on inputs by type of crops and region can be obtained from regular agricultural surveys, household surveys and administrative data sources.

Countries conducting regular 5-yearly agricultural censuses or surveys can collect detailed benchmark information on agricultural land use, yields and inputs by type of crops. These results can be used to compute benchmark ratios that can be used to estimate output and intermediate consumption for the current years. Benchmark ratios include input costs or quantity per unit of land by type of crops, or costs per quantity of output although the former is preferred the reason being that output is dependent on other factors as well. Costs may be detailed in terms of specific inputs, such as seeds, fertilizers, pesticides, fuels,

service charges, etc. and have to be updated to current prices in the following years, as input prices tend to vary.

The part of agricultural output that is retained by the farmers for own consumption should be recorded as output.

Commodity flow approach

The commodity flow approach involving different data sources can also be used:

$$\text{Output} + \text{Imports} = \text{Inputs to other production activities} + \text{Final consumption of households} + \text{Change in inventories} + \text{Exports}$$

This approach ensures consistency of data collected from different sources and helps to impute any under-reporting as well as informal production.

Crop year and calendar year

The crop year is defined as the period from the time the crop is sown to the time it is harvested.

When the crop and national accounts accounting periods do not overlap, the crop output, intermediate consumption, and value added should be allocated to the correct accounting periods. The following information is needed:

- When the intermediate consumption (e.g., seeds, fertilizers, pesticides, small tools, gas) is used.
- How the crop year can be allocated over the two concerned calendar years.

Intermediate consumption can be allocated to the months it is used in the production process, while value added can be allocated in proportion of the working time. For each sub-period of the accounting year, output can be calculated as the sum of value added and intermediate consumption allocated to that specific period.

Figure 5: Allocation of production over a calendar year

CY 2020		CY 2021											CY 2022		
Crop 20/21						Crop year 21/22									
						Crop sown									Harvest
...	...	Jan	Feb	Mar	Apr	May	Jun	Dec	Jan	Feb
O4		O1				O2								O3	

Crop X is planted in May and harvested in Feb of the following year. The crop year 2021/2022 thus spans from May 2021 to February 2022.

Output is estimated as a sum of intermediate consumption (seeds, fertilizers, pesticides, small tools, gas) used during the period plus part value added of the respective crop year, where

$$\text{Output for year 2021} = \text{O1} + \text{O2}$$

O3 and O4 are not considered even if O3 is part of crop year 21/22.

O1 = Intermediate consumption used during January - February 2021
+ part of Value added generated by 20/21 crop year harvest

O2 = Intermediate consumption used during May - December 2021
+ part of Value added generated by 21/22 crop year harvest

Losses

Special attention should be given to recording crop losses. Losses can happen before the crop is harvested, for example due to storms or fires, or at harvest, for example due to vermin. Whereas losses at harvesting are not part of the output, losses by merchants remain part of the output.

Example 3: Losses due to vermin

In 2020, the company bought 1,000 tons of maize for 100 dollars per ton. Later during the year, it sold the maize for 150 dollars per ton. Between the time of purchase and sale, it suffered a loss of 20 tons due to vermin.

Purchases	= 1,000 tons * 100
	= 100,000
Sales	= (1,000 – 20) * 150
	= 147,000
Margin	= 1,000 * (150 – 100) – (20 * 150)
	= 47,000

Output due to storage

In general, changes in the price of a good while it is in storage are recorded in the national accounts as a holding gains or losses and not considered as part of output. However, there are some exceptional cases for which the SNA recommends recording the increase in value of goods held in inventories as output due to storage instead of holding gains.

For example, some goods such as maize are held in storage to take advantage of seasonal demand. In these cases, even though demand is seasonal, producers may wish to produce for the entire year and hold most of the maize in inventories until demand peaks again.

Example 4: Output due to storage

Harvest of maize in January = 1,000 tons at 100 dollars per ton

Sales in June at 200 dollars per ton	
Output	= (1000 * 100) + 1000 * (200 – 100)
	= 200,000 units
Change in inventories	= (+1000 * 100) – (1,000 * 200) + 1000 * (200-100)
	= 0

Data sources

Output for agricultural activity is estimated using direct data sources such as 5-yearly censuses of agriculture and livestock, crop estimation surveys, agriculture household surveys, household expenditure survey, studies on farm management and on cost of cultivation, and administrative data as well as indirect data sources. Some countries have also started to experiment the use of satellite images to measure crop production. This practice is useful where informal production is important.

In many countries, multiple data sources are used due to the unavailability or insufficient frequency of the direct sources. Indirect data sources include population censuses, quantities and prices of imports and exports, wholesale and retail prices, government budget expenditure, reports of specialized agencies or boards dealing with the production and prices of agricultural products (marketing agencies, distribution of seeds, fertilisers and pesticides, etc.) and cooperatives.

5.3.3 Animal Production

Animal production activities include raising (farming) and breeding of animals, except aquatic animals.

In national accounts, growth of animals is considered output and can be estimated as:

- the sum of the live weights of all animals in the herd, or;
- the total number of animals multiplied by the average live weight per animal.

Table 5: Measuring animal growth

	Beginning of reference period			Beginning of reference period			Animal growth (g)=(f)-(c)
	Total number (a)	Average live weight (Kg) (b)	Total live weight (Kg) (c)=(a)*(b)	Total number (d)	Average live weight (Kg) (e)	Total live weight (Kg) (f)=(d)*(e)	
Sheep	87	16.2	1409.4	91	16.7	1519.7	110.3
Goats	55	12.6	693	49	12.7	622.3	-70.7

Source: Guidelines on methods for estimating livestock production and productivity - FAO

Animal growth is the difference between the total live weight at the end and the total live weight at the beginning of the reference period. Animal growth may be negative if there is a decrease in the number of livestock, or a significant decrease in the average weight of the animals while their number is more or less stable.

It is not always possible to accurately observe and record the weight of each animal. A simpler method of estimation assumes that the structure of the herd is stable and the average weight of the animals is constant for each livestock system. In this case, only the number of animals is needed.

Output can also be estimated using the following relationship:

$$\text{Output of animal production} + \text{Imports} = \text{Intermediate consumption} + \text{Gross fixed capital formation} + \text{Change in animal inventories} + \text{Exports}$$

where Intermediate consumption = slaughtered animals

Gross fixed capital formation = change in the number of dairy and working animals in the herd

Change in inventories = change in the animals in the herd to be slaughtered

Output can be first estimated in terms of number and weight, and then valued at basic prices.

It is important for compilers to pay attention to whether the number of animals in the herd is decreasing, for example during an epizootic. In these cases, output would be negative, and part of the change in the number of animals must be considered as catastrophic losses in other volume changes.

Data sources

Output for the animal production activity can be estimated using data from agricultural and livestock censuses, regular household and business surveys, specific studies, and administrative data such as information from the Ministry responsible for livestock. In many economies, the share of own-account production of livestock is significant, and this activity could be challenging to estimate in the national accounts if specific data sources are not available.

5.3.4 Manufacturing

Manufacturing activities includes the physical or chemical transformation of materials, substances, or components into new products. The materials, substances, or components used are raw materials that are products of agriculture, forestry, fishing, mining or quarrying as well as products of other manufacturing activities. Manufacturing units may process materials or may contract with other units to process their

materials for them. Both are manufacturing activities. The output of a manufacturing process may be finished ready for utilization or consumption, or semi-finished that can be an input for further manufacturing.

Conceptually, the output of the manufacturing industry is the easiest to measure. The data collected from censuses and surveys of enterprise will normally reflect the value of sales. These need to be adjusted for the changes in inventories of both finished goods and work-in-progress.

Some manufacturing industries undertake production that takes a very long time to complete, such as shipbuilding and large engineering works. In such cases, work-in-progress should be measured based on work put in place. As indicated before, a provisional value of the output treated as work-in-progress should be estimated based on the actual costs incurred and a mark-up (except for non-market producers) for the estimated operating surplus or mixed income. The provisional estimates should subsequently be replaced by the actual value (once known) of the finished products distributed over the period of work-in-progress.

Example 5: Computing the value added of Manufacturing sector

Tables 6 (a) and (b) present a typical income statement prepared by business accountants to record sales, other incomes, and operating cost and other costs. Cost of goods sold may contain two components: cost of goods manufactured representing the activity of a manufacturer and the cost of goods bought for resale representing the activity of a trader

In this example, the manufacturer produces goods for sale and does not act as a wholesaler or retailer. Expenses include costs of goods sold and operating expenses covering administrative, planning, and marketing costs. Other income may include interest received. Similarly, other expenses include interest payable, etc.

Table 6(a): Statement of income for year ended 31 December, 2020

Sales		850
Cost of sales sold		-586
Gross profit		264
Operating expenses		222
Labour costs	115	
Goods and services	100	
Depreciation	7	
Operating income		42
Other income		9
Interests received	9	
Other expenses		-15
Interests paid	-10	
Bad debts provision	-5	
Extraordinary gains or loss for sale of assets		-2
Net income before taxes		34
Taxes on income		-12
Net income after taxes		22
Dividends payable		-12
Retained earnings		10

Table 6 (b): Cost of goods sold

Inventory of finished goods at the beginning of the period		70
Cost of goods manufactured		592
Raw materials used up in manufacturing	123	
Depreciation of plants and machinery	30	
Direct labour in manufacturing	360	
Manufacturing overheads costs	81	
Materials and services	10	
Depreciation	5	
Labour costs	66	
Goods in process beginning inventory	21	
Goods in process end inventory	-23	
Inventory of finished goods at the end of the period		-76
Cost of goods sold		586

Source: GDP compilation in African countries (April 2017). AfDB

a. [Production approach](#)

$$\begin{aligned}
 \text{Output at basic prices} &= \text{Sales} \\
 &+ \text{changes in inventories of finished goods} \\
 &+ \text{changes in inventories of goods in process} \\
 &= 850 + (76 - 70) + (23 - 21) \\
 &= \mathbf{858}
 \end{aligned}$$

Intermediate consumption at purchasers' prices=

$$\begin{aligned}
 &\text{Raw materials consumed} \\
 &+ \text{Other goods and services consumed} \\
 &= 123 + 100 + 10 \\
 &= 233
 \end{aligned}$$

$$\begin{aligned}
 \text{Value added at basic prices} &= \text{Output at basic prices} - \text{Intermediate consumption} \\
 &= 858 - 233 \\
 &= \mathbf{625}
 \end{aligned}$$

b. [Income approach](#)

$$\begin{aligned}
 \text{Labour costs} &= 115 + 360 + 66 \\
 &= 541
 \end{aligned}$$

$$\begin{aligned}
 \text{Depreciation} &= 7 + 30 + 5 \\
 &= 42
 \end{aligned}$$

$$\begin{aligned}
 \text{Property income and other transfers payable} &= (10 - 9) + 5 + 2 + 12 + 12 + 10 \\
 &= 42
 \end{aligned}$$

$$\begin{aligned}
 \text{Value added at basic prices} &= 541 + 42 + 42 \\
 &= \mathbf{625}
 \end{aligned}$$

Manufacturing services

A producer may carry out the same activity under quite different economic conditions. For example, a farmer may process his own grain (vertically integrated production with higher value added), and also offers to mill grain of other farmers against a processing fee. The production account for the farmer with a mill will be different from that of the farmer who does not have a mill but pays a fee for milling, even though both produce flour for sale. In this case, the reasons for *subcontracting or outsourcing* the activity to another may be the availability of suitable fixed capital.

When goods dispatched to another unit (or country) for processing do not change ownership, the work done constitutes a service even though it may be undertaken by a manufacturing industry.

The processing fee or outsourcing fee is treated as intermediate consumption of the unit having recourse to outsourcing, and as output of the processor.

Increasingly, similar processes are being carried out worldwide, with many countries upgrading their industrial base to the global value chain mostly with respect of activities associated with manufacturing. An example is a petroleum refinery. A unit refining on own account has intermediate consumption of crude oil and output of refined petroleum products. A unit processing on behalf of another unit will show neither the crude petroleum nor the refined products in its production account. The value added and other inputs will be comparable and when the process is carried out for a non-resident, imports will exclude the crude oil and exports will exclude the refined products but include the processing fee. Hence, their production account and operating ratios will be different. It is therefore necessary to identify those manufacturing on own account, those providing processing services and those doing both, and collect the required information from them.

Manufacturing services on physical inputs owned by others should be collected separately, and not derived as the difference between the value of goods sent abroad and subsequently returned. The value of the manufacturing services is not necessarily the same as the difference between the value of goods before and the value of goods after processing because of holding gains/losses and the inclusion of overheads in the finished goods price.

An example of a questionnaire that can be used is at Annex 5.

Additional details on processing services are given in Section 6.3.4.

Data sources

Within manufacturing, some degree of disaggregation (group or class) will need to be shown depending on the weights of the activity in the economy. The degree of disaggregation can be determined in conjunction with the production statisticians and relevant authorities, such as the Ministry for Industry. Also, within the manufacturing sector, there are likely to be many medium- and small-sized enterprises, as well as informal activities, whose cost structures would differ and in particular with those of larger enterprises.

Due to the importance of manufacturing sector in some countries, surveys and censuses of manufacturing on at least a benchmark basis may have high priorities.

For large and medium sized enterprises, required information are available from their accounts and can be collected through censuses and surveys or from administrative data sources such as tax data and exports data for export-oriented enterprises. For small-scale and informal activities, special mixed household-enterprise surveys and labour force surveys will help to gather benchmark data required to estimate their production and operating costs.

Administrative data can be used to supplement the regular censuses and surveys, as well as for computing inter-censal estimates if economic censuses and surveys of enterprises are not conducted on a regular basis.

Main sources of data are:

- a. Economic censuses and surveys of enterprises;
- b. Surveys of household unincorporated enterprises;
- c. Labour force surveys;
- d. Industrial production data;
- e. Business accounts of corporations;
- f. Administrative data sources (income tax, VAT data, imports and exports data)

5.3.5 Construction

Construction activities comprise

- a. Construction of buildings,
- b. Civil engineering, which includes
 - Construction of road and railways;
 - Construction of utility projects; and
 - Construction of other civil engineering projects, such as industrial facilities (other than buildings), waterways, harbours, the dredging of waterways, dams, etc.
- c. Specialized construction activities which include
 - Demolition and site preparation;
 - Electrical, plumbing and other construction, installation activities;
 - Building completion and finishing; and
 - Other specialized construction activities.

The production of buildings and other building structures usually take several months or years to complete. The output from such production should not be recorded at the time when the process of production is completed.

When a contract of sale is agreed in advance for the construction of buildings and structures, the output produced during each period is treated as a sale to the purchaser at the end of the period, and is recorded as gross fixed capital formation by the purchaser and not as work-in-progress by the producer.

When the contract of sale requires stage payments, the value of the output may be approximated by the value of the stage payments made in each period.

In the absence of a contract of sale, the output produced during each period is recorded as work-in-progress of the producer.

Units without any prior contract of sale remain in the inventories of the producer until sold, changing status within inventories from work-in-progress to finished products if they remain unsold on completion.

For own-account construction not completed during an accounting period, the value of the output can be estimated as follows: the ratio of the costs incurred in the current period to the total costs over the whole time of construction is applied to the estimate of total output at the current basic price. If it is not possible to estimate the value of the finished structure at current basic price, it is valued by costs of production plus a mark-up (except for non-market producers) for net operating surplus or mixed income. If some or all of the labour is provided free, as it may happen with communal construction by households, an estimate of the cost of paid labour is made using wage rates for similar labour inputs and included in the estimated total production costs.

Data Sources

The output of the construction industry is very often computed in conjunction with the computation of gross fixed capital formation estimates. Construction statistics are captured by business surveys or household surveys depending on the type of unit that carries out the construction activity.

Main sources of data are:

- g. Economic censuses and surveys of establishments;
- h. Household income and expenditure surveys to capture own-account construction by households;
- i. Surveys of household unincorporated enterprises to capture construction that are not covered by construction establishment surveys; and
- j. Government expenditure for own construction, particularly for construction and major repairs of roads, dikes, waterways, etc.

Indirect methods

In some countries, the construction industry may involve a lot of small-scale activity. It may not be possible to collect all information through enterprise surveys although large and medium-sized enterprises will provide data covering a substantial part of the production of the industry. Alternative indirect approaches can be used.

Where administrative data on building permits are complete (irrespective of whether construction is done by enterprises, household unincorporated enterprises, or own accounts construction), the data can be used to estimate total output by applying benchmark rates, such as rates charged per unit area of construction and operating ratios obtained from economic censuses and surveys.

Data on inputs such as domestic production and imports of construction materials can be used to estimate the output of the construction industry. Based on these data, the output and value added can be estimated using benchmark output/input and value added/output ratios at current prices.

In the absence of direct statistical information, estimates of output can also be calculated as the sum of its components: intermediate consumption and gross value added. Data on domestic production, import and export of raw materials used in the construction process can be used as basis for estimating intermediate consumption. Information on the number of employees, the average wage of the sector and assumptions about the gross profit can be used to estimate gross value added. The number of employees in the construction sector may be available from the Labour Force Survey (LFS) or from administrative data source.

For some developing countries without any source of data, the estimation of the construction of dwellings can be worked out based on a per capita space requirement. Estimated increases in population or households would allow for the estimation of additional housing units needed and thence of construction output, particularly in rural areas.

5.3.6 Wholesale and retail trade services

Although wholesalers and retailers buy and sell goods with minimal processing such as cleaning and packaging, the goods purchased are not treated as part of their intermediate consumption when they are resold. Wholesalers and retailers are treated as supplying services to their customers by storing and displaying a selection of goods in convenient locations which make them easily available to customers.

Their output is measured by the total value of the trade margins realized on the goods they purchase for resale, where *the trade margin is the difference between the actual or imputed price realized on a good purchased for resale and the price that would have to be paid by the distributor to replace the good at the time it is sold or otherwise disposed of.*

Trade margins realized on some goods can be negative if their sale prices are marked down. Trade margins are negative on goods that are not sold, as they go to waste or are stolen. Trade margins on goods given to employees as compensation in kind, or withdrawn for final consumption by owners, are equal to zero.

The output of wholesalers and retailers is

- = the value of sales
- + the value of goods purchased for resale and used for intermediate consumption, compensation of employees in kind or mixed income in kind,
- the value of goods purchased for resale,
- + the value of additions to inventories of goods for resale,
- the value of goods withdrawn from inventories of goods for resale,
- the value of recurrent losses due to normal rates of wastage, theft or accidental damage.

However, several special cases must be considered

- a. *Goods sold are valued at the price they are actually sold* (excluding VAT), even if the trader has to mark down the prices for some reason.
- b. *Goods purchased for resale* should be valued excluding any transport charges invoiced separately by the suppliers or paid to third parties by wholesalers or retailers. The transport services are part of the intermediate consumption of the wholesalers or retailers.
- c. *Goods provided to employees as remuneration in kind* are valued at the current purchasers' prices payable by the traders to replace them. Therefore, their margin is zero. Similarly for goods withdrawn by the owners of unincorporated enterprises for their own final consumption.
- d. *Additions to inventories of goods for resale* are valued at the prices prevailing at the time of entry into inventories.
- e. The value of *goods for sale withdrawn from inventories* depends on whether the goods were acquired with the intention of making a real holding gain over a given period in storage.
 - If the goods were not expected to realize a real holding gain while in storage, the value of the goods on withdrawal from inventories should be the cost of acquiring exactly similar replacement goods, for later sale at the time of the withdrawal. This valuation is necessary to exclude holding gains and losses from the measurement of output, as is the general rule in the SNA.
 - Otherwise, when the goods have been stored for reasons of seasonal variation in prices or as part of the maturing process, the expected real holding gain over the anticipated period is deducted from the replacement value of goods withdrawn from inventories. This deduction is fixed in value at the time the goods enter storage.
- f. The *value of recurrent losses due to wastage, theft or accidental damage* are valued in the same way as goods withdrawn from inventories.

Example 6: Estimating trade output with and without holding gains

Consider Wholesaler A that specializes in the sale of office furniture. In 2020, it incurred sales of 2,000. The total value of the goods purchased for resale was 1,400 of which 100 was used as intermediate consumption. During this period, the Wholesaler added 1,000 to the inventories of goods for resale and withdrew 800, with no seasonal variation in prices. Additionally, a theft represented a loss of 100.

Total output of Wholesaler A during 2020 =

- Value of sales
- + value of goods purchased for resale and used for intermediate consumption
- value of goods purchased for resale
- + value of additions to inventory of goods for resale
- value of goods withdrawn from inventory of goods for resale
- value of recurrent losses due to normal rates of wastage, theft, or accidental damage

$$\begin{aligned}
&= 2000 + 100 - 1,400 + 1,000 - 800 - 100 \\
&= \mathbf{800}
\end{aligned}$$

Another example is Retailer B that specializes in the sale of umbrellas. In 2021, it incurred sales of 1,400. The total value of goods purchased was 1,000. During this period, the retailer added 1,000 to the inventories of goods for resale, and withdrew 1,400. With the rainy season, there was a seasonal variation in the price of umbrellas that led to a real holding gain on inventories of 400.

The total output of Retailer B during 2021 =

$$\begin{aligned}
&\text{Value of sales} \\
&- \text{value of goods purchased for resale} \\
&+ \text{value of additions to inventories of goods for resale,} \\
&- \text{value of goods withdrawn from inventories of goods for resale.} \\
&+ \text{seasonal variation in prices, leading to real holding gains on inventories} \\
&= 1,400 - 1,000 + 1,000 - (1,400 - 400) \\
&= \mathbf{400}
\end{aligned}$$

Data sources

Usually there are a number of large enterprises, many medium-sized enterprises and many very small-scale enterprises engaged in wholesale and retail trade activities. These very small-scale enterprises will include street traders and others with no fixed premises. Additionally, retail activities are increasingly carried out online.

Main data sources include economic censuses and surveys of establishments, as well as household surveys to identify the very small-scale enterprises and the informal ones. The establishment of an up-to-date business register will help a long way to conduct an establishment census or survey.

Indirect method

Where it is not possible to obtain detailed source data for the measurement of trade activities, indirect methods can be used as below:

- a. identify the products on which the margins are levied from imports data and locally production data, including agricultural products. These should exclude any goods that have been exported. (Supply table)
- b. group identified goods (classified to a certain level) into broad economic categories namely intermediate, final consumption and capital goods.
- c. apply fixed trade margin to each of the groups. Usually, the margin rate can be obtained from benchmark censuses and regular surveys of establishments.

5.3.7 Financial Intermediaries

There are three types of financial services:

- a. financial intermediation (including insurance and pension services);
- b. services of financial auxiliaries; and
- c. other financial services.

Corporations engaged in financial intermediation obtain funds by taking deposits, and issuing bills, bonds and other securities. They use these funds as well as own funds to acquire financial assets by making loans to others and by purchasing bills, bonds or other securities. Financial intermediation includes insurance and pension services.

Auxiliary financial activities facilitate risk management and liquidity transformation. Financial auxiliaries act on behalf of other units and do not put themselves at risk by incurring financial liabilities or by acquiring financial assets as part of an intermediation service.

Other financial services include monitoring services such as monitoring the stock and bond market, security services such as safeguarding expensive jewellery and important documents, and trading services such as foreign exchange dealing and dealing in securities.

Financial services may be paid for directly or indirectly. Financial services are provided and charged for in four main ways:

- a. financial services provided for explicit charges;
- b. financial services provided for through with interest charges;
- c. financial services in acquiring and disposing of financial assets and liabilities in financial markets; and
- d. financial services provided in insurance and pension schemes, where the activity is financed by loading insurance contributions and from the income return on savings.

Financial services provided for explicit charges

The examples below illustrate the nature of the services charged for directly:

- a. banks charge households to arrange a mortgage, manage an investment portfolio, and administer an estate;
- b. specialized institutions charge non-financial corporations for organizing a takeover or for administering a restructuring of a group of corporations;
- c. credit card companies charge units that accept credit cards usually a percentage of each sale; and
- d. a card holder is charged an explicit annual fee for holding the card.

Financial services provided for through interest charges

In financial intermediation, a financial institution (e.g., a bank) accepts deposits from units wishing to receive interest on funds for which the unit has no immediate use and lends them to other units whose funds are insufficient to meet their needs. In doing so, the bank provides a mechanism to allow the first unit to lend to the second. Each unit pays a fee to the bank for the service provided: the unit lending funds pays a rate of interest lower than the 'reference' rate of interest, while the unit borrowing funds pays a rate of interest higher than the 'reference' rate of interest. The difference between the interest rate paid to banks by borrowers and the interest rate actually paid to depositors is a charge for financial intermediation services indirectly measured (FISIM).

FISIM represents the charges due to the difference between the rate paid by lenders and the reference rate, plus the difference between the reference rate and the rate actually paid to depositors.

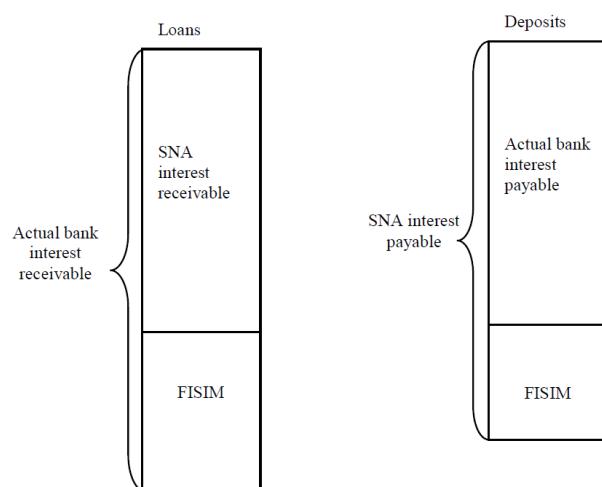
By convention within the SNA, FISIM applies only to loans and deposits and only when the loans and deposits are provided by, or deposited with, financial institutions. Therefore, loans are the only assets of deposit-taking corporations that generate FISIM, and part of the interest paid by the borrower is reclassified as purchases of services from banks. Deposits are the only liabilities of the deposit-taking corporations that generate FISIM; the depositor receives the reference rate of interest and uses the imputed interest income to purchase services.

The financial Institutions need not be resident; nor need the clients of the financial institution be resident. Thus, imports and exports of this type of financial service are possible.

Financial institutions do not necessarily need to offer deposit taking facilities or making loans, e.g. money-lenders.

FISIM is estimated as below.

Figure 6 - Actual bank interest, SNA interest and FISIM



$$FISIM = FISIM_L + FISIM_D = \left(\frac{r_L - rr}{100.0} \right) Y_L + \left(\frac{rr - r_D}{100.0} \right) Y_D$$

where $FISIM_L$, $FISIM_D$, r_L , r_D , rr , Y_L and Y_D represent FISIM on loans made by financial institutions, FISIM on deposits held by financial institutions, the lending and deposit rates of interest, the reference rate of interest, the average stock of loans and average stock of deposits respectively.

Data sources

Input data for the calculation of domestically produced FISIM (stock of loans and deposits, and interest payable and receivable on loans and deposits) are available in reports provided by financial institutions to the monetary authority. Compiling agencies may need to request the data, should they be not readily available.

Other possible data sources include enterprise surveys or censuses as well as data sets from credit reporting agencies.

For imported FISIM, estimates of the total imported FISIM, SNA interest and bank interest on loans and deposits can be obtained directly from balance of payments statistics. Otherwise, enterprise and household surveys can be conducted to collect data on the stock of loans and deposits, as well as on the associated interest transactions with non-resident deposit-taking corporations. The input data to calculate imports of FISIM by general government can be obtained from general government accounts.

To ensure that there is consistency between national accounts and balance of payments statistics, the compiling agency should estimate the imports of FISIM, SNA interest and bank interest in consultation with the compilers of the balance of payments.

Example 7: Calculation of FISIM

Assume the following:

- the average stock of loans granted by a bank was 2,000.
- the average stock of deposits was 3,000.
- The effective rate of interest on loans issued by the bank was 10%.
- The effective rate of interest on deposits was 2%.
- Interbank borrowing rate was 5% and was used as the reference rate.

Table 7: Calculation of FISIM

	Stocks	Effective exchange rate (%)	Interest receivable/ payable (c) = (a) * (b)	Service Margin	FISIM	SNA Interest
	(a)	(b)		(d)	(e) = (a) * (d)	(f) = (a) * 5%
Assets				$R_L - rr$		
Average loan stock	2,000	10	200	$10.0 - 5.0 = 5.0$	100	100
Liabilities				$rr - R_D$		
Average stock of deposits	3,000	2	60	$5.0 - 2.0 = 3.0$	90	150
Average stock of interbank loans	300	5	15			
Total					190	250

The interest receivable on loans during the period = $10\% * 2,000 = 200$.

The interest payable on deposits during the period = $2\% * 3,000 = 60$

FISIM on loans is the difference between the lending and the reference rates ($10\% - 5\%$) multiplied by the stock of loans outstanding, $FISIM_L = 5\% * 2,000 = 100$.

FISIM on deposits equals the difference between the reference rate and the deposit rates ($5\% - 2\%$) multiplied by the stock of deposits outstanding, $FISIM_D = 3\% * 3,000 = 90$.

Therefore, total output of produced FISIM = $100 + 90 = 190$.

The actual interest payable to, or receivable from banks is known as "bank interest." Bank interest can be divided into two components:

- interest known as 'SNA interest', and
- the implicit payment for financial intermediation services

both of which should be recorded separately. The interest component is recorded as property income flows.

SNA interest can be estimated as below:

- SNA interest on loans and deposits can be obtained by multiplying the reference rate by the average stock of loans and deposits respectively (column (f)).

$$\text{SNA Interest (loans)} = 5\% * 2,000 = 100$$

$$\text{SNA Interest (deposits)} = 5\% * 3,000 = 150$$

- Alternatively, SNA Interest on deposits is calculated as: $90 + 60 = 150$
SNA Interest on loans is calculated as: $200 - 100 = 100$
- Total SNA interest = 250.

FISIM is treated as the output of financial intermediation services, and the SNA interest (not interest receivable or payable by the bank) is recorded as property income flows in the allocation of primary income account.

To note that total output of the financial institutions is equal to FISIM plus all explicit service charges.

Allocating FISIM

The output of FISIM should be distributed to the institutional sectors and the rest of the world, based on data on borrowers by type of loans and on holders by type of deposits, as well as stock of loans and deposits by sector or economic activity.

Allocation of FISIM to resident institutional units is classified as intermediate or final consumption while allocation to the rest of the world is included in exports of services.

The distinction between intermediate and final consumption depends on the purpose for which the institutional sector is consuming the service. Intermediate consumption is incurred by producers (corporations, general government, households in their role as owners of dwellings and unincorporated enterprises, and NPISHs), while final consumption expenditure is incurred by general government, households in their role as consumers, and NPISHs.

Depending on the level of details of data received, two approaches can be used to allocate FISIM to sectors. The first approach, '[bottom-up approach](#)' assumes that the compiling agency is able to obtain data on the interest receivable on loans, interest payable on deposits and stocks of loans and deposits by institutional sector (including the rest of the world). FISIM and SNA interest on loans and deposits computed by sector are summed up to obtain the economy-wide estimates.

Otherwise, it will adopt the '[top-down approach](#)'. The compiling agency will use available data to compute the total FISIM, SNA interest and bank interest on loans and deposits. Various indicators such as loan/deposit balances or interest receivable/payable from other sources will then be used to allocate the computed FISIM to user sectors.

For the allocation of estimates of FISIM, SNA interest and bank interest to households in the respective categories, the same indicators mentioned above can be used. If these indicators are not available, some assumptions will have to be made. For example, data on deposits of households as owners of unincorporated enterprises, if not available, can be estimated by assuming that the ratio of stocks of deposits to value added or turnover observed for the smallest corporations applies to those unincorporated enterprises.

Detailed input data to calculate FISIM and SNA interest by industry may not be available at the industry level. The compiling agency will then need to allocate the intermediate consumption of domestically produced FISIM to industries using the "top-down" approach using indicators such as the shares of the stocks of loans and deposits, gross value added, or the output of each industry.

Example 8: Allocation of FISIM using top-down approach

The example below assumes that all information on stock of loans and deposits by sector, and only total interests receivable on loans and payable on deposits are available.

Table 8(a): Stock of loans and deposits, and interests receivable and payable

	2020	2021	Average
Interests receivable on loans	525	585	555.0
Interests payable on deposits	265	280	272.5
Stock of deposits held at end of period	4,480	4,650	4,565.0
Non-financial corporations	890	924	907.0
Households	2,998	3,111	3,054.5
Non-residents	592	615	603.5
Stock of outstanding loans at end of period	5,600	5,790	5,695.0
Non-financial corporations	1,900	1,964	1,932.0
Households	3,200	3,309	3,254.5
Non-residents	500	517	508.5

Step 1: Calculate total domestically produced FISIM

Interest payable on deposits during 2021 = 280

Stock of deposits at mid-period =
= Average (stock of deposits at end of 2020 and stock of deposits at end 2021)
= (4,480 + 4,650)/2 =
= 4,565

Average interest rates on deposits = $280/4,565 * 100 = 6.1 \%$

Interest receivable on loans during 2021 = 585

Stock of deposits at mid-period =
= Average (stock of deposits at end of 2020 and stock of deposits at end 2021)
= (5,600 + 5,790)/2
= 5,695

Average interest rates on loans = $585/5,695 * 100 = 10.3 \%$

Reference rate (average of interest of the average interest rates on deposits and loans)
= $(6.1 + 10.3)/2 = 8.2 \%$

Total domestic FISIM on loans during 2021 = $(10.3 \% - 8.2 \%) * 5,695 = 119.6$

Total domestic FISIM on deposits during 2021 = $(8.2 \% - 6.1 \%) * 4,565 = 95.9$

Step 2: Calculate the share of stock of loans and deposits of each sector

Step 3: Allocate the total domestic FISIM on loans and on deposits calculated at step 1 to the sectors, based on their shares of the stock of loans and deposits respectively.

Table 8 (b): Allocation of domestic FISIM

	Average stock of deposits	Stock of loans at mid-period	FISIM on Loans	FISIM on Deposits	Total FISIM	Allocation as
Total	5,695.0	4,565.0	119.6	95.9	215.5	Output
Non-financial corporations	1,932.0	907.0	40.6	19.0	59.6	Intermediate Consumption
Households and NPISHs	3,254.5	3,054.5	68.3	64.1	132.5	Intermediate Consumption
o/w Mortgage loans	2,245.6	-	47.2	-	47.2	
Households	1,008.9	3,054.5	21.2	64.1	85.3	Final Consumption
Rest of the World	508.5	603.5	10.7	12.7	23.4	Export

Example 9: Computation of FISIM and SNA interest by institutional sector using bottom-up approach

Tables 9(a) and 9(b) show the breakdown of interest receivable on loans and interest payable on deposits of resident deposit-taking corporations by sector, and the corresponding stock data on the loans and deposits of the deposit-taking corporations respectively.

Table 9 (a) - Interest receivable on loans and interest payable on deposits offered by resident deposit-taking corporations

Line number	Item	Value
(1)	Interest receivable on loans	150.1
(1a)	Non-financial corporations	80.0
(1b)	Other financial corporations	7.5
(1c)	General government	10.0
(1d)	Households	36.1
(1e)	of which: dwelling loans	20.0
(1f)	NPISHs	7.5
(1g)	Rest of the world	9.0
(2)	Interest payable on deposits	62.9
(2a)	Non-financial corporations	36.0
(2b)	Other financial corporations	6.6
(2c)	General government	5.0
(2d)	Households	8.0
(2e)	NPISHs	4.3
(2f)	Rest of the world	3.0

Table 9 (b) - Stock of loans and deposits of resident deposit-taking corporations

Line number	Financial assets and liabilities	Value
(3)	Stock of loans granted on 1 January	1,809.0
(3a)	Non-financial corporations	982.0
(3b)	Other financial corporations	102.0
(3c)	General government	110.0
(3d)	Households	430.0
(3e)	of which: dwelling loans	230.0
(3f)	NPISHs	90.0
(3g)	Rest of the world	95.0
(4)	Stock of deposits held on 1 January	1,127.0
(4a)	Non-financial corporations	650.0
(4b)	Other financial corporations	99.0
(4c)	General government	98.0
(4d)	Households	150.0
(4e)	NPISHs	80.0
(4f)	Rest of the world	50.0
(5)	Stock of loans granted on 31 December	1,893.0
(5a)	Non-financial corporations	1,022.0

(5b)	Other financial corporations	104.0
(5c)	General government	116.0
(5d)	Households	440.0
(5e)	of which: dwelling loans	240.0
(5f)	NPISHs	96.0
(5g)	Rest of the world	115.0
(6)	Stock of deposits held on 31 December	1,155.0
(6a)	Non-financial corporations	660.0
(6b)	Other financial corporations	101.0
(6c)	General government	92.0
(6d)	Households	152.0
(6e)	NPISHs	84.0
(6f)	Rest of the world	66.0

Table 9(b) is used to derive the average loans and deposits, as well as their changes for each sector in Table 9(c).

The average is the simple average of the level of loans or deposits as at 1 January and 31 December, while the change is obtained by taking the difference between the level of loans and deposits as at 1 January and 31 December.

Table 9(c) - Average stock of, and changes in, loans and deposits of resident deposit-taking

Line number	Financial assets and liabilities	Description	Value
(7)	Average stock of loans granted (YL,av)	[(3)+(5)]/2	1,851.0
(7a)	Non-financial corporations	[(3a)+(5a)]/2	1,002.0
(7b)	Other financial corporations	[(3b)+(5b)]/2	103.0
(7c)	General government	[(3c)+(5c)]/2	113.0
(7d)	Households	[(3d)+(5d)]/2	435.0
(7e)	of which: dwelling loans	[(3e)+(5e)]/2	235.0
(7f)	NPISHs	[(3f)+(5f)]/2	93.0
(7g)	Rest of the world	[(3g)+(5g)]/2	105.0
(8)	Average stock of deposits held (YD,av)	[(4)+(6)]/2	1,141.0
(8a)	Non-financial corporations	[(4a)+(6a)]/2	655.0
(8b)	Other financial corporations	[(4b)+(6b)]/2	100.0
(8c)	General government	[(4c)+(6c)]/2	95.0
(8d)	Households	[(4d)+(6d)]/2	151.0
(8e)	NPISHs	[(4e)+(6e)]/2	82.0
(8f)	Rest of the world	[(4f)+(6f)]/2	58.0

Table 9(d) shows how to derive the average interest rate for the loans and deposits for each sector, and the domestic reference rate (rr_{DOM}), which is more suitable for countries with less detailed data.

Table 9 (d) - Calculation of average interest rates on loans and deposits offered by resident deposit-taking corporations and of the reference rate

Line number	Item	Description	Value
(9)	Average interest rate on loans (r_L)	$(1)/(7)*100$	8.11
(9a)	Non-financial corporations	$(1a)/(7a)*100$	7.98
(9b)	Other financial corporations	$(1b)/(7b)*100$	7.28
(9c)	General government	$(1c)/(7c)*100$	8.85
(9d)	Households	$(1d)/(7d)*100$	8.30
(9e)	of which: dwelling loans	$(1e)/(7e)*100$	8.51
(9f)	NPISHs	$(1f)/(7f)*100$	8.06
(9g)	Rest of the world	$(1g)/(7g)*100$	8.57
(10)	Average interest rate on deposits (r_D)	$(2)/(8)*100$	5.51
(10a)	Non-financial corporations	$(2a)/(8a)*100$	5.50
(10b)	Other financial corporations	$(2b)/(8b)*100$	6.60
(10c)	General government	$(2c)/(8c)*100$	5.26
(10d)	Households	$(2d)/(8d)*100$	5.30
(10e)	NPISHs	$(2e)/(8e)*100$	5.24
(10f)	Rest of the world	$(2f)/(8f)*100$	5.17
(11)	Reference rate domestic (rr_{DOM})	$[(9)+(10)]/2$	6.81

The domestic reference rate (rr_{DOM}) is computed as below:

- Calculate the average interest rate on loans (r_L) by dividing the total interest income receivable on all loans made by resident deposit-taking corporations by the average stock of all loans and multiply by 100.0
- Calculate the average interest rate on deposits (r_D) by dividing the total interest payable on all deposits with resident deposit-taking corporations by the average stock of all deposits and multiply by 100.0
- Obtain the domestic reference rate (rr_{DOM}) by taking the simple average of the two values.

Table 9(e) shows the data on the loans provided by non-resident deposit-taking corporations to the economy and interest receivable on loans granted by these corporations. It is assumed that the non-resident deposit-taking corporations are from only one foreign country; the loans are denominated in the foreign country's currency, and are granted to resident non-financial corporations; FISIM provided in the foreign country is based on the interbank rate.

There is a need to convert these data into local currency.

Converting to local currency:

- Multiply the average stock of loans and interest receivable on loans denominated in foreign currency by the exchange rate to get the equivalent in local currency terms.

Computing the average interest rate in foreign currency terms:

- Divide interest receivable by the average stock of loans in foreign currency terms and multiply the result by 100.0.

Table 9(e) - Loans granted by non-resident deposit-taking corporations to resident non- financial corporations

Line number	Item	Description	Value
(12)	Stock of loans granted in foreign currency on 1 January		80.00
(13)	Stock of loans granted in foreign currency on 31 December		86.00
(14)	Average stock of loans in foreign currency (YL,F,av)	(12)/(13)*100	83.00
(15)	Change in loans in foreign currency	(13)-(12)	6.00
(16)	Interest payable in foreign currency		5.80
(17)	Average interest rate (rL,F)	(16)/(14)*100	6.99
(18)	Reference rate in foreign country (rrF)	Interbank rate	5.00
(19)	Exchange rate	1.3 local currency units for 1 of foreign currency	1.30
(20)	Average stock of loans in local currency	(14)*(19)	107.90
(21)	Change in loans in local currency	(15)*(19)	7.80
(22)	Interest payable in local currency on loans	(16)*(19)	7.54

Using data from the tables above, FISIM is computed separately for loans and deposits for each sector in Table 9(f).

For each sector, the FISIM on loans provided by resident deposit- taking corporations is calculated as follows:

- Compute the difference between the average interest rate on loans and the domestic reference rate (rr_{DOM}) in Table 9(d).
- Multiply this difference by the average level of loans to get the FISIM on loans.

For example, the FISIM on loans which are provided by resident deposit-taking corporations to non-financial corporations = $\frac{(7.98 - 6.81)}{100} * 1002.0 = 11.8$ units

For each sector, the FISIM on deposits with resident deposit-taking corporations is obtained as follows:

- Compute the difference between the domestic reference rate (rr_{DOM}) and the average interest rate on deposits in Table 9(d).
- Multiply this difference by the average level of deposits to get the FISIM on deposits.

For example, the FISIM on deposits of non-financial corporations with resident deposit-taking corporations = $\frac{(6.81 - 5.50)}{100} * 665.0 = 8.6$ units

In the case of loans from non-resident deposit-taking corporations, FISIM is computed as follows:

- Compute the difference between the average interest rate on loans ($r_{L,F}$) and the foreign reference rate (rr_F), both of which are denominated in foreign currency terms, in Table 9(e).
- Multiply this difference by the average level of loans (YL,F ,av) to get the FISIM on loans in foreign currency terms.

- iii. Convert the FISIM on loans in foreign currency terms to local currency units using the given average exchange rate (1.3 local currency units to 1 of foreign currency).

In the case of this worked example, the FISIM on loans provided by non-resident deposit-taking Institutions = $\frac{(7.00 - 5.00)}{100} * 83.0 * 1.3 = 2.2$ units

The FISIM on loans provided by resident deposit-taking corporations to each sector is then summed up to obtain total domestic FISIM on loans (24.0 units). Similarly, the FISIM on deposits provided by resident deposit-taking corporations to each sector is then summed up to obtain total domestic FISIM on deposits (14.8 units). Total FISIM on foreign currency loans is 2.2 units.

The lower part of the table also shows how FISIM is allocated to final and intermediate uses. In the case of households, there is a need to distinguish between FISIM for final consumption and FISIM for intermediate consumption in the case of dwelling loans.

Table 9 (f) - Calculation of FISIM

Line number	Item	Description	Value
(23)	Total supply of FISIM	(25)+(26)+(27)	41.0
(24)	Output of domestically produced FISIM	(25)+(26)	38.8
(25)	Domestic FISIM on loans	(25a)+(25b)+(25c)+(25d)+(25f)+(25g)	24.0
(25a)	Non-financial corporations	[(9a)-(11)]/100*(7a)	11.8
(25b)	Other financial corporations	[(9b)-(11)]/100*(7b)	0.5
(25c)	General government	[(9c)-(11)]/100*(7c)	2.3
(25d)	Households	[(9d)-(11)]/100*(7d)	6.5
(25e)	of which: dwelling loans	[(9e)-(11)]/100*(7e)	4.0
(25f)	NPISHs	[(9f)-(11)]/100*(7f)	1.2
(25g)	Rest of the world	[(9g)-(11)]/100*(7g)	1.8
(26)	Domestic FISIM on deposits	(26a)+(26b)+(26c)+(26d)+(26e)+(26f)	14.8
(26a)	Non-financial corporations	[(11)-(10a)]/100*(8a)	8.6
(26b)	Other financial corporations	[(11)-(10b)]/100*(8b)	0.2
(26c)	General government	[(11)-(10c)]/100*(8c)	1.5
(26d)	Households	[(11)-(10d)]/100*(8d)	2.3
(26e)	NPISHs	[(11)-(10e)]/100*(8e)	1.3
(26f)	Rest of the world	[(11)-(10f)]/100*(8f)	1.0
(27)	Imports of FISIM	[(17)-(18)]/100*(20)	2.1
(28)	Total use of FISIM	(29)+(30)+(31)	41.0
(29)	Intermediate consumption	(29a)+(29b)+(29c)+(29d)+(29e)	33.4
(29a)	Non-financial corporations	(25a)+(26a)+(27)	22.5
(29b)	Other financial corporations	(25b)+(26b)	0.7
(29c)	General government	(25c)+(26c)	3.8
(29d)	Households (dwelling services)	(25e)	4.0
(29e)	NPISHs	(25f)+(26e)	2.5
(30)	Household consumption expenditure	(25d)-(25e)+(26d)	4.8
(31)	Exports of FISIM	(25g)+(26f)	2.8

Table 9(g) shows how to derive SNA interest for the loans and deposits of each institutional sector.

SNA interest on loans is derived as the difference between bank interest receivable by deposit-taking corporations and FISIM for each sector.

In the case of deposits, SNA interest is derived as the sum of bank interest payable by deposit-taking corporations and FISIM for each sector. These are then summed up to obtain the corresponding economy-wide estimates.

SNA interest and not bank interest is recorded in the allocation of primary income account.

Table 9 (g) - Calculation of SNA interest

Line number	Item	Description	Value
	SNA interest of resident deposit-taking corporations		
(32)	SNA interest receivable on loans	(32a)+(32b)+(32c)+(32d)+(32e)	126.1
(34a)	Non-financial corporations	(1a)-(25a)	68.2
(34b)	Other financial corporations	(1b)-(25b)	7.0
(34c)	General government	(1c)-(25c)	7.7
(34d)	Households	(1d)-(25d)	29.6
(34e)	NPISHs	(1f)-(25f)	6.3
(34f)	Rest of the world	(1g)-(25g)	7.2
(33)	SNA interest payable on deposits	(33a)+(33b)+(33c)+(33d)+(33e)	77.7
(33a)	Non-financial corporations	(2a)+(26a)	44.6
(33b)	Other financial corporations	(2b)+(26b)	6.8
(33c)	General government	(2c)+(26c)	6.5
(33d)	Households	(2d)+(26d)	10.3
(33e)	NPISHs	(2e)+(26e)	5.6
(33f)	Rest of the world	(2f)+(26f)	4.0
	SNA interest of non-resident deposit-taking corporations		
(34)	SNA interest receivable on loans	(22)-(27)	5.40
(35)	SNA interest of non-financial corporations		
(36)	SNA interest receivable on deposits	(33a)	44.6
	SNA interest payable on loans	(32a)+(34)	73.6
(37)	SNA interest of other financial corporations		
(38)	SNA interest receivable on deposits	(33b)	6.8
	SNA interest payable on loans	(32b)	7.0
(39)	SNA interest of general government		
(40)	SNA interest receivable on deposits	(33c)	6.5
	SNA interest payable on loans	(32c)	7.7
(41)	SNA interest of households		
(42)	SNA interest receivable on deposits	(33d)	10.3
	SNA interest payable on loans	(32d)	29.6
(43)	SNA interest of NPISHs		
(44)	SNA interest receivable on deposits	(33e)	5.6
	SNA interest payable on loans	(32e)	6.3
(45)	SNA interest of non-residents		
(46)	SNA interest receivable on deposits and loans	(33f)+(34)	9.3
	SNA interest payable on loans	(32f)	7.2

5.3.8 Central Bank

The Central Bank delivers the following services:

- (a) monetary policy services (non-market);
- (b) financial intermediation services (market);
- (c) supervisory services overseeing financial corporations (market or non-market).

Monetary policy services include setting interest rates and determining the level of money supply in the economy through various tools. They are collective in nature, serving the community as a whole, and represent the non-market output of the central bank.

Financial intermediation services are individual in nature and, are treated as market production. The method to calculate the output of these financial intermediation services is the same as the method to calculate FISIM.

Supervisory services, may be classified as market or non-market services, depending on whether explicit fees are charged to cover the costs of providing these services.

In principle, a distinction should be made between market and non-market output of the Central Bank; but in practice, the resource intensiveness of the exercise and the relative importance of making the distinction should be considered before implementing the conceptual recommendations.

When it is not possible to separate market output from non-market output, ***the whole output of the Central Bank should be treated as non-market and valued at the sum of costs***. It is therefore measured as the sum of intermediate consumption, compensation of employees, consumption of fixed capital and other taxes less subsidies on production.

Allocation to users

Market output, such as fees and commissions for directly measured services invoiced by the Central Bank should be allocated to users, usually a deposit-taking institutions.

The part of the total output of central bank (sum of costs less commissions and fees) which is not sold will be, by convention, allocated to the intermediate consumption of other financial institutions subsectors (deposit-taking corporations except the central bank and other financial intermediaries, except insurance corporations and pension funds) in proportion to the respective value added of each of these subsectors.

Nonmarket output of the Central Bank is provided on behalf of the government, for regulatory and other services provided without charge for the benefit of financial intermediaries. It is therefore recorded as part of the collective consumption expenditure of General Government. However, since this output is not produced by the General Government, a current transfer is recorded as payable by the Central Bank to the General Government to cover its purchase of the non-market output of the Central Bank.

5.3.9 Insurance

There are three types of insurance: direct insurance, reinsurance and social insurance. Direct insurance covers life insurance and non-life insurance, while social insurance covers social security and employment-related social insurance.

Direct Insurance

There are two types of direct insurance: life Insurance and non-life insurance.

Insurers provide an insurance service to their clients, but do not charge explicitly for their service.

The insurance company accepts a premium from a client and holds it until a claim is made or until the period of the insurance expires. In the meantime, the insurance company invests the premium and the investment income is an extra source of funds to meet any claim due. The insurance company sets the level of the premiums such that the sum of the premiums plus the investment income earned on them less the expected claim will leave a margin for the insurance company. *This margin represents the output of the insurance company.*

The output of the insurance industry is measured reflecting the premium setting policies of the insurers. Four separate items need to be defined. These are

- a. premiums earned;
- b. premium supplements;
- c. claims incurred, or benefits due; and
- d. insurance technical reserves.

Premium earned is the part of the actual premium that relates to insurance cover provided in the accounting period, compared to the actual premium which is the amount payable to secure insurance cover for a specific event over a stated time period.

Premium earned =

- Actual premiums
- + the reserves for unearned premiums at the beginning of the accounting year
- the reserves for unearned premiums at the end of the accounting year.

For example, an annual policy with a premium of 120 units comes into force on April 1. The premium earned for the calendar year will be 90. At the end of the accounting period, there will be an unearned premium of 30, intended to provide cover for the first three months of the next year.

The difference between the actual premium and the earned premium (unearned premiums) are amount set aside and included in reserves of unearned premium and are treated as assets of the policy holders.

Premium supplements are the income earned from the investment of the insurance technical reserves of the insurers, and are liabilities towards the policyholders.

The insurance corporation has at its disposal reserves (technical reserves) consisting of unearned premiums and claims outstanding. These reserves are used to generate investment income.

Claims (benefit) is the amount payable to the policyholder by the direct insurer or reinsurer in respect of an event covered by the policy occurring in the period for which the policy is valid. Claims become due when the event occurs, even if the payment is made some time later.

Claims that become due are described as claims incurred. In some cases, the delay between the occurrence of the event giving rise to the claim and the settlement of the claim may be several years.

Claims outstanding cover claims that have not been reported, have been reported but are not yet settled or have been both reported and settled but not yet paid.

Non-life insurance claims incurred in the calendar year =

- claims paid
- the reserve for claims outstanding at the beginning of the accounting year
- + the reserve for claims outstanding at the end of the accounting year.

Insurance technical reserves are funds that insurers set aside. They consist of unearned premiums and claims outstanding which are used to generate income. Such funds and the corresponding investment income (premium supplements) are assets of the policyholders and liabilities of insurers. The technical reserves can be distinguished between non-life and life insurance and annuities.

5.3.10 Non-life Insurance

Non-life insurance output is calculated as:

- total premiums earned
- + implicit premium supplements (equal to the property income earned on technical reserves)
- adjusted claims incurred.

The level of claims incurred by policyholders of non-life insurance varies from year to year and there may be events that cause a particularly high level of claims. The formula used for the calculation of output uses *adjusted claims incurred, which is an estimate corrected for volatility in claims*.

In estimating the adjusted claims, information should be broken down by product, for example motor insurance, buildings insurance, etc.

Adjusted claims incurred can be estimated using

- a. the [expectation approach](#) based on past pattern of claims payable by the corporation, using the n-point moving average technique.

This technique calculates the moving average of the n most recent observations to smooth out the volatility in the original series. This mean is taken to be the forecast for the next period. The choice for the n-point average is between a lagged moving average or a centered moving average. The output of non-life insurance will have to be recalculated upon the availability of actual data.

Output is calculated as

- Premiums earned
 - + premium supplements
 - adjusted claims incurred
- where adjusted claims are estimated from past experience.

Conceptually premium supplements should also be estimated on the basis of past experience. However, since premium supplements are less volatile than claims, in practice no such adjustment may be necessary.

Example 10 – calculating the output of non-life insurance using moving average technique

Table 10: Calculation of output of non-life insurance

Year	No. of policies (a)	Premium earned (b)	Claims incurred (c)	Premium supplements (d)	Value of claims per policy (e)=(c)/(a)	7-term average of claims per policy (f)=average(e)	Adjusted claims (g)=(a)*(f)	Premium supplements/Premiums earned (h)=(d)/(b)	7-term average of supplements/premiums (i)=average(h)	Adjusted supplements (j)=(i)*(b)	2008 SNA Output (k)=(b)-(g)+(j)
2000	20	100	80	10	4.00			0.10			
2001	20	105	84	11	4.20			0.10			
2002	20	107	83	8	4.15			0.07			
2003	20	109	87	10	4.35			0.09			
2004	20	110	91	12	4.55			0.11			
2005	20	114	93	13	4.65			0.11			
2006	20	118	98	14	4.90			0.12			
2007	20	120	102	14	5.10	4.40	88.00	0.12	0.10	12.22	44.22
2008	20	122	100	6	5.00	4.56	91.14	0.05	0.10	12.72	43.57
2009	20	125	200	8	10.00	4.67	93.43	0.06	0.10	12.04	43.61
2010	20	140	102	12	5.10	5.51	110.14	0.09	0.09	13.27	43.12
2011	20	143	108	10	5.40	5.61	112.29	0.07	0.09	13.43	44.14
2012	20	145	111	13	5.55	5.74	114.71	0.09	0.09	12.80	43.09
2013	20	148	110	14	5.50	5.86	117.29	0.09	0.08	12.55	43.27
2014	20	151	114	16	5.70	5.95	119.00	0.11	0.08	12.29	44.29
2015	25	180	120	20	4.80	6.04	150.89	0.11	0.08	14.38	43.48

- b. accounting information: adjusted claims are derived ex post as actual claims incurred plus the change in equalization provisions, i.e., the funds set aside to meet unexpectedly large claims. Where the equalization provisions are insufficient to bring adjusted claims back to a normal level, contributions from own funds are added to the measure of adjusted claims.

A major feature of both methods is that unexpectedly large claims do not lead to volatile and negative estimates of output.

Example 11: Calculating non-life insurance output using accounting method

This example uses the accounting approach to calculate the output of non-life insurance. The method involves adding changes in equalization provisions to claims incurred to obtain adjusted claims to compute the output.

Lines 1 to 6 of Table 11 show information from insurance corporations for a particular line of non-life insurance, and lines 7 to 10 show how to use these information to compute claims incurred, adjusted claims incurred, non-life insurance output and net non-life insurance premiums.

Claims incurred
 = claims paid
 + changes in reserves against outstanding claims
 = 195 + 166.0 = 361.0

Adjusted claims
 = claims incurred
 + changes in equalization provisions
 = 361.0 + 200.0 = 561.0

Table 11: Calculation of non-life insurance output and net non-life insurance premiums

Line number	Item	Description	Value
(1)	Earned premiums		750
(2)	Unearned premiums		195
(3)	Claims paid		195
(4)	Changes in claims outstanding		166
(5)	Changes in equalization provisions		200
(6)	Investment income		63
(7)	Claims incurred	(3)+(4)	361
(8)	Adjusted claims incurred	(7)+(5)	561
(9)	Output of insurance corporations (ISC)	(1)+(6)-(8)	252
(10)	Net non-life insurance premiums	(1)+(6)-(9)	561

The output of non-life insurance (insurance service charge) is computed as follows:
 = premiums earned
 + premium supplements
 - adjusted claims
 = 750.0 + 63.0 – 561.0
 = **252.0**

Net non-life insurance premiums are computed as follows:
 = premiums earned
 + premium supplements
 - minus the non-life insurance output.
 = 750.0 + 63.0 – 252.0
 = **561.0**

c. [Cost approach](#)

When information is not available for either of the above approaches, the output of non-life insurance may be estimated as the sum of costs (i.e., intermediate costs, labour and capital costs, and other taxes less other subsidies on production) plus an allowance for 'normal profit'. The allowance for normal profit can be obtained by smoothing past actual profits.

The output of non-life insurance is computed as follows:
 = compensation of employees
 + intermediate consumption
 + capital costs
 + other taxes on production
 - other subsidies on production
 + normal profit.

where capital costs will need to be imputed as the sum of consumption of fixed capital and return to capital.

Example 12: Calculating non-life insurance output using the cost method

Compensation of employees	= 100
Intermediate consumption	= 20
Capital costs	= 15
Other taxes on production	= 8
Other subsidies on production	= 3
Normal profit	= 20

In the above example, output of insurance corporations (insurance service charge) is
 $= 100 + 20 + 15 + 8 - 3 + 20$
= 160

Allocation of non-life insurance output among users

The output of non-life insurers is recorded as a use as follows:

- intermediate consumption of businesses, including non-financial corporations, financial corporations, general government, households as employers and own-account workers, and non-profit institutions serving households;
- final consumption expenditure of households as individuals; and
- exports to non-resident policyholders.

Allocation of the output of non-life insurance can be done using the “bottom-up” approach. This assumes that, for each type of non-life insurance, the compiling agency is able to obtain detailed data from the insurance corporations. Thus, it will be able to directly compute the non-life insurance output and related transactions, such as net non-life insurance premiums, for each sector and for each type of non-life insurance. These transactions are then summed up to obtain the economy-wide estimates. In practice, it is very unlikely that the detailed input data are readily available.

In such cases, the compiling agency may consider using the “top-down” approach. In this approach, the compiling agency can use the source data available to compute the total non-life insurance output for each line of non-life insurance. It will then allocate the total output of non-life insurance in proportion to the breakdown of actual premiums data by sector.

Estimates of net non-life insurance premiums payable by sector are computed by deducting the output allocated to each user sector from the corresponding data on premiums earned and premium supplements. The sectoral estimates are then summed up to obtain the estimates receivable by the insurance corporations (net premiums).

Example 13: Allocation of non-life insurance charge to sectors using top-down approach

Available data are in Table 12(a). They are earned premiums, unearned premiums, claims paid and changes in outstanding claims broken down by institutional sector, but not changes in equalization provisions and investment income attributable to policyholders. Given the partial data set, a ‘top-down’ approach is needed to allocate the output of non-life insurance.

Total non-life insurance output (ISC) is computed first. The total output and the investment income attributable to policyholders are then allocated to the institutional sectors in proportion to the actual premiums (earned + unearned premiums). Estimates of non-life insurance premiums payable by each sector are calculated, and aggregated to obtain the total insurance premiums receivable by the insurance corporations.

Table 12(a): Data available from insurance corporations on non-life insurance transactions

Line number	Item	Value
(1)	Earned premiums	750
(1a)	Financial corporations	240
(1b)	Non-financial corporations	210
(1c)	General government	120
(1d)	Households	90
(1e)	NPISHs	60
(1f)	Rest of the world	30
(2)	Unearned premiums	195
(2a)	Financial corporations	60
(2b)	Non-financial corporations	52.5
(2c)	General government	37.5
(2d)	Households	22.5
(2e)	NPISHs	15
(2f)	Rest of the world	7.5
(3)	Claims paid	195
(3a)	Financial corporations	60
(3b)	Non-financial corporations	45
(3c)	General government	35
(3d)	Households	26
(3e)	NPISHs	21
(3f)	Rest of the world	8
(4)	Changes in claims outstanding	166
(4a)	Financial corporations	45
(4b)	Non-financial corporations	39
(4c)	General government	32
(4d)	Households	22
(4e)	NPISHs	17
(4f)	Rest of the world	11
(5)	Changes in equalization provisions	200
(6)	Investment income	63

Step 1 - Table 12(b): Compute the actual premiums payable by each sector and the total actual premium payable.

The actual premiums payable by each sector = Earned premiums + unearned premiums.

The total actual premiums payable by all sectors is the sum of the calculated actual premiums of the sectors.

Table 12(b): Computation of actual premiums by sector

Line number	Item	Description	Value
(7)	Actual premiums	(7a)+(7b)+(7c)+(7d)+(7e)+(7f)	945.0
(7a)	Financial corporations	(1a)+(2a)	300.0
(7b)	Non-financial corporations	(1b)+(2b)	262.5
(7c)	General government	(1c)+(2c)	157.5
(7d)	Households	(1d)+(2d)	112.5
(7e)	NPISHs	(1e)+(2e)	75.0
(7f)	Rest of the world	(1f)+(2f)	37.5

Step 2 - Table 12(c): Derive the share of each sector in total actual premiums

The share of each sector in total actual premiums = actual premiums payable by each sector divided by the total actual premiums payable by all sectors, multiplied by 100.0.

The share will be used to break down total non-life insurance output and investment income attributable to policyholders.

Table 12 (c): Breakdown of actual premiums by sector (%)

Line	Item	Description	Percent
(8)	Actual premiums	(8a)+(8b)+(8c)+(8d)+(8e)+(8f)	100.0
(8a)	Financial corporations	$[(7a)/(7)] \times 100$	31.7
(8b)	Non-financial	$[(7b)/(7)] \times 100$	27.8
(8c)	General government	$[(7c)/(7)] \times 100$	16.7
(8d)	Households	$[(7d)/(7)] \times 100$	11.9
(8e)	NPISHs	$[(7e)/(7)] \times 100$	7.9
(8f)	Rest of the world	$[(7f)/(7)] \times 100$	4.0

Step 3 - Table 12(d): Calculate the total output of non-life insurance using the accounting approach and then allocate the total output to each sector.

The output of non-life insurance (insurance service charge) is computed as follows:

- = premiums earned
- + premium supplements
- adjusted claims

Table 12(d) shows how to allocate the investment income attributable to policyholders and how to compute the net non-life insurance premiums payable by each sector.

The total output (252.0 units) is allocated to each sector by multiplying the share of each sector in total actual premiums in Table 12(c) by the total output and then dividing the result by 100.0.

Similarly, the investment income attributable to policyholders (63.0 units) is also allocated to each sector using the same procedure.

Net non-life insurance premiums payable by each sector are then calculated as below, and the sectoral estimates are aggregated to obtain the estimates receivable by the insurance corporations.

Net non-life premiums
= premiums earned
+ premium supplements
- minus the non-life insurance output.

Table 12(d): Calculation and allocation of non-life insurance output, investment income attributable to policyholders and net non-life insurance premiums

Line number	Item	Description	Value
(9)	Claims incurred	(9a)+(9b)+(9c)+(9d)+(9e)+(9f)	361.0
(9a)	Financial corporations	(3a)+(4a)	105.0
(9b)	Non-financial corporations	(3b)+(4b)	84.0
(9c)	General government	(3c)+(4c)	67.0
(9d)	Households	(3d)+(4d)	48.0
(9e)	NPISHs	(3e)+(4e)	38.0
(9f)	Rest of the world	(3f)+(4f)	19.0
(10)	Adjusted claims	(9)+(5)	561.0
(11)	Output of non-life insurance corporation (insurance service charge)	(1)+(6)-(10)	252.0
(11a)	Financial corporations	[(8a)/100]*(11)	80.0
(11b)	Non-financial corporations	[(8b)/100]*(11)	70.0
(11c)	General government	[(8c)/100]*(11)	42.0
(11d)	Households	[(8d)/100]*(11)	30.0
(11e)	NPISHs	[(8e)/100]*(11)	20.0
(11f)	Rest of the world	[(8f)/100]*(11)	10.0
(12)	Investment income attributable to policyholders	(6)	63.0
(12a)	Financial corporations	[(8a)/100]*(12)	20.0
(12b)	Non-financial corporations	[(8b)/100]*(12)	17.5
(12c)	General government	[(8c)/100]*(12)	10.5
(12d)	Households	[(8d)/100]*(12)	7.5
(12e)	NPISHs	[(8e)/100]*(12)	5.0
(12f)	Rest of the world	[(8f)/100]*(12)	2.5
(13)	Net non-life insurance premiums	(13a)+(13b)+(13c)+(13d)+(13e)+(13f)	561.0
(13a)	Financial corporations	(1a)+(12a)-(11a)	180.0
(13b)	Non-financial corporations	(1b)+(12b)-(11b)	157.5
(13c)	General government	(1c)+(12c)-(11c)	88.5
(13d)	Households	(1d)+(12d)-(11d)	67.5
(13e)	NPISHs	(1e)+(12e)-(11e)	45.0
(13f)	Rest of the world	(1f)+(12f)-(11f)	22.5

5.3.11 Life Insurance

A life insurance policy is a sort of saving scheme. For a number of years, the policyholder pays premiums to the insurance corporation against a promise of benefits at some future date. These benefits may be expressed in terms of a formula related to the premiums paid or may be dependent on the level of success the insurance corporation has in investing the funds. For the latter, the terms 'with-profits' life insurance

or endowment policy are generally used. Although the date and sum may be variable, a claim is always paid in the case of a life policy.

The output of life insurance is calculated as:

- premiums earned
- + premium supplements
- benefits due
- increases (plus decreases) in actuarial reserves and reserves for with-profits insurance.

Net premiums are derived by deducting the output of life insurance from the sum of actual premiums and premium supplements.

The method of calculating output for life insurance follows the same general principles as for non-life insurance. Because of the time interval between when premiums are received and when benefits are paid, special allowances must be made for changes in the technical reserves.

Premiums are defined in exactly the same way for life insurance as for non-life insurance.

Premium supplements are more significant for life insurance than for non-life insurance. They consist of all the investment income (including holding gains/losses) earned on the reserves of the policyholders. This includes the bonuses declared by the insurance corporations to policyholders each year. The amount involved is earnings forgone by the policyholders by putting the funds at the disposal of the insurance corporation and is thus recorded as property income in the distribution of primary income account.

Benefits are recorded as they are awarded or paid. There is no need under life insurance to derive an adjusted figure since there is no unexpected volatility in the payment due under a life policy.

Actuarial reserves for life insurance and reserves for with-profits insurance represent the amounts set aside for the payment of benefits in future. They are part of life insurance technical reserves, which also include unearned premiums and reserves against outstanding benefits.

Data sources

The input data to calculate the output of life insurance can be obtained from the returns of insurers to the government agency responsible for the insurance sector, such as the insurance regulatory commission. Otherwise, the compiling agency may need to conduct surveys of insurers. Generally, the financial statements of insurers would contain the input data needed to calculate the output of life insurance.

If adequate data are not available for the calculation of life insurance as above, the costs approach similar to that described for non-life insurance, may be used. As for non-life insurance, an allowance for normal profits must be included.

Allocation of life insurance output among users

The holder of a life insurance policy is always an *individual*; they are resident and non-resident households. The output which is allocated to resident households is recorded as their *final consumption expenditure*, while the output which is allocated to non-residents is recorded as *exports of services*.

Very often, insurance corporations are able to provide the input data to enable the compiler to calculate total life insurance output, and not on the breakdown of each of the items (premium supplements, for example) to compute life insurance output for resident households and non-resident households.

In such instances, the compiler will need to allocate the input data before computing total output and other related transactions. For example, if no breakdown of the investment income attributable to policyholders (i.e., premium supplements) is available, the compiler can allocate this item in proportion to the actual

premiums payable by resident households and the rest of the world. The life insurance output of resident households and non-resident households are then calculated. Total life insurance output are obtained as the sum of the sectoral output.

Example 14: Computation of life insurance output and its allocation

Insurance corporations were not unable to provide any breakdown on premium supplements. Thus, the sectoral breakdown of the investment income attributable to the policy holders will have to be estimated using data on actual premiums before computing the output of the life insurance.

Table 13(a): Data from insurance corporations on life insurance transactions

Line number	Item	Value
(1)	Earned premiums Households	750.0
(1a)	Households	720.0
(1b)	Rest of the world	30.0
(2)	Unearned premiums	195.0
(2a)	Households	187.5
(2b)	Rest of the world	7.5
(3)	Benefits due	195.0
(3a)	Households	187.0
(3b)	Rest of the world	8.0
(4)	Increase in actuarial reserves	240.0
(4a)	Households	225.0
(4b)	Rest of the world	15.0
(5)	Investment income	63.0

Step 1 - Table 13(b): Compute the actual premiums payable by each sector as the sum of the corresponding earned premiums and unearned premiums.

Table 13(b): Computation of actual premiums by sector

Line	Item	Description	Value
(6)	Actual premiums	(1)+(2)	945.0
(6a)	Households	(1a)+(2a)	907.5
(6b)	Rest of the world	(1b)+(2b)	37.5

Step 2 - Table 13(c): Derive the percentage share of each sector in total actual premiums payable by each sector.

Table 13(c): Breakdown of actual premiums by sector

Line number	Item	Description	Per cent
(7)	Actual premiums	(7a)+(7b)	100.0
(7a)	Households	[(6a)/6]*100	96.0
(7b)	Rest of the world	[(6b)/6]*100	4.0

Step 3 – Table 13(d): Allocate the investment income attributable to policyholders to each sector using the percentage share derived in Step 2; then calculate the output of life insurance and net premiums of each sector.

The output of life insurance which is allocated to each sector is then computed as follows:

- = premiums earned
- + premium supplements
- minus benefits due
- minus the increase in life insurance actuarial reserves.

Output of life insurance (insurance service charge) for households

$$= 720.0 + 60.5 - 187.0 - 225.0$$

$$= 368.5$$

Output of life insurance (insurance service charge) for the Rest of the World

$$= 30.0 + 2.5 - 8.0 - 15.0$$

$$= 9.5$$

Total output of life insurance = $368.5 + 9.5 = \mathbf{378.0}$

Net premiums allocated to each sector are computed as follows:

- = actual premiums (i.e., the sum of earned and unearned premiums)
- + premium supplements
- minus allocated output of life insurance.

Net premiums allocated to households

$$= 720.0 + 187.5 + 60.5 - 368.5$$

$$= 599.5$$

Net premiums allocated to the Rest of the World

$$= 30.0 + 7.5 + 2.5 - 9.5$$

$$= 30.5$$

Total net premium = $599.5 + 30.5 = \mathbf{630.0}$

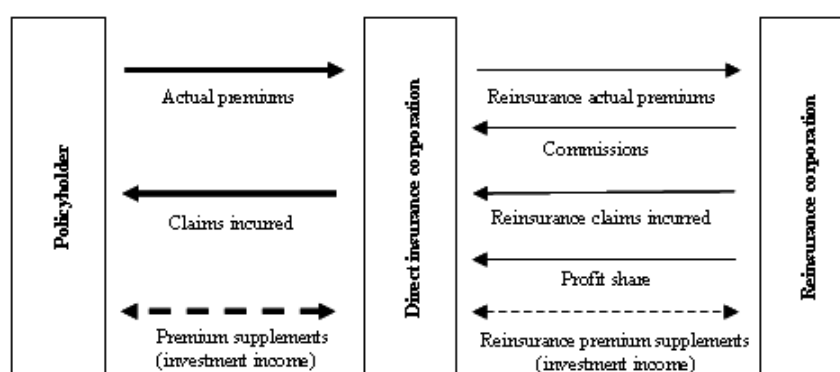
Table 13(d): Calculation and allocation of investment income attributable to policyholders, life insurance output and net premiums

Line number	Item	Description	Value
(8)	Investment income attributable to policyholders	(8a)+(8b)	63.0
(8a)	Households	$[(7a)/100]*(5)$	60.5
(8b)	Rest of the world	$[(7b)/100.0]*(5)$	2.5
(9)	Output of insurance corporations (insurance service charge)	(9a)+(9b)	378.0
(9a)	Households	$(1a)+(8a)-(3a)-(4a)$	368.5
(9b)	Rest of the world	$(1b)+(8b)-(3b)-(4b)$	9.5
(10)	Net premiums	(10a)+(10b)	630.0
(10a)	Households	$(1a)+(2a)+(8a)-(9a)$	599.5
(10b)	Rest of the world	$(1b)+(2b)+(8b)-(9b)$	30.5

5.3.12 Reinsurance

The output of reinsurance is measured in the same way as that for direct non-life insurance, whether it is life or non-life insurance policies that are being reinsured. However, there are commissions peculiar to reinsurance. They are commissions payable to the direct insurer under proportionate reinsurance and profit sharing in excess of loss reinsurance.

Figure 7 - Flows between policy holders, direct insurers and reinsurers



Output of reinsurance is calculated as:

- Premiums earned less commissions payable
- + premium supplements
- both adjusted claims incurred and profit sharing

Premiums earned are defined in the same way as those for life and non-life insurance.

Adjusted claims incurred can be derived using the expectations or accounting approaches, as for non-life insurance. In addition, when using the expectations approach, there is need to derive expected premium supplements.

Insurance transactions are recorded gross of reinsurance. Premiums are first payable to the direct insurer who may then pay a proportion of the premium to the reinsurer (cession), who might then pay a smaller amount to another reinsurer, and so on (retrocession). The same applies to claims or benefits. Thus, the transactions between the direct insurance and the reinsurance corporations are recorded as an entirely separate set of transactions and *no consolidation* takes place between the transactions of the direct insurance corporation as issuer of policies to its clients on the one hand and the holder of a policy with the reinsurance corporation on the other.

The whole of the output of the reinsurer is intermediate consumption of the direct insurer holding the reinsurance policy. Many reinsurance policies are between insurers resident in different economies. The value of the output in such cases represents imports by the insurer taking out the reinsurance policy and exports by the reinsurer.

5.3.13 Pension

Social insurance pensions are benefits which beneficiaries receive upon retirement, usually under predetermined legal or contractual terms and typically in the form of a guaranteed annuity. They are provided to beneficiaries as participants in social insurance schemes. The part provided by general government is called social security pensions, including social security funds, and the part provided by other units is called other employment-related pensions

Social security pension schemes

Social security pension schemes are contractual insurance schemes where the beneficiaries are obliged by General Government to insure against old age and other age-related risks such as disability, health etc. Beneficiaries usually make compulsory contributions towards a social security pension scheme which is frequently financed on a pay-as-you-go basis. The contributions in a period are used to finance the benefits in the same period.

The costs of operating social security schemes are treated as part of the normal expenditure of General Government if the schemes are not separate institutional units, so the accounting for social security operations does not include measures of output.

If these schemes are treated as separate institutional units, their output is computed as the sum of costs. This output is non-market in nature and is recorded in the output of the general government sector. The cost of producing this output is also recorded in government final consumption expenditure, since the government is consuming the output to provide goods and services to the population.

Example 15: Computing the output of a social security fund which pays pension benefits

Input data on the social security pension contributions and benefits for a social security fund are given in Table 13 below. Both employers and employees are contributing to the social security fund and the sum of employers' and employees' actual social pension contributions is just sufficient to pay the social security pension benefits for the period. It is assumed that the costs involved only include intermediate consumption of goods and services.

The social security fund produces non-market output and is computed as the sum of costs. In this case, the output of the social security fund is computed as the value of the intermediate consumption of goods and services, that is, 0.7 unit.

Table 14: Output of a social security fund which pays pension benefits

Line number	Item	Value
(1)	Employers' actual social pension contribution	139.0
(2)	Employees' actual social pension contribution	87.0
(3)	Social security pension benefits	226.0
(4)	Intermediate consumption of goods and services	0.7
(5)=(4)	Output of the social security fund	0.7

Other employment-related pension schemes are contractual insurance schemes, either compulsory by law or where employers make it a condition of employment that employees participate in a social insurance scheme specified by the employer to insure against old age and other age-related risks.

Pension schemes are categorised as a defined contribution scheme or defined benefit schemes.

For the defined benefit pension scheme, the benefit to the employee is determined in terms of the undertakings made by the employer about the level of pension, whereas for the defined contribution pension scheme the benefit to the employee is determined by the contributions made to the scheme, and the investment income and holding gains and losses earned on those and previous contributions.

Thus, while there is in principle complete information available on the benefits for participants in the defined contribution pension scheme, the benefits for participants in a defined benefit pension scheme are estimated actuarially.

Under a defined contribution pension scheme, all of the risk is borne by the beneficiaries. The pension scheme is operated on their behalf and they pay for the cost of it. The operating cost is treated as part of the investment income that is retained by the scheme to meet its costs and generate a profit.

For a defined benefit pension scheme, the risk is borne by the employer. Although operating costs are initially borne by the employer, it is regarded as a form of income in kind provided to the employees and for convenience is included with the employers' contributions. This assumes all the costs are borne by current employees and not by retirees.

Example 16: Computing output associated with defined contribution pension schemes

In the example below, the schemes comprise autonomous funds which are operated by pension fund managers. The pension fund managers do not charge explicit fees. Their output will have to be derived implicitly using the formula to compute life insurance output.

Table 15: Output and net contributions associated with defined contribution pension schemes

Line number	Item	Value
(1)	Employers' actual social pension contribution	11.0
(2)	Employees' actual social pension contribution	11.5
(3)	Investment income on pension entitlements	16.2
(4)	Pension benefits	26.0
(5)	Increase in pension entitlements	11.3
(6)=(1)+(2)+(3)-(4)-(5)	Output of pension fund managers	1.4
(7)=(1)+(2)+(3)-(6)	Net social contributions	37.3

The output of the pension fund managers is computed as:

employers' actual pension contributions
+ employees' actual pension contributions
+ contribution supplements (equivalent to investment income on pension entitlements)
- pension benefits
- the increase in pension entitlements
= 11.0 + 11.5 + 16.2 – 26.0 – 11.3
= **1.4**

The net social contributions are computed as:

employers' actual pension contributions
+ employees' actual pension contributions
+ contribution supplements (equivalent to investment income on pension entitlements)
- output of defined contribution pension funds (service charge)
= 11.0 + 11.5 + 16.2 – 1.4
= **37.3**

Example 17: Computing output associated with defined benefit pension schemes

Available data on defined benefit pension funds are shown in Table 16. Both employers and employees contribute to the funds. Actual property income earned on the funds amounts to 2.2 units.

In addition, actuarial calculations show that the increase in pension entitlements is 19.0 units, made up of the current service increase (15.0 units) and investment income payable on pension entitlements (4.0 units). The investment income payable on pension entitlements represents the increase in pension entitlements coming from the past service increase due to the fact that for all participants retirement is one year nearer.

Since the actual property income earned by the pension funds is less than the investment income payable on pension entitlements, there is a shortfall which will need to be covered by employers. Operating costs associated with operating the defined benefit pension funds involved only intermediate consumption of goods and services.

Table 16 - Output and net contributions associated with defined benefit pension schemes

Line number	Item	Value
	From observed transactions	
(1)	Employers' actual pension contributions	10.0
(2)	Employees' actual pension contributions	1.5
(3)	Property income	2.2
(4)	Pension benefits	16.0
(5)	Intermediate consumption of goods and services	0.6
	From actuarial estimates	
(6)	Increase in pension entitlements	19.0
(6a)	Current service increase	15.0
(6b)	Investment income payable on pension entitlements	4.0
(7) = (5)	Output of defined benefit pension funds	0.6
(8) = (6a) - (1) - (2) + (7)	Employers' imputed pension contributions	4.1
(9) = (6b) - (3)	Imputed interest on pension funds' claims on employers	1.8
10 = (1) + (2) + (6b) + (8) - (7)	Net social contributions	19.0

The output of the pension funds is computed as the value of intermediate consumption of goods and services and is equal to 0.6

Employers' imputed social contributions are computed:

increase in pension entitlements from current service (15.0 units)
 - employers' actual pension contributions (10.0 units)
 - households' (employees') actual pension contributions (1.5 units)
 + the service charge (output) of pension funds (0.6 units)
 = 15.0 - 10.0 - 1.5 + 0.6
 = **4.1 units**

Imputed interest on pension funds' claim on employers is equal to:

investment income payable on pension entitlements (4.0 units)
 - actual investment income (2.2 units)
 = 4.0 - 2.2 = **1.8 units**

Net social contributions payable to the pension funds (19.0 units) are obtained as:

employers' actual pension contributions (10.0 units)
 + employers' imputed pension contributions (4.1 units)
 + households' (employees') actual pension contributions (1.5 units)
 + household pension contribution supplements (equivalent to investment income payable on pension supplements) (4.0 units)
 - the service charge (output) of pension funds (0.6 units).
 = 10.0 + 4.1 + 1.5 + 4.0 - 0.6
 = **19.0 units**

5.3.14 Research and Development

Research and Development (R&D) creates intellectual property products which are key in promoting industrial innovation and economic growth. It consists of the value of expenditure on creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and use of this stock of knowledge to devise new applications.

The value is determined in terms of the economic benefits expected in the future. *Unless the market value of the R&D is directly observed, it is, by convention, valued as the sum of costs, including those of unsuccessful research and development.*

Research and development is treated as capital formation except in cases where it is clear that the activity does not provide any economic benefit to its owner in which case it is treated as intermediate consumption.

Output of R&D services is measured as follows:

- a. R&D by specialised commercial research laboratories or institutes is valued at the revenue from sales, contracts, commissions, fees, etc. in the usual way;
- b. The output of R&D for use within the same enterprise is valued on the basis of the estimated basic prices that would be paid if the research were subcontracted. In the absence of a market for subcontracting R&D of a similar nature, it is valued as the sum of production costs plus a mark-up (except for non-market producers) for net operating surplus (NOS) or mixed income;
- c. R&D by government units, universities and non-profit research institutes is valued as the sum of costs of production. Revenues from the sale of R&D by non-market producers are to be recorded as revenues from secondary market output.

When the production of R&D products occurs in the in-house R&D units of businesses, these units are recognised as *secondary units* performing R&D, and products created are acquired as *capital formation* by the main businesses.

Where the output of commercial R&D units goes to other commercial R&D units or in-house R&D units, it is treated as *intermediate consumption* as the product will be embedded as a component in a final R&D product. If the output goes to a main production business, it is recognized as *capital formation* by the business.

Government and NPI units performing R&D will produce output which is considered to be held by the government and the NPIs themselves as *capital assets*, even although the use of these assets is normally freely available.

As regards performance of R&D for speculative sale, the product should be recorded as an increase to stocks of finished goods until sold to be recorded as capital formation by the buyer. By convention, the output is either valued through the sum of costs approach, or is not recorded until a sale is made. If valued through the cost approach, it will have to be revalued when sold.

Where a commercial unit produces and keeps an R&D product which it licenses out to other units, then the commercial unit will show this output going to own account capital formation, and estimate its value through a sum of costs approach.

Example 18: R&D output and capitalisation - market producer

A corporation has an output of 50m units, and total inputs of materials of 20m units and services of 10m units. Compensation of all employees is 15m units and operating surplus is 5m units. Capital consumption of existing assets is 5m units.

During the year, R&D is carried out within the corporation leading to the creation of intellectual property. For the R&D activity, part of materials used for this is 5m units, services used is 5m units and compensation

of employees is 5m units. Existing capital assets contribute 1 in Consumption of Fixed Capital (CFC) to the creation of a new R&D asset. It is assumed that the latter does not contribute to the creation of new R&D assets, but to the output of the corporation.

The output of R&D is calculated as the sum of the costs of undertaking R&D:

$$\begin{aligned}
 &= 5 \text{ (materials)} + 5 \text{ (services)} + 5 \text{ (compensation of employees)} + 1 \text{ (capital consumption from existing assets to the performance of the R\&D), and an imputed mark-up of 1} \\
 &= \mathbf{17}
 \end{aligned}$$

Capital formation = **17**

Table17: Computing output of R&D at sum of costs and capitalisation R&D (market producer)

Production account					
Uses			Resources		
	Main Activity	R&D		Main Activity	R&D
Materials	15	5	Output	50	17
Services	5	5			
Intermediate consumption	20	10			
<i>Value added, gross</i>	30	7			
Generation of Income Account					
Compensation of Employees	10	5	<i>Value added, gross</i>	30	7
CFC	4	1			
<i>Operating surplus (net)</i>	16	1			
Capital Account					
Capital formation		17	<i>Saving, net</i>	16	1
CFC	-4	-1			
<i>Net lending/borrowing</i>	20	-15			

Example 19: R&D output and capitalisation – non-market producer

Output of non-market producer — for example government is calculated as sum of costs, including capital consumption for assets held. No mark-up is imputed.

Materials consumed are 20m units and services consumed are 10m units. Compensation of all employees is 15m units, and capital consumption of existing capital assets is 5. During the same period, R&D is carried out within government leading to the creation of intellectual property.

For the R&D activity, the part of materials used is 5m units, services used is 5m units and compensation of employees is 5m units. Of the CFC of 5, 1 is due to using existing assets for the performance of R&D.

Net tax revenue is assumed to be 50, to cover costs.

The output of R&D is sum of input costs, with no mark-up.

$$\begin{aligned}
 &= 5 + 5 \text{ (Intermediate consumption)} + 5 \text{ (compensation of employees)} + 1 \text{ (CFC for assets used in R\&D performance)} \\
 &= \mathbf{16}
 \end{aligned}$$

Capital formation = **16**

Government final consumption =

$$\begin{aligned}
 &= 15 + 5 \text{ (Intermediate consumption)} + 10 \text{ (compensation of employees)} + 4 \text{ (CFC)} \\
 &= \mathbf{34}
 \end{aligned}$$

The capital consumption of the R&D asset will sum to 16 over its future economic life. This will result in an increase of that amount in government output and value added over this period.

Table 18: Computing output of R&D at sum of costs and capitalisation R&D (non-market producer)

Production account					
Uses			Resources		
	Main Activity	R&D		Main Activity	R&D
Materials	15	5	Non-market output	34	
Services	5	5	Output for final consumption		16
Intermediate consumption	20	10			
<i>Value added, gross</i>	14	6			
Generation of Income Account					
Compensation of Employees	10	5	<i>Value added, gross</i>	14	6
CFC	4	1			
<i>Operating surplus, net</i>	0	0			
Allocation of Income Account					
<i>Balance of primary income, net</i>	0	0	<i>Operating surplus, net</i>	0	0
Secondary distribution of Income Account					
			<i>Balance of primary income, net</i>	0	0
			Net tax revenue	50	0
<i>Disposable income, net</i>	50	0			
Use of Income Account					
Government final consumption	34	0	<i>Disposable income, net</i>	50	0
<i>Saving, net</i>	16	0			
Capital Account					
Capital formation (R&D)		16	<i>Saving, net</i>	16	0
CFC	-4	-1			
<i>Net lending/borrowing</i>	20	-15			

Data sources

The sources for estimation of R&D expenditure in the national accounts are:

a. Frascati Manual surveys

The Frascati Manual (FM) is a guide to collecting data and producing statistics on the measurement of human and financial resources devoted to research and development, often referred to as R&D input data. The surveys established to provide the statistics as prescribed by the Frascati Manual provide a basis for the estimation of R&D in national accounts. The main sources for Frascati Manual estimates of spending on R&D are surveys on the following:

- i. Government Expenditure on R&D;
- ii. Business Expenditure on R&D;
- iii. Private non-profit making bodies' expenditure on R&D, and
- iv. Higher Education expenditure on R&D

b. Other sources include

- i. administrative data (government, university, etc.): different definitions and key concepts may make the use of such data in national accounts problematic
- ii. International trade in services surveys covering the use of R&D services and transfer of ownership of R&D
- iii. Business surveys: Such surveys collect information on the costs of inputs as well as the revenue of businesses. Where R&D is carried out within the normal arrangements of the production

process, rather than in a unit identified as an R&D unit, the costs of R&D will be included in the general costs of production. Tracker questions can be introduced to determine where such R&D is carried out.

- iv. Capital expenditure surveys: The coverage of these inquiries can include the acquisition and disposal of Intellectual Property Products, including those produced as the result of the performance of R&D.
- v. Taxes and subsidies data – in countries having a tax credit and subsidies system to encourage the performance of R&D across industries. These systems can provide sufficient information for reliable estimates.
- vi. Records held by patent offices. However, partial coverage may be a problem. R&D can be performed without the final product being patented, and the value preserved through secrecy rather than legal protection.

In general, compilers should collect data from as many data sources as possible. As different data sources may allow for different thresholds, concepts or other factors, their results have to be reconciled.

Also, using data from different surveys may result in some double-counting. Thus, bought-in R&D should be treated as intermediate consumption when embedded in the final R&D product to avoid double counting. Where custom-built software is used with the R&D product to produce a combination of R&D and software, the final product could be considered as software. In this case, the R&D will be embedded in the final software product, and should be treated as intermediate consumption in the estimation of the software.

5.3.15 Originals and Copies

The production of books, recordings, films, software, tapes, disks, etc. is a two-stage process. The first one consists in the production of the original, and the second stage the production and use of copies of the original.

- a. The output of the first stage is a fixed asset that belongs to the producer of the original. It may be produced for sale or for own account gross fixed capital formation by the original producer. If sold when it has been produced, the value of the output of the original producer is given by the price paid. If not sold, its value may be estimated on the basis of its production costs with a mark-up based on the discounted value of future receipts expected from using it in production.
- b. The owner of the asset may use it to produce copies in subsequent periods. The value of the copies is recorded as production activities separate from those in the making of the original. Consumption of fixed capital is recorded in respect of the use of the asset in the making of copies in the same way as for any other fixed asset used in production.
- c. If the owner has licensed other producers to make use of the original in production, the fees, commissions, royalties etc. received are recorded as output of services of the owner, and intermediate consumption of the licensees.

5.3.16 Owner-occupied dwelling services

Owner-Occupied Dwellings Services is an activity of the unincorporated household enterprises that produce real estate services to owner-occupied households similar to those produced by market real estate enterprises.

Some houses are owned by households but are leased out. Rental paid by tenants is the value of the output of the rental service. Others are owned by households who live in them.

The ratio of owner-occupied to rented dwellings varies significantly between countries, between regions of a country and even over short periods of time within a country or region, so that both international and temporal comparisons of the production and consumption of housing services could be distorted if no imputation were made for the value of own-account housing services.

The owner-occupiers are treated as owners of unincorporated enterprises producing housing services for their own consumption. Owner-occupiers hence produce and consume owner-occupied dwelling services.

In well-organized markets of rented housing, the output of own-account housing services can be valued using the prices of the same kind of services sold on the market. That is, owner-occupied dwelling services are valued at the estimated rental that a tenant would pay for the same accommodation, taking into account factors such as location, neighborhood amenities, etc.

Measuring owner-occupied dwelling services

a. Stratification or rental equivalent method

The stratification or rental equivalence method is based on actual rentals, and combines information on the housing stock broken down by strata, with information on actual rentals paid in each stratum. The stock of dwellings is stratified by location, type of dwellings or other factors that may affect the rental. Information about actual rentals from similar rented dwellings is used to obtain an estimate of the rental value of the total stock of dwellings in different strata.

The use of data sources such as population and housing censuses, rental and housing surveys, household budget surveys, or administrative sources should be preferred. If information on rentals is obtained from sample surveys, the grossing-up should be to total stock rentals including rented dwellings. The rental is for the base year and needs to be extrapolated to the later periods.

b. User-cost method

In the absence of a sufficiently large rental market, where accommodation is characteristic of owner-occupied dwellings, the user-cost method can be applied.

Output of dwelling services
= Intermediate consumption
+ Other taxes on production
+ Consumption of fixed capital (CFC)
+ Net operating surplus (cost of capital)

Separate estimates have to be made for each of the components.

Intermediate consumption will include expenditure on repair and maintenance (such as expenditures on replacing or repairing parts of the dwelling that are broken or dilapidated; repairing the roof, replacing window frames, and painting the outside of the building) and insurance service charges. Maintenance and repair expenditures do not extend the service lives of dwellings beyond their previously expected lifetimes and do not involve enlarging the dwelling. Such expenditures are treated as gross fixed capital formation. Information on repair and maintenance is usually obtained from household expenditure surveys.

The *net operating surplus* is estimated by applying an annual rate of return to the net value of the stock of owner-occupied dwellings (including land) at current prices (replacement costs). It represents an estimate of the interest that the owners would have received if they had invested in a financial asset instead of purchasing a dwelling.

In practice, there are many interest rates that could be used as the rate of return. In countries where there is a well-established system of housing loans, the interest rates charged on these loans may be the most applicable rate of return.

Countries that estimate stocks of dwellings using Perpetual Inventory Method (PIM) would already have CFC estimates. Alternatively, they can use the method below to approximate the CFC.

Table 19 is a worksheet that can be used to estimate the value at current market prices of the stock of each type of owner-occupied dwellings. It is designed for countries that only have information on the number of owner-occupied dwellings classified by broad types of dwellings (such as single-family dwellings and apartments grouped by floor area) from a recent population census.

The first step is to draw up a classification of dwellings which distinguishes between the main types of owner-occupied dwellings in the country. The stocks of owner-occupied dwellings will then be estimated separately for each type.

Table 19: Worksheet for estimating the stock of owner-occupied dwellings in current market prices for countries that cannot apply the PIM.

Item No.	Description of the item
K 1	Number of OOD at the time of the most recent census
K 2	Growth rate of OOD between the last census and the middle of the current year
K 3	Estimated number of OOD in the middle of the current year = $K1 * K2$
K 4	Average price of newly-constructed dwellings (excluding land) in the current year
K 5	Average net value (i.e. after deducting accumulated depreciation) of a dwelling in the current year = $K4 * (1-A/L)$
K 6	Value at current market prices of the stock of OOD = $K3 * K5$
K 7	Ratio of the value of land to the average net value of dwellings (excluding land) in the current year
K 8	Value at current market prices of land underlying dwellings = $K6 * K7$

The growth rate in the number of dwellings (**K2**) can be derived from a number of sources such as GFCF statistics, building permits issued, and administrative data on completion and destruction of buildings. Else, it can be assumed that the stock of owner-occupied dwellings grows at the same rate as the population.

Information on prices of newly constructed dwellings (**K4**) can be obtained from real estate agents, construction companies, property developers, and advertisements in journals and magazines that specialise in sales of dwellings. If a cost approach is used, the cost figures need to be adjusted to market prices by adding the estimated profit margins.

Since K4 refers to the price of a newly constructed dwelling, this price needs to be adjusted downwards to approximate the price of a dwelling of average age (**K5**). For simplicity, prices of dwellings are assumed to decline by the same amount each year reaching zero in the last year of their life. With this assumption, the price of a dwelling of average age (P_{average}) will equal the new price (P_{new}) times the remaining years that a dwelling of average age (A) is expected to continue providing dwelling services as a ratio of the total service life (L) i.e.

$$P_{\text{average}} = P_{\text{new}} * (L-A)/L$$

$$\text{or } P_{\text{new}} * (1-A/L)$$

Table 20 gives the values of the adjustment factor $1-(A/L)$ for values of L commonly assumed for dwellings and rates of annual growth in the housing stock from -1% to + 3%.

Table 20: Sample values of $(1-(A/L))$

Average service life of dwellings	Annual growth rate of the stock of dwellings				
	-1%	zero	1%	2%	3%
60 years	0.442	0.492	0.541	0.588	0.632
70 years	0.435	0.493	0.550	0.605	0.654
80 years	0.427	0.494	0.559	0.621	0.675

In order to calculate consumption of fixed capital, the estimated value of the stock of dwellings (**K6**) must exclude the value of the land on which the dwellings are situated, because no consumption of fixed capital is calculated for land. However, when calculating the net operating surplus, it is necessary to include the value of the land and the dwellings because the owner's total investment covers both.

Consumption of fixed capital (CFC) is obtained by multiplying the mid-year value of the net capital stock by the depreciation rate. The depreciation rate is usually written as D/L , where D is the "declining balance rate" and L is the average service life of the assets. Declining balance rate is usually assumed to lie between 1 and 3. For dwellings in Europe and North America, a value of 1.6 is found to provide plausible pattern of CFC.

Thus, if the mid-year net value of the stock of a particular type of owner-occupied dwelling is 4,000 with a declining balance rate of 1.6 and average service life of 70 years, the depreciation rate will be 0.023 ($1.6/70$) and the CFC will be $4,000 \times (0.023) = 91$.

Table 21: Estimating consumption of fixed capital of owner-occupied dwellings at current prices

Item No.	Description of the item
CFC 1	Mid-year current market value of the stock of owner-occupied dwellings (excluding land)
CFC 2	Estimated service life of owner-occupied dwellings (in years)
CFC 3	Depreciation rate for owner-occupied dwellings. $1.6/(CFC2)$
CFC 4	Consumption of fixed capital formation of owner-occupied dwellings in current market prices. $(CFC1) \times (CFC3)$

Example 20: Calculating output of OOD

Available information is in *italic*. Other taxes on production are insignificant.

Table 22: Calculating output of owner-occupied dwellings – user cost method

		2010	2011	2012	2013	2014
(a)	<i>Surface area of owner-occupied dwellings from 2010 census (mn square meters)</i>	200				
(b)	<i>Growth rate of OODs between last census (2010) and middle of the current year</i>		0.0040	0.0055	0.0065	0.0075
(c)	<i>Average cost of newly constructed dwellings in current year (per square meter) in currency units</i>	9,000	10,000	12,000	13,000	15,000
(d)	<i>Adjustment factor</i>	0.51	0.51	0.51	0.51	0.51
(e) = (a) * (1+b)	Estimated surface area of OODs in the middle of current year (mn square meters)	200	200.8	201.9	203.2	204.7
(f) = (c) * (d)	Average net value of a dwelling in the current year (per square meter)	4,590	5,100	6,120	6,630	7,650
(g) = (e) * (f)	Value at current prices of the net stock of OODs (millions currency units)	918,000	1,024,080	1,235,655	1,347,327	1,566,268
(h)	<i>Value of land under houses is estimated to be around 15% of the value of net stock of OODs</i>	0.15	0.15	0.15	0.15	0.15
(i) = (g) * (h)	Value of land under houses (currency units)	137,700	153,612	185,348	202,099	234,940
(k) = (g) - (i)	Value of net stock of OODs at current prices (excluding land)	780,300	870,468	1,050,307	1,145,228	1,331,328
(l)	<i>Estimated service life of OODs</i>	70	70	70	70	70
(m)	<i>Depreciation rate for OODs (1.6/70)</i>	0.0229	0.0229	0.0229	0.0229	0.0229
(n) = (m) * (k)	Consumption of fixed capital of OODs in current prices	17,835	19,896	24,007	26,177	30,430
(o)	<i>Total intermediate consumption</i>	2,500	2,875	3,306	3,802	4,373
(p)	<i>Rate charged (Home loan market) (%)</i>	8.0	8.0	8.3	8.3	8.5
(q) = (o) * (p) / 100	Net operating surplus	73,440	81,926	101,942	111,154	133,133
(r) = (o) + (n) + (q)	Output (measured as sum of costs) = IC+CFC+NOS	93,775	104,698	129,255	141,133	167,936

5.4 Output of Government

The non-market output produced by government units and NPISHs that is supplied free, or at prices that are not economically significant is valued by the total production costs, including consumption of fixed capital, plus taxes (less subsidies) on production other than taxes or subsidies on products. *By convention, no net return to capital is included for non-market production.*

Similarly, no net return to capital is included in the estimates of production for own final use by non-market producers when these are estimated as the sum of costs.

Non-market output is output undertaken by general government and NPISHs and takes place in the absence of economically significant prices. Economically significant prices are prices which have a

substantial influence on the amounts of products producers are willing to supply and on the amounts of products that purchasers wish to acquire.

As a rule of thumb, a particular price is considered as economically significant, when price of goods and services cover more than half of the cost of production

The main data sources are administrative data sources and Government Finance Statistics. Statistics for government units and public corporations are derived directly from the micro-data in the government financial accounting database and rely heavily on accounting information.

Example 21: Computation of output of government departments

Output of general government is measured as the sum of its production cost components. Compensation of employees includes the value of the unfunded pension benefits. The payroll tax is classified as other taxes on production.

Table 23: Expenditure of education department of government

Function / Item Description	Expenditure	Income
1. Administration of Educational Services:		
– purchases of goods and services	500	
– wages and salaries	300	
– taxes on payroll	30	
– employer social contributions	50	
– depreciation ^{1/}	60	
– certification fees		30
2. Educational Institutions:		
– purchases of goods and services ^{2/}	9,000	
– wages and salaries	10,000	
– taxes on payroll	1,000	
– employer social contributions	1,000	
– depreciation	2,000	
– certification fees		1,500
3. Construction Department:		
– consumption of materials	2,000	
– purchases of services	200	
– wages and salaries	1,000	
– taxes on payroll	100	
– depreciation of equipment	500	

1/ Depreciation is registered at current replacement cost

2/ Of which 1,000 was spent on the acquisition of books for free delivery to low-income students

Given expenditure data in Table 23,

- a. Output of educational services =
- Intermediate consumption
 - + Compensation of employees
 - + Taxes on production
 - + Consumption of fixed capital
 - = 500 + (300 + 50) + 30 + 60
 - = **940**

b. Output of educational institutions =

$$\begin{aligned} & \text{Intermediate consumption} \\ & + \text{Compensation of employees} \\ & + \text{Taxes on production} \\ & + \text{Consumption of fixed capital} \\ & = (9,000 - 1,000) + (10,000 + 1,000) + 1,000 + 2,000 \\ & = \mathbf{22,000} \end{aligned}$$

c. Output of construction =

$$\begin{aligned} & \text{Intermediate consumption} \\ & + \text{Compensation of employees} \\ & + \text{Taxes on production} \\ & + \text{Consumption of fixed capital} \\ & = (2,000 + 200) + 1,000 + 100 + 500 \\ & = \mathbf{3,800} \end{aligned}$$

6 MEASUREMENT OF GDP BY THE FINAL EXPENDITURE APPROACH

The amount of a product available for use within the economy is supplied either by domestic production or by imports. The same amount of the product in the economy will be used for intermediate consumption, final consumption, capital formation (including changes in inventories) or exports. These two statements can be combined to give a statement of a product balance as follows:

$$\begin{aligned}\text{Supply : Output + Imports + Taxes less subsidies on products} \\ = \\ \text{Use : Intermediate consumption + Final consumption expenditure +} \\ \text{Gross capital formation + Exports}\end{aligned}$$

Rearranging the above, gives the estimates of GDP from the production and expenditure perspectives

$$\begin{aligned}\text{GDP(P) : Output (O) – Intermediate consumption (IC) + Taxes less subsidies on products} \\ = \\ \text{GDP(E): Final consumption expenditure + Gross capital formation + Exports - Imports}\end{aligned}$$

The product balance is a powerful quality assurance tool that is used to compare data from various sources to improve coherence. Any imbalances between the supply and use of a product often point to gaps in the system.

For this reason, it is recommended that national accountants compile both approaches to GDP independently.

6.1 Final Consumption Expenditure

Final consumption expenditure consists of expenditure incurred by resident institutional units on goods or services that are used for the direct satisfaction of individual needs or wants or the collective needs of members of the community.

6.1.1 Household final consumption expenditure

Household final consumption expenditure (HFCE) is usually the largest component of GDP by expenditure. It consists of expenditure incurred by resident households on consumption goods or services as well as the value of barter transactions, goods and services received in kind, and goods and services produced and consumed by the same household.

A distinction needs to be made between households and individuals in the households as final consumers, and households as producers of goods and services for the market. The latter are *unincorporated household enterprises*. The purchases of goods and services by these unincorporated household enterprises for the purpose of their production activities are treated as *intermediate consumption or gross capital formation, depending on the characteristics of the goods*. They do not form part of household final consumption expenditure.

Household consumption expenditure includes:

- goods and services bought for final consumption by households
- goods received through barter transaction for final consumption

- c. services of owner-occupied dwellings;
- d. income in kind, such as:
 - i. goods and services received as income in kind by employees;
 - ii. goods or services produced as outputs of unincorporated enterprises owned by households that are retained for consumption by members of the household. Examples are food and other agricultural goods, and household services produced by employing paid staff (servants, cooks, gardeners, etc.);
- e. items not treated as intermediate consumption, such as:
 - i. materials for small repairs and interior decoration of dwellings carried out by tenants or owners;
 - ii. materials for repairs and maintenance to consumer durables, including vehicles;
- f. items not treated as capital formation, in particular consumer durables; this includes the transfer of ownership of some durables from an enterprise to a household;
- g. financial services directly charged and the part of FISIM used for final consumption purposes by households;
- h. insurance services by the amount of the implicit service charge;
- i. pension funding services by the amount of the implicit service charge;
- j. payments by households for licences, permits, etc. which are regarded as purchases of services;
- k. purchase of output at not economically significant prices, e.g., entrance fees for a museum.

Consumption of resident households abroad consisting of expenditures on goods and services of residents traveling abroad, and expenditures on goods and services of residents working abroad should be estimated and included in the household final consumption.

Household final consumption expenditure excludes the following:

- a. social transfers in kind, such as expenditures initially incurred by households but subsequently reimbursed by social security, e.g., some medical expenses;
- b. items treated as intermediate consumption or gross capital formation, such as:
 - i. expenditures by households owning unincorporated enterprises when incurred for business purposes, e.g., on durable goods such as vehicles, furniture or electrical equipment (gross fixed capital formation), and also on non-durables such as fuel (treated as intermediate consumption);
 - ii. expenditure that an owner-occupier incurs on the decoration, maintenance and repair of the dwelling not typically carried out by tenants (treated as intermediate consumption in producing housing services);
 - iii. the purchase of dwellings (treated as gross fixed capital formation);
 - iv. expenditure on valuables (treated as gross capital formation);
- c. items treated as acquisitions of non-produced assets, in particular the purchase of land;
- d. all those payments by households which are to be regarded as taxes;
- e. subscriptions, contributions and dues paid by households to NPISHs, such as trade unions, professional societies, churches and social, cultural, recreational and sports clubs;
- f. voluntary transfers in cash or in kind by households to charities, and relief and aid organisations.

Time of recording and Valuation

Expenditure on a good is recorded at the time of change of ownership; expenditure on a service is recorded when the delivery of the service is completed.

Expenditure on goods acquired under a hire purchase or similar credit agreement and financial lease is recorded at the time the goods are delivered even if there is no change of ownership at this point.

Own-account consumption is recorded when the output retained for own final consumption is produced.

The final consumption expenditure of households is recorded *at purchasers' prices*, that is, the price the purchaser actually pays for the products at the time of the purchase.

Goods and services supplied as employee compensation in kind are valued *at basic prices* when produced by the employer and at the *purchasers' prices* when bought by the employer.

Retained goods or services for own consumption are valued *at basic prices*.

Sources of data

Data for final consumption expenditure of households are regularly collected by Household Budget Surveys. The survey is the most comprehensive source of information on household expenditure and is usually used to establish benchmark estimates. Some socio-economic characteristics of the respondents are also collected in an integrated way, making the survey data appropriate for detailed analysis. Because of underreporting, adjustments to some expenditure categories, more specifically on tobacco and alcoholic beverages may be necessary using administrative data related to excise taxes on these products. Low-income and high-income groups may not be well represented in the survey.

Data on household expenditure on goods and services by residents while travelling or working abroad, and production for own final consumption may also be collected through the same survey.

Other data sources include

- a. Survey of retailers: since households buy mostly from retailers, the survey is a good data source in the estimation of household final consumption expenditure. The survey provides useful indicators that can be applied to the benchmark data from the less-frequent household budget surveys. The surveys of retailers can provide higher frequency indicators if conducted on a monthly or quarterly basis. Such data can be processed quickly and the results released with a short time lag. However, increasing online purchases may make the use of the results of the surveys of retailers less complete.
- b. Tax data (such as VAT and excise data) are highly accurate, very timely and of high frequency (monthly or quarterly basis). They can be used to establish trends of household final consumption expenditure. Specific excise taxes on alcohol and tobacco can help to adjust under-reporting in the Household Budget Surveys. However, VAT data are generally tabulated by industry and lack product details. Besides, they may not cover small businesses.
- c. Production data can be used as indicators for household spending. They are very often timely and of high frequency.
- d. Foreign trade data are used to estimate consumption of goods that are imported. Trade data are very timely, available at high frequency and have an extensive coverage.
- e. Balance of payment data are used to estimate purchases of residents travelling abroad and of non-residents visiting the compiling country's economic territory. However, the BOP data usually report aggregated travel related expenditure and cover both household and business travel. Assumptions or other sources may be required to apportion the expenditure.

The commodity flow approach can be used to estimate Household Final Consumption Expenditure when there are good data on the supply of the products, namely production and imports. The household consumption is obtained as a residual from the supply approach, after the intermediate consumption, government consumption, fixed capital formation, and changes in inventories are estimated and deducted.

Example 22: Calculating the household final consumption expenditure using commodity flow approach

Table 24: Available information from various data sources

Item Description	Source	Value	Remarks
Expenditure on clothing and footwear.	Household expenditure survey	10,000	The survey uses a purchases concept of expenditures.
Retail trade turnover on clothing and footwear.	Annual survey of trade establishments.	8,000	The survey does not include the informal sector.
Output of clothing and footwear.	Industrial survey.	10,000	Output is valued at basic prices.
Imports of clothing and footwear.	Foreign trade statistics.	2,000	Value c.i.f. including shuttle trade imports of 800.
Exports of clothing and footwear.	Foreign trade statistics.	600	Value f.o.b.

In addition, the following additional information is available:

- Household unincorporated enterprises produced clothing and footwear valued at 500, which is not included in the industrial survey. Moreover, half of this production was for own-consumption. The other half was sold directly to other households.
- The clothing and footwear industry paid wages and salaries in kind for an amount of 300.
- Changes in inventories (at current market prices) of clothing and footwear products held by producers (manufacturing and trade together) was + 1,500.
- Industries bought clothing and footwear for 500 from the retail trade and another 400 directly from the industry.
- There is a 10% sales tax on domestic production and on imports.
- The distribution margin rate is estimated to be 20% over the basic price.
- Expenditure on clothing and footwear in the domestic market by non-residents is 50. Expenditures of resident households abroad are 70.
- It is assumed that all imports by shuttle traders are distributed through informal trade

Step 1: Estimate the total supply at basic prices

Output at basic prices	= 10,000 + 500	= 15,000
Imports (CIF)		= 2,000
Expenditure of residents abroad		= 70
TOTAL		= 12,750

Step 2: Estimate the total uses at basic prices

Intermediate consumption:

400 units bought from producers to basic prices (deduct sales tax)	
	= $400/1.10$
	= 363.64
500 units bought from retailers to basic prices (deduct sales tax and margin)	
	= $500/(1.10 \times 1.20)$
	= 378.79
Total intermediate consumption	= 363.64 + 378.79
	= 742.43

Exports:

600 units exported brought from f.o.b to basic prices (deduct sales tax)	= 600/1.10
	= 545.45
50 units bought by non-residents in the domestic market brought to basic prices (deduct sales tax and margin)	= 50/(1.10*1.20)
	= 37.88
Total exports	= 545.45 + 37.88
	= 583.33

Step 3 : Calculate household final consumption expenditure at basic prices

Household final consumption expenditure at basic prices =

Total supply at basic prices	12,570.00
Less intermediate consumption	- 742.43
Less changes in inventories	- 1,500.00
Less exports	- 583.33
	= 9,744.24

Step 4: Calculate margin and tax

Margins	= (9,744.24 – 300 – 500 – 70) * 0.20
	= 1,774.85

Note that distribution margin is not applicable on wages and salaries in kind (300), on production by household unincorporated enterprises, half of which was for own-consumption and the other half sold directly to other households (500), and on expenditures of resident households abroad (70).

Tax base	= 9,744.24 – 300 – 500 – 70 – 800
	+ 0.2 * (8,874.24 – 800)
	= 9,689.09

Tax	= 0.1 * 9,689.09
	= 968.91

Tax base for household final consumption expenditure excludes wages and salaries in kind (300), production by household unincorporated enterprises produced, half of which was for own-consumption and the other half sold directly to other households (500), expenditures of resident households abroad (70) and shuttle trade imports (800), and include the distribution margin.

Step 5: Calculate household final consumption expenditure at purchasers' prices

Household final consumption expenditure at market prices =

HFCE at basic prices	= 9,744.24
Distribution margin	+ 1,774.85
Tax	+ 968.91
	= 12,488.00

Second-hand goods in household consumption

Use of second-hand goods are common in some countries. The treatment of second-hand goods in national accounts depends on the type of transactions and on the nature of the goods.

Types of transactions

- a. Direct purchase between resident households: no production is generated in the economy.
- b. Purchase between resident households through a third party: the difference between the price that the buyer pays to the trader and the price the trader pays to obtain the goods is a trade margin. The trade margins are output of trade activities of the third party.
- c. Transactions between a non-resident and a resident: such transactions are recorded as an export / import.

Nature of goods

- a. Used fixed assets sold by enterprises and government to households: the value of the goods purchased plus the transfer costs are treated as household final consumption expenditure. The same value of the goods less trade margins is entered as negative gross fixed capital formation for the enterprises and government. Only trade margins are produced. Second-hand automobiles make up a major part of these second-hand goods.
- b. Used consumer durables sold by households to enterprises to be used as fixed assets: the value of the goods purchased and the transfer costs are entered as gross fixed capital formation of the enterprises. A negative value equal to the value of the goods less trade margins is entered as negative household final consumption.
- c. Used non-durables to be reused as such (e.g., used garments): the transactions between resident households (negative household consumption for the seller and positive household consumption for the buyer) will cancel out.
- d. Used non-durables to be recycled (e.g., waste paper): For transactions between households and enterprises (e.g., waste paper to be recycled), the value received by households should be entered as negative household consumption and as intermediate consumption by recycling industries.

6.1.2 General government final consumption

Government final consumption expenditure (GFCE) includes all final expenditures on goods and services made at all levels of government (federal/ central, state/provincial, and local governments).

Final consumption expenditure by government includes two categories of expenditures:

- a. the value of the goods and services produced by general government itself other than those produced for own-account capital formation, market output and payments for non-market output.

Since non-market in nature, the output of general government is estimated by the sum of the costs involved in production.

- b. purchases by general government of goods and services produced by market producers that are supplied to households, without any transformation, as social transfers in kind. General government pays for these goods and services that the sellers provide to households.

Final consumption expenditure of government is derived as follows:

- = value of all types of output of general government
- the value of output for own account capital formation
- the value of sales of goods and services at both economically insignificant prices and at economically significant prices
- + the value of goods and services purchased from market producers for delivery to households free or at economically insignificant prices (social benefits in kind)

Government output produced for own capital formation is an asset and is not included in GFCE. Incidental sales by government units (e.g., souvenirs by the shop at a museum included in the general government sector) are also excluded from GFCE. They are either included in intermediate consumption if used during a production process or in HFCE if consumed by households.

Government often purchases goods and services from market producers for the benefit of households. When these goods are not transformed during the government's production process but supplied to households, they are not included in government output but are part of GFCE. Examples are food or medicine provided to households free of charge or at reduced rates.

Source of data

The main source of data for the compilation of government final consumption expenditure is the actual consolidated expenditure of all levels of the government (i.e., central/federal, state/provincial, and local) reclassified to appropriate national accounts concepts, or the Government Finance Statistics (GFS), more specifically the expense section of the Statement of Operations.

Data on actual government expenditures are, however, rarely available at the end of the year. Thus, government expenditures are estimated on the basis of budgeted expenditures using some relationship (simple ratios) between actual and budgeted expenditures based on past data. Estimates of government output and final consumption expenditure are revised when actual data become available.

Caution may be need be taken with respect to:

- a. **Coverage:** Government units covered by GFS compilers may differ from those needed in the compilation of CGFCE estimates. For example, extra-budgetary and local government units which may not be covered in GFS.
- b. **Valuation:** GFS compilers may use a mix of accrual and cash data while national accounts are recorded on an accrual basis.
- c. Lumped expenditures such as end-of-year bonuses paid to government employees at the end of the year are part of government output and are therefore included in GFCE. They relate to labour provided during the year and *should be allocated across the four quarters of the year*.
- d. The distinction between of *taxes on products and fees* is not always straightforward, and their treatment may differ.
- e. **Military expenditure** data may not be available.
- f. Other issues could include identification of *own-account capital formation, estimates of consumption of fixed capital, and the distinction between interests and FISIM*.

Example 23: Calculating government output and government final consumption expenditure

Table 25(a): Government expenses

Expenditure category	
Wages and salaries	5,000
Employee pension plans	500
Government spending on medical supplies for low-income households	100
Transfers to seniors	200
Consumption of fixed capital	1,000
Other taxes on production	500
Intermediate consumption	2,000
Sales of goods and services	500
Research and Development expenditure	500
Construction of government buildings undertaken by government employees	500
Transfers to households in connection with education	750

Table 25(b): Final consumption expenditure of Government

Compensation of employees	5,500
Intermediate consumption	2,000
Consumption of fixed capital	1,000
Other taxes on production	500
Government Output	9,000
- Goods for own capital formation	-1,000
- Sales of goods and services	-500
+ Goods and services purchased from market producers for households	100
Final consumption expenditure of Government	7,600

Government Output =
 Compensation of Employees
 + Intermediate consumption
 + Consumption of fixed capital
 + Other taxes on production
 = (5,000 + 500) + 2,000 + 1,000 + 500
 = **9,000**

Government final consumption expenditure =
 Government Output
 – Output for own capital formation
 – Sale of goods and services
 + Goods and services purchased from market producers for households
 = 9,000 – 1,000 – 500 + 100
 = **7,600**

Government transfers to households in connection with education and government transfers to seniors are current transfers and not final consumption expenditure of government.

6.1.3 Final consumption expenditure of NPISHs

The compilation of output and final consumption expenditure of Non-Profit Institutions Serving Households (NPISH) is similar to that of general government. Its output is measured by costs, and its final consumption expenditure consists of

- the value of the goods and services produced by NPISHs other than own-account capital formation and other than expenditure made by households and other units; and
- expenditures by NPISHs on goods or services produced by market producers that are supplied, without any transformation, to households for their consumption as social transfers in kind.

Like general government, NPISHs are mostly involved in the production of nonmarket services for households or for the community at large. The main difference is that they are largely funded by subscriptions, contributions, donations, or property income.

In most countries, the final consumption expenditure of NPISHs is small compared to that of households and general government, and is usually combined with the estimate of HFCE.

Data sources

In many countries, NPISHs are required to register with government and to submit their annual statements on revenue and expenditure. The latter contain most information required to compile the final consumption expenditure of NPISHs. However, very often small institutions may be exempt for reporting.

Other sources include surveys of NPISHs, and income tax data source whereby donations to charitable institutions are consistently reported by individuals.

6.2 Gross capital formation

Gross capital formation (GCF) is made up of

- a. gross fixed capital formation:
 - i. consumption of fixed capital
 - ii net fixed capital formation
- b. changes in inventories
- c. acquisitions less disposals of valuables

Gross capital formation is measured gross of consumption of fixed capital. Net capital formation is calculated by deducting consumption of fixed capital from gross capital formation.

6.2.1 Gross fixed capital formation

Gross fixed capital formation (GFCF) is the total value of resident producers' acquisitions less disposals of fixed assets during the accounting period, plus some specific additions to the value of non-produced assets.

Fixed assets are produced assets used in production for more than one year.

GFCF consists of:

- a. new or existing fixed assets purchased;
- b. fixed assets produced and retained for producers' own use;
- c. new or existing fixed assets acquired through barter;
- d. new or existing fixed assets received as capital transfers in kind;
- e. new or existing fixed assets acquired by the user under a financial lease;
- f. major improvements to fixed assets and existing historic monuments;
- g. natural growth of those natural assets that yield repeat products;
- less
- h. existing fixed assets sold;
- i. existing fixed assets disposed of through barter;
- j. existing fixed assets disposed of as capital transfers in kind.

The following key components of GFCF are distinguished:

- a. dwellings;
- b. other buildings and structure including major improvements to land;
- c. machinery and equipment, such as ships, cars and computers;
- d. weapons systems;
- e. cultivated biological resources, e.g., trees and livestock; and
- f. Intellectual property rights.

Major improvements to land include land reclamation from the sea; clearance of forests to enable the use of the land in production; construction of ditches and channels for irrigation of deserts; and construction of breakwaters, sea walls or flood barriers to prevent of flooding or land erosion.

Borderlines cases includes acquisitions of houseboats and mobile homes used as residences; military structures and equipment; light weapons and armoured vehicles used by non-military units; changes in livestock used in production year after year (breeding stock, dairy cattle, sheep reared for wool and draught animals) and changes in trees that are cultivated year after year (fruit trees, vines, rubber trees, palm trees, etc.).

Improvements to existing fixed assets beyond ordinary maintenance and repairs, the acquisition of fixed assets by financial leasing, and the costs of ownership transfer incurred in acquisitions and disposals of assets are included.

Are excluded transactions treated as intermediate consumption (such as purchase of small tools for production purposes, ordinary maintenance and repairs, and acquisition of fixed assets under operational lease); machinery and equipment acquired by households for final consumption; holding gains and losses on fixed assets; and catastrophic losses.

Cultivated Biological Resources

Cultivated biological resources *cover animal resources yielding repeat products and tree, crop and plant resources yielding repeat products* whose natural growth and regeneration are under the direct control, responsibility and management of institutional units.

For the specialist producers, animals or trees whose production is not yet complete and are not ready for sale or delivery are recorded as *work-in-progress*. Examples are one-year-old horses bred for sale as two-year-old race horses, or young fruit trees that need further growth before being marketable.

However, when animals or trees intended to be used as fixed assets are produced on own account, incomplete assets in the form of immature animals, trees, etc. that are not ready to be used in production are treated not as work-in-progress but as *gross fixed capital formation* by the producing unit in its capacity as eventual user.

Animal resources yielding repeat products include breeding stocks, dairy cattle, draft animals, sheep or other animals used for wool production and animals used for transportation, racing or entertainment.

Animals raised for slaughter, including poultry, are not fixed assets but inventories. Immature cultivated assets are excluded unless produced for own use.

GFCF in livestock is equal to the total value of all mature animals and immature animals produced on own account acquired by users of the livestock less the value of their disposals. Disposals consist of animals sold or disposed of, including those sold for slaughter, plus those animals slaughtered by their owners.

Tree, crop and plant resources yielding repeat products include trees (including vines and shrubs) cultivated for fruits and nuts, for sap and resin and for bark and leaf products. Trees grown for timber that yield a finished product once only when they are ultimately felled are not fixed assets.

GFCF in plantations, orchards, etc., consists of the acquisitions less disposals of mature trees, shrubs, etc., including acquisitions of immature trees, shrubs, etc., produced on own account. Its value may be approximated by the costs incurred in their production during the period: such as the costs of preparing the ground, planting, staking, protection from weather or disease, pruning, training, etc., until the tree reaches maturity and starts to yield a product.

Disposals consist of trees, shrubs, etc., sold or otherwise transferred to other units plus those cut down before the end of their service lives. Disposals do not include exceptional losses due to drought or other natural disasters such as hurricanes, these being recorded in the other changes in the volume of assets account.

Intellectual Property Products

Intellectual property products are the result of research and development, investigation or innovation leading to knowledge, the use of which is restricted by law or other means of protection. They include:

- a. results of Research and Development (R&D);
- b. results of mineral exploration;
- c. computer software and large databases to be used in production for more than one year; and
- d. entertainment, literary or artistic originals of manuscripts, models, films, sound recordings, etc.

Research and development consist of expenditures on creative work undertaken on a systematic basis in order to increase the stock of knowledge (including knowledge of man, culture, and society) and use of this stock of knowledge to devise new applications.

Mineral exploration and evaluation consist of expenditures on exploration for petroleum and natural gas and for non-petroleum deposits and subsequent evaluation of the discoveries made. For example, expenditure of a gas company to discover a deposit of gas.

Computer software consist of computer programs, program descriptions, and supporting materials for both systems and applications software. The software may be for own use or may be intended for sale by means of copies.

Databases consist of files of data organized in such a way as to permit resource-effective access and use of the data. Databases may be developed exclusively for own use or for sale as an entity or for sale by means of a licence to access the information contained therein.

Entertainment, literary, or artistic originals consist of the original films, sound recordings, manuscripts, tapes, models, etc., on which drama performances, radio and television programming, musical performances, sporting events, literary and artistic output, etc., are recorded or embodied. They are frequently developed on own account. Subsequently they may be sold outright or by means of licences.

Other intellectual property products include any such products that constitute fixed assets but are not captured in one of the specific items above.

Time of recording and valuation of gross fixed capital formation

GFCF is recorded when the ownership of the fixed assets is transferred to the institutional unit that intends to use them in production.

For financial leasing, it is recorded when a change of ownership from lessor to lessee is imputed. For own-account gross fixed capital formation, it is recorded when it is produced.

GFCF is valued at purchasers' prices including installation charges and costs of ownership transfer. When produced on own-account or transferred in kind, it is valued at the basic prices of similar fixed assets, and if such prices are not available, at the costs of production plus a mark-up (except for non-market producers) for net operating surplus or mixed income.

The costs of ownership transfer consist of the following:

- a. All professional charges or commissions incurred when acquiring or disposing of an asset such as fees paid to engineers and valuers, and commissions paid to estate agents;
- b. Any trade and transport costs separately invoiced to the purchaser;
- c. All taxes payable by the unit acquiring the asset on the transfer of ownership;
- d. Any tax payable on the disposal of an asset;
- e. Any delivery and installation or dis-installation costs not included in the price of the asset being acquired or disposed of; and

- f. Any terminal costs incurred at the end of an asset's life such as those required to render the structure safe or to restore the environment in which it is situated.

Acquisitions of intellectual property products are valued in different ways:

- a. *R&D*: valued at the sum of costs, including the cost of unsuccessful R&D, unless the market value of the R&D is observed directly.
- b. *Mineral exploration*: by the costs of actual test drillings and borings, and the costs incurred to make it possible to carry out tests, such as aerial or other surveys;
- c. *Computer software*: by purchasers' prices when purchased on the market, or at its estimated basic price. If no basic price is available, it is estimated at its costs of production plus a mark-up for net operating surplus (except for non-market producers) when developed in-house;
- d. *Databases*: estimated by a sum-of-costs approach. The cost of the data base management system (DBMS) used should not be included but treated as a computer software asset unless it is used under an operating lease. The cost of preparing data in the appropriate format is included, but not the cost of acquiring or producing the data. Other costs include staff costs estimated on the basis of time spent in developing the database, an estimate of the capital services of the assets used in developing the database and costs of items used as intermediate consumption.

If sold, it is valued at their market price, which includes the value of the information content. If the value of a software component is available separately, it should be recorded as the sale of software.

- e. *Entertainment, literary or artistic originals*: valued at the price paid by the purchaser when it is sold.
If not sold:
 - i. at the basic price paid for similar originals;
 - ii. the sum of its production costs plus a mark-up (except for non-market producers) for net operating surplus; or
 - iii. the discounted value of expected receipts.

Disposals of existing fixed assets by sale are valued at basic prices, deducting any costs of ownership transfer incurred by the seller.

Existing assets

Assets can have service lives that may range up to 50 years or more (example dwellings or other structures) and may change ownership several times before they are eventually scrapped, demolished or abandoned.

Existing goods are goods that already have had a use (other than inventories). They include buildings, valuables, consumer durables, and non-durable goods. The transfer of existing goods is a negative expenditure (acquisition) for the seller and a positive expenditure (acquisition) for the purchaser.

Thus, when the ownership of an existing fixed asset is transferred from one resident producer to another, the value of the asset sold, bartered or transferred is recorded as negative gross fixed capital formation by the former and as positive gross fixed capital formation by the latter, cancelling out each other at the level of the economy as a whole except for the costs of ownership transfer incurred by the purchaser.

If an existing immovable fixed asset, such as a building, is sold to a non-resident, the buyer is treated as purchasing a financial asset from a notional resident unit. The latter is then deemed to purchase the asset, so that the sale and purchase of the asset takes place between resident units.

However, if an existing movable fixed asset, such as a ship or aircraft, is exported, only the seller's negative gross fixed capital formation is recorded.

Some durable goods, such as vehicles, may be classified as fixed assets or as consumer durables depending upon the owner and the purpose for which they are used. If the ownership of vehicle is transferred from an

enterprise to a household to be used for final consumption, the enterprise will record a negative gross fixed capital formation, and the household a positive final consumption expenditure. If a vehicle owned by a household is acquired by an enterprise, a positive gross fixed capital formation will be recorded by the enterprise, and a negative final consumption expenditure by the household.

Imports of 'used' assets are treated in the same way as new assets.

Example 24: Recording of transactions of existing fixed assets

A business purchases a house from a household for 500,000 units. The real estate fees are 10,000 units and the land transfer tax is 5,000 units.

GFCF will be **15,000 units**.

The following will be recorded:

- a. The business will record an increase in GFCF of 515,000 units equal to the purchase price of the house (500,000) plus the value of ownership transfer costs (10,000 + 5,000).
- b. The household will record a disposal of a fixed asset of 500,000 units.
- c. Therefore, GFCF (acquisition less disposal of fixed assets) would increase by the value of the ownership transfer costs (15,000).

Data sources

- a. Building permits can provide information on the types of buildings, the size as well as estimates of the cost of the buildings. They are usually very timely and are available on a monthly or quarterly basis. However, they only indicate that construction will occur and do not reflect on the pace of construction activities. Also, the costs are only indicative.
- b. Business surveys: In many countries, investment modules are included in existing quarterly or annual business surveys. Some countries conduct specific surveys to collect detailed information of GFCF. Generally, the specific surveys will provide significant product details.
- c. Merchandise trade statistics: For countries importing most of its machinery and equipment for investment, trade data source is an important source of information. Trade data are very timely and of high frequency, besides being very detailed. However, it may be difficult at times to segregate those items to be treated as intermediate consumption from those to be treated as GFCF.
- d. IPP administrative data sources: Administrative source data in connection with special tax incentives to encourage research and development can be used to estimate GFCF in IPP. Similarly, administrative data on drilling permits and registration of exploration activities may be used. Where IPPs are measured using the sum-of-cost approach, wages and salaries would be an important component of the input costs. In such cases, labour force and business payrolls surveys would provide the required data to measure GFCF in IPP.
- e. Government agriculture department usually maintain detailed records on crop and livestock production. These data such as areas under cultivation and livestock population can be used to estimate GFCF in cultivated biological assets. However, in countries where own-account production is significant, the government data source might not be complete.

6.2.2 Consumption of fixed capital

Consumption of fixed capital (CFC) is the decline in value of fixed assets owned as a result of normal wear and tear and obsolescence. It covers anticipated terminal costs, such as the decommissioning costs of power stations or the clean-up costs of landfill sites. These are recorded as consumption of fixed capital at the end of the service life when the terminal costs are recorded as gross fixed capital formation.

Consumption of fixed capital should be calculated for all fixed assets except animals, including intellectual property rights, major improvements to land and costs of ownership transfers associated with non-produced assets.

Consumption of fixed capital is different from the depreciation allowed for tax purposes or the depreciation shown in business accounts. It is estimated on the basis of the stock of fixed assets and the expected average economic life of the different categories of those goods. For the calculation of the stock of fixed assets, the perpetual inventory method (PIM) is applied whenever direct information on stock is not available.

Losses of fixed assets occurring as a result of accidental damage which can be insured against are taken into account in calculating the average service life of the goods in question.

Losses due to war or to major natural disasters such as major earthquakes and volcanic eruptions, are not included under consumption of fixed capital. The values of assets lost in these ways are recorded in the other changes in the volume of assets account.

The Perpetual Inventory Method (PIM)

The perpetual inventory method requires an estimate of the stock of fixed assets in the hands of producers. The first step is to estimate how many of the fixed assets resulting from gross fixed capital formation undertaken in previous years have survived to the current period. For this purpose, average service lives, or survival functions, based on observations or technical studies are applied to past investments. Fixed assets purchased at different prices in the past have to be valued at the prices of the base period by utilizing appropriate price indices for fixed assets. The stock of fixed assets surviving from past investment and revalued at the purchasers' prices of the current period is the gross capital stock.

The PIM method applies the simple principle that today's stock is equal to what was previously invested minus what has since been used up. The method requires very long series of GFCF. Each annual investment is an addition to the stock, while each element of physical deterioration (consumption of fixed capital) is a deduction.

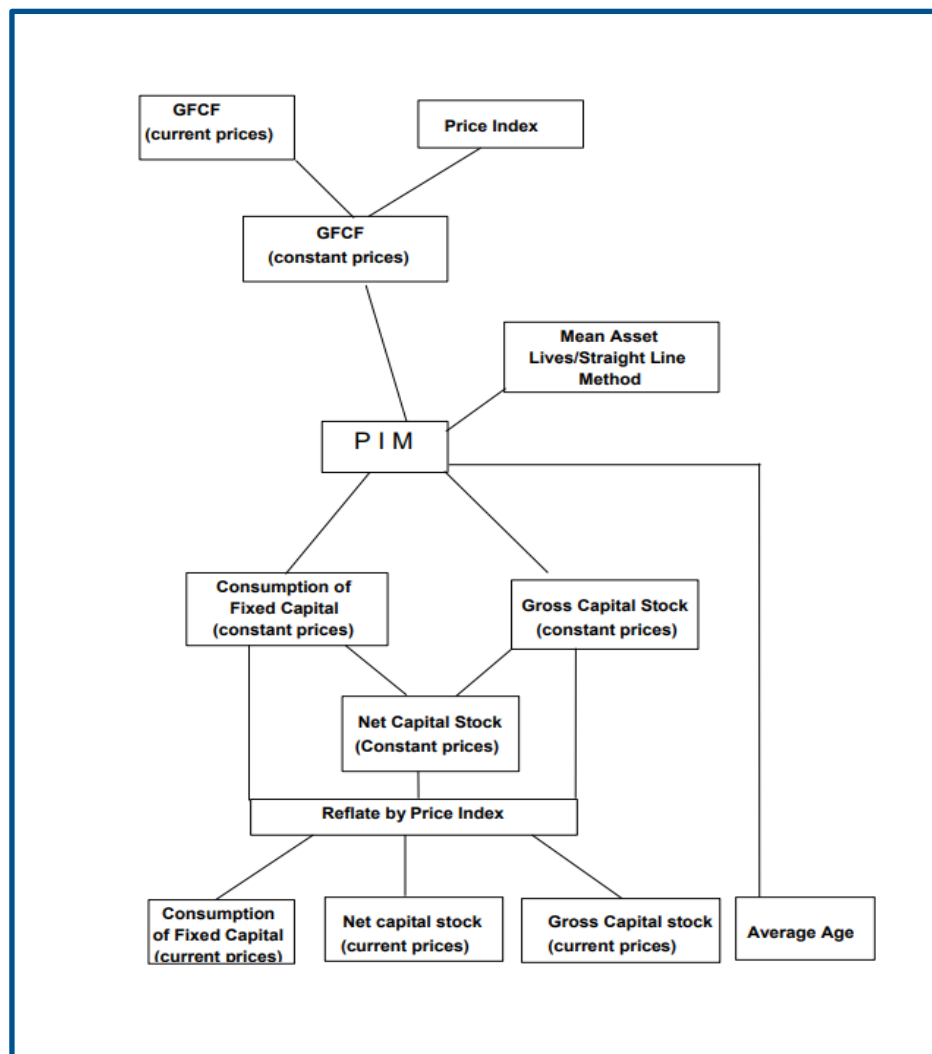
Consumption of fixed capital shall be calculated according to the 'straight line' method, by which the value of a fixed asset is written off at a constant rate over the whole lifetime of the good.

The net stock of fixed capital at the end of period n denoted by $NC(n)$

- = the net stock of fixed capital at the end of the previous period $NC(n - 1)$
- + the GFCF in period n , $GFCF(n)$
- the consumption of fixed capital $CFC(n)$

The PIM should be applied to estimates of GFCF at a detailed level; that is, for each type of assets and for a particular industry or institutional sector.

Figure 8 – The PIM Process



Source: Statistics Mauritius – Methodology

The table below shows the difference between depreciation used in business accounting and consumption of fixed capital, which is the economic concept adopted by the SNA.

It shows how depreciation in business accounts and consumption of fixed capital are calculated. It is assumed that the fixed asset was bought at time T-3 for 800 and entered in the business account at this price (e.g., book value or historical value), that it has a lifetime of 4 years and that it will be scrapped thereafter. The value of the fixed asset is assumed to decline proportionately over 4 years (straight-line depreciation).

Part (1) shows the calculation of depreciation in business or government accounting. Gross capital formation is recorded at book value. As the asset survives 4 years, depreciation is simply calculated by dividing the book value by 4.

Part (2) shows the calculation of the consumption of fixed capital using the perpetual inventory method. This method requires, first, the calculation of gross capital stock and consumption of fixed capital at the base year price and then the inflating of these values into current prices using price indices. Thus, the following steps are required:

- The gross capital stock at book value is converted to the price of a base year. In this example, the base year is set at T-2.
- The consumption of fixed capital at the base year price is calculated by using the same straight - line depreciation method.
- Net capital stock at the base year price is the difference between gross capital stock and consumption of fixed capital.
- The next step is to calculate the consumption of fixed capital and net capital stock at current market values by reflatting the above using the same price indexes.

Table 26 – Calculating consumption of fixed capital using PIM

1. Depreciation in business accounting at book value (straight line over 4 years)							
	Description	T ₋₄	T ₋₃	T ₋₂	T ₋₁	T	T ₊₁
Capital formation at book value (GCF)	(1)		800				
Depreciation at book value (D)	(2) = (1)/4		200	200	200	200	0
Net capital stock at book value, end of period	(3) = (3) _{t-1} + (1) - (2)	0	600	400	200	0	0
2. Consumption of fixed capital in national accounting by perpetual inventory method							
Price index of fixed asset	(4)		100	105	106	115	
At base price T₋₂							
Gross capital formation (GCF)	(5)		840				
Consumption of fixed capital (CFC)	(6) = (5)/4		210	210	210	210	0
Net capital stock, end of period	(7) = (7) _{t-1} + (5) - (6)	0	630	420	210	0	0
At current market price							
Consumption of fixed capital at current market prices	(8) = (6) price adjusted by (4)		200	210	212	230	0
Net capital stock at current market prices, end of period	(9) = (7) price adjusted by (4)		600	420	212	0	0

As can be seen above, the calculation of the consumption of fixed capital of one fixed asset with a four-year lifetime at time T requires data on gross capital formation of that kind of asset from year T-3 onwards.

The consumption of fixed capital of buildings with 30-year lifetime at the present time will require data on annual gross capital formation of buildings of the same kind for 30 years before that. Thus, the calculation of consumption of fixed capital requires long time-series of data on gross capital formation and their average service life and their probability of retirement.

In practice, the compilation of net capital stock and consumption of fixed capital requires an initial benchmark estimate of capital stock, and a series of gross capital formation statistics and price indices.

6.2.3 Change in Inventories

Changes in inventories are measured by the value of the entries into inventories less the value of withdrawals and the value of any recurrent losses of goods held in inventories.

Inventories include

- Materials and supplies:** products that an enterprise holds in inventory with the intention of using them as intermediate inputs into production;
- Work-in-progress:** output that is not yet sufficiently processed for delivery to other institutional units or other use (such as growing crops, maturing trees and livestock, uncompleted structure except those produced under a contract of sale or on own-account, uncompleted other fixed assets such as ships, and partially completed film productions and computer programmes);

Work-in-progress is recorded for any production process that is not finished at the end of the given period. Reductions in work-in-progress will take place when the production process is completed. At that point, all work-in-progress is transformed into a finished product.

- c. *Finished goods*: goods produced as outputs that their producer does not intend to process further; these are considered finished from the perspective of the producer; and
- d. *Goods for resale*: goods acquired for reselling them unchanged from their present state, except some grading, washing, and repacking.

Time of recording and valuation

The value of inventories recorded in business accounts at the end of each accounting period is known as the book value. Period to period changes in the book value of inventories can be calculated by deducting the book value of inventories at the end of the previous accounting period from the book value at the end of the current accounting period.

For national accounting purposes, the physical changes in inventories during a period should be valued at the prices prevailing at the time that inventory change occurs.

Finished goods transferred into the producer's inventories is valued as if they were sold at that time, at current basic prices. Finished goods withdrawn from inventories are valued at the basic prices at the time when their withdrawals take place. Losses resulting from physical deterioration or recurrent accidental damage or pilfering are treated as withdrawals at the current basic price of undeteriorated goods.

Goods for resale entering the inventories of wholesalers and retailers are valued at their actual or estimated purchasers' prices of the trader. Goods for resale withdrawn from inventories are valued at the purchasers' prices at which they can be replaced at the time they are withdrawn, and not at the price they are acquired.

Additions to work-in-progress are valued in proportion to the estimated current basic price of the finished product; reductions in work-in-progress due to work withdrawn from inventories when production is finished are valued at current basic prices of the unfinished product.

By definition, goods enter inventories because of the lag between production or acquisition and sale or use. A valuation issue arises because prices may change during that time. Change in prices of goods while held in inventories is not production, but a holding gains or loss.

Measuring changes in inventories

Table 27 - Calculating changes in inventories

	Opening inventories at Jan 1	Additions	Withdrawals	Closing inventories at Jan 31
Quantity	9	3	2	10
Price	6	7	8	10
Value	54	21	16	100

Transactions	Price	Quantity	Value
Additions	7	3	21
Withdrawals	8	2	16
Change in inventories (without holding gain)		1	5

Holding gains can be derived first. Items that enter the inventory first are the ones to leave the inventory first, i.e., first in, first out, or FIFO.

Changes due to holding gains

$$\begin{aligned}
 &= 2 * (8 - 6) \quad \rightarrow \text{(units withdrawn)} \\
 &+ 7 * (10 - 6) \quad \rightarrow \text{(units remaining in inventories)} \\
 &+ 3 * (10 - 7) \quad \rightarrow \text{(units added in inventories)} \\
 &= 41
 \end{aligned}$$

Total change (closing inventories – opening inventories)

$$\begin{aligned}
 &= 100 - 54 \\
 &= 46
 \end{aligned}$$

Changes due to inventories

$$\begin{aligned}
 &= \text{Total change} - \text{Changes due to holding gains} \\
 &= 46 - 41 \\
 &= 5
 \end{aligned}$$

The above calculation requires information on all additions and withdrawals and prices at all times.

In practice, many businesses adopt historical cost measurement whereby inventories are valued at the lower of cost or market prices. Inventories at the beginning of the period are valued at costs or prices prevailing at the beginning of the accounting period, and inventories at the end of period are valued at costs or prices prevailing at the end of the period. As a result, in periods of rising prices the book value of inventories will include an element of capital gain, even if there has been no change in the physical quantity of inventories held. Conversely, if prices are falling, the book value of inventories will include an element of capital loss even with no change in the quantity of inventories on hand.

Business accounting data book values of changes in inventories therefore have to be adjusted to remove the effects of such gains or losses. In practice, approximate measures using inventory valuation adjustment (IVA) are used: (i) the quantity method and (ii) the deflate/inflate method

The Quantity Method returns the value of the physical change in inventories at the average prices of the period, and the corresponding holding gain is derived as a residual.

$$\begin{aligned}
 p &= \text{average price during the period,} \\
 q_o &= \text{quantity at the beginning of period (o), and} \\
 q_n &= \text{quantity at the end of period (n)}
 \end{aligned}$$

Example 25: Calculating changes in inventories and holding gains using quantity method

Inventories at end of December 2020 (q_o) = 50 m barrels of oil

Inventories at end of March 2021 (q_n) = 60 m barrels of oil

Prices of oil per barrel were as follows:

At 31 December 2020 = 20 units

Average prices January 2021 = 20 units

Average prices February 2021 = 20 units

Average prices March 2021 = 26 units

At 31 March 2021 = 30 units

Value of inventories as at 31 December 2020 = $50 * 20 = 1,000$ m units

Value of inventories as at 31 March 2021 = $60 * 30 = 1,800$ m units

Changes in quantities during 31 December 2020 – 31 March 2021	= 60 – 50 = 10 m barrels
Average price (p)	= (20+20+26)/3 = 22 units
Change in inventories at current average price	= 10 * 22 = 220 m units
Change in book value (Dec 31–March 31)	= 1,800 – 1,000
	= 800 m units
Holding gains	= 800 – 220
	= 580 m units

Deflate/Inflate method

Broadly, the method consists of the following steps:

- an estimate is made of the value of inventories at constant prices at the end of each period by revaluing end of period book values to base year prices using price indexes; the value of changes in inventories at constant prices is then derived as the difference between successive end of period levels;
- the estimates of the values of changes in inventories at constant prices are multiplied by price indexes that reflect current period average prices; this calculation gives an estimate of the physical change in inventories at average current period prices; and
- the IVA is the difference between the value of changes in the book value of inventories obtained from business accounting records and the value of changes in inventories estimated in b.

Example 26: Calculating inventory valuation adjustment: Deflate/Inflate method

Given the information in part (1) of the table below.

(1) Change in book value		
Book value of inventories at end of quarter (t)		51,000
Book value of inventories at end of quarter (t+1)		55,056
Change in book value		4,056
Base of price index		100
Price index at end of quarter (t)		120
Price index at end of quarter (t+1)		124
Average price index for quarter (t+1)		122
(2) Revaluation to constant prices		
Constant price level	book value ÷ price index * 100	
End quarter (t)	51,000 ÷ 120 * 100 =	42,500
End quarter (t+1)	55,056 ÷ 124 * 100 =	44,400
Constant price change in inventories	44,400 - 42,500 =	1,900
(3) Revaluation to current quarter prices		
Change in inventories at average current quarter prices	change at constant prices * average price index for current quarter ÷ 100 = 1,900 * 122 ÷ 100 =	2,318
(4) Derivation of the IVA		
IVA	change in book value - change at average current quarter prices 4,056 - 2,318 =	1,738

To note:

- Deflation of book values of inventories should be performed at the most detailed level of classification (by product, or branch of activity; and by type of inventories, i.e., finished goods, work-in-progress, materials, goods for resale).
- Price indices should be as relevant as possible to the type of inventory to be deflated.
- Inventory valuation should be performed for shorter time periods to cater for fluctuations in both the volume and the prices of the changes in inventories within the accounting year, if substantial. Thus, the sum of quarterly changes is the best estimate of annual change.
- Holding gains for a longer period (year) should be derived by summing holding gains for shorter periods (quarter, month).

Sources of data

The main data sources to estimate the change in inventories are business surveys. These will collect detailed information on additions, withdrawals, losses, and prices of the goods on entry into and exit from inventories by type (materials and supplies, work in progress, finished goods, etc).

As indicated above, compilers would also need detailed price indices to calculate the change in inventories. Given that this detailed price information is often not available, assumptions around price movements are often required.

Since data sources are very often limited, national compilers often estimate inventories by 'residual' calculation as below:

$$\underbrace{\text{Output} + \text{Imports}}_{\text{Supply}} - \underbrace{\text{FCE} - \text{IC} - \text{GFCF} - \text{Exports}}_{\text{Use}} = \text{Change in inventories}$$

The above method to estimate inventories by 'residual' is not recommended. However, it may be the only option available if national accountants are confident in the reliability of all other entries in the commodity balance.

Also, it is not recommended to use unadjusted book values when deriving changes in inventories. Using unadjusted book values will include holding gains or losses in production and causes bias in periods of high or low inflation.

6.2.4 Net acquisition of valuables

Valuables are defined as non-financial goods that are not used primarily for production or consumption, do not deteriorate (physically) over time under normal conditions and are acquired and held primarily as stores of value.

They include:

- precious stones and metals, such as diamonds, non-monetary gold, platinum, silver, etc.;
- antiques and other art objects, such as paintings, sculptures, etc.;
- other valuables, such as jewellery fashioned out of precious stones and metals and collectors' items.

They are recorded as acquisition or disposal of valuables in the following examples:

- the acquisition or disposal of non-monetary gold, silver, etc. by central banks and other financial intermediaries;

- (b) the acquisition or disposal of these goods by enterprises whose principal or secondary activity does not involve the production or trade in such types of goods. This acquisition or disposal is not included in the intermediate consumption or fixed capital formation of these enterprises;
- (c) the acquisition or disposal of such goods by households. Such acquisitions are not included in final consumption expenditure by households.

The production of valuables is valued at basic prices. All other acquisitions of valuables are valued at the purchasers' prices, including agents' fees or commissions. They include trade margins if bought from dealers. Disposals of valuables are valued at the prices received by sellers, after deducting fees or commissions paid to agents or other intermediaries. Acquisitions less disposals of valuables between resident sectors cancel out, leaving only agents' fees and commissions and dealers' margins.

In practice, very few countries compile specific estimates for valuables.

6.3 Exports and imports of goods and services

Exports of goods and services consist of transactions in goods and services (sales, barter, and gifts) from residents to non-residents.

Imports of goods and services consist of transactions in goods and services (purchases, barter, and gifts) from non-residents to residents

6.3.1 Exports and imports of goods

Imports and exports of goods occur when economic ownership of goods changes between residents and non-residents. This applies irrespective of corresponding physical movements of goods across frontiers.

Imports and exports of goods include transactions between residents and non-residents in the following:

- a. non-monetary gold; silver bullion, diamonds and other precious metals and stones; and paper money and coins not in circulation and unissued securities (valued as goods, not at face value);
- b. electricity, gas and water;
- c. livestock driven across frontiers;
- d. parcel post;
- e. government exports including goods financed by grants and loans;
- f. goods delivered / received by a resident enterprise to /from its non-resident affiliates, except for goods for processing;
- g. smuggled goods; and
- h. other unrecorded shipments, such as gifts and those of less than a stated minimum value.

Exports and imports of goods *without crossing border* includes merchanting (i.e., the purchase of goods by a resident from a non-resident and the subsequent resale of the good to another non-resident without the good entering the merchant's economy); goods produced by resident units operating in international waters and sold directly to non-residents such as oil, natural gas, and fishery products; and transportation equipment or other movable equipment not tied to a fixed location.

Imports and exports of goods *exclude* the following goods which may cross the national frontier:

- a. goods in transit through a country;
- b. goods shipped to or from a country's own embassies, military bases or other enclaves inside the national frontiers of another country;
- c. transportation equipment and other movable kinds of equipment which leave a country temporarily, without any change of economic ownership, e.g., construction equipment for installation or construction purposes abroad;
- d. equipment and other goods which are sent abroad for maintenance, servicing or repair;

- e. other goods which leave a country temporarily and returned within a year in their original state and without change of economic ownership. Examples are goods sent abroad for exhibition and entertainment purposes; goods under an operating lease, including leases for several years; and goods returned without being sold to a non-resident.
- f. goods on consignment lost or destroyed after crossing a frontier before change of ownership occurs.

Time of recording and valuation of imports and exports of goods

Imports and exports of goods are recorded when the ownership of the goods is transferred.

Imports and exports of goods are to be valued free on board at the border of the exporting country (FOB).

The FOB value is the value of the goods at basic prices, plus the related transport and distributive services up to that point of the border, including the cost of loading onto a carrier for onward transportation, and any taxes less subsidies on the goods exported.

The CIF price is the price of a good delivered at the frontier of the importing country (i.e., they include cost, insurance and freight), or the price of a service delivered to a resident, before the payment of any import duties or other taxes on imports or trade and transport margins within the country.

In practice, however, many countries use data on imports and exports of goods on customs declarations that value imports on a CIF basis and exports on a FOB basis. For balance of payments and NA purposes, imports of goods should be converted to a FOB basis; this is usually done at an aggregate level and may be disaggregated in the Supply and Use context.

Proxies for FOB values are used in some instances. Gift and barter of goods from abroad are valued at the basic prices that would have been received if the goods were sold for cash. Goods transferred under a financial lease are valued on the basis of the purchasers' price paid by the lessor, and not by the cumulative value of the rental payments. For transactions between affiliated enterprises, the actual transfer values are used. If they are different from the market prices, they are then replaced by an estimated market price.

6.3.2 Exports and imports of services

Exports of services consist of all services rendered by residents to non-residents, while imports of services consist of all services rendered by non-residents to residents.

Exports of services include:

- a. transportation of exported goods after they have left the territory of the exporting country by a resident carrier;
- b. transportation of goods by residents on behalf of non-residents;
- c. passenger transportation on behalf of non-residents by resident carriers;
- d. processing and repair activities on behalf of non-residents; these activities are recorded as an export of services excluding the value of the goods processed or repaired;
- e. installation of equipment abroad when a project is of limited duration by its nature;
- f. financial services including FISIM provided by residents to non-residents;
- g. insurance services provided by residents to non-residents;
- h. expenditure by non-resident tourists and business travellers;
- i. expenditure by non-residents on health and education services provided by residents;
- j. services of owner-occupied holidays homes of non-residents; and
- k. royalties and license fees, receipts paid by non-residents to residents.

Similarly for imports of services.

Imports in respect of direct purchases abroad by residents cover all purchases of goods and services made by residents while travelling abroad for business or personal purposes. All business-related expenditure by

business travellers are intermediate consumption; and all other expenditure are household final consumption expenditure.

Time of recording and valuation of imports and exports of services

Imports and exports of services are recorded at the time at which they are rendered. Imports of services are valued at purchasers' price and exports of services at basic prices.

Data sources

One of the most important data sources that countries use to produce estimates of imports and exports of goods are customs-based International Merchandise Trade Statistics (IMTS). However, some adjustments may need to be done, besides converting the CIF valuation of imports to FOB for the purpose of national accounts. Other adjustments may have to be made to cover any informal or shuttle trade / smuggling of goods especially for countries having common borders with others, exports of fish and purchases of oil on high seas, and 'Merchanting' and 'Goods sent abroad for processing and Processing services'.

In general, establishment surveys are used to estimate imports and exports of services, specifically commercial services. Travel services are generally estimated using various data sources such as household and business surveys on travel spending. Travel spending related to education and health can often be obtained from education data sources (such as the number of foreign students) and health data (such as the number of foreign patients) or from the banking system. Imports and exports of government services can generally be obtained from government accounting records.

6.3.3 Merchanting

Merchanting is defined as the purchase of goods by a resident from a non-resident and the subsequent resale of the same goods to another non-resident without the goods being present in the compiling economy. Merchanting occurs for transactions involving goods where physical possession of the goods by the owner is unnecessary for the process to occur.

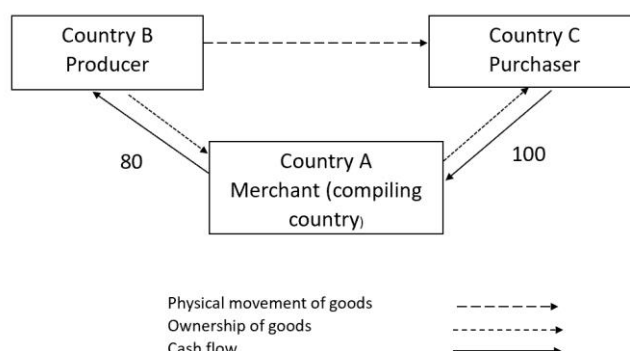
Goods under merchanting are recorded as follows:

- a. The acquisition of goods by merchants is shown under goods as a negative export of the economy of the merchant;
- b. Sale of goods is shown under goods sold under merchanting as a positive export of the economy of the merchant;
- c. The difference between sales over purchases of goods for merchanting is shown as the item 'net exports of goods under merchanting';
- d. Merchanting entries are valued *at the transaction price agreed by the parties*, not FOB

For example, a merchant in country A buys goods worth 80 from a producer in country B and sells them for 100 to a customer in country C, without the goods entering country A.

The acquisition of goods by the merchant in country A is shown under goods as a negative export (-80), while the sales are recorded as a positive export (+100). The difference between sales and purchases of goods under merchanting are recorded as net exports of goods under merchanting in country A (+20). Country B and C continue to record the value of the goods entering and leaving the country.

Figure 9 - Merchant in Country A purchases goods from Country B and sells to country C
(Source: Handbook on Globalisation)



	Export	Import
Country A		
Goods under merchanding	100	
Goods under merchanding	-80	
Net exports of goods under merchanding	20	
Country B		
Goods (General goods)	80	
Country C		
Goods (General goods)		100
Global balance		
Goods	100	100
(of which under merchanding)	-20	

Merchandising is only recorded in the accounts of the country in which the merchant is resident. In the counterpart countries, export sales to merchants and import purchases from merchants *are included indistinguishably within general merchandise.*

Merchandising arrangements are used for wholesaling and retailing. It may also be used in commodity dealing and for the management and financing of global manufacturing processes.

An enterprise may contract the assembly of a good among one or more contractors, for sale without passing through the territory of the owner. If the physical form of the goods is changed during the period the goods are owned, as a result of manufacturing services performed by other entities, then the goods transactions are recorded under general merchandise rather than merchanding. When the form of the goods does not change, the goods are included under merchanding, with the selling price reflecting minor processing costs and the wholesale margins.

A distinction is made between goods that are transformed or not transformed where there is a change of ownership but do not enter the compiling economy. **The transformed goods are recorded in general merchandise, while goods that are not transformed are recorded as goods under merchanding.**

6.3.4 Goods for processing and processing services

In the SNA 08, imports and exports occur when there is a change of ownership between residents and non-residents. Physical movement of goods across national borders does not necessarily imply an import or export of these goods. Goods sent abroad for processing, without a change of ownership between residents and non-residents, are not recorded as exports and imports.

Goods sent abroad for processing therefore need to be separately identified and removed from the IMTS source data when the latter is used for national accounts.

For example, a computer manufacturer (the principal) based in country A sends component parts to a processor in country B for assembly. The processor in country B assembles the components and returns the finished product (computers) back to the computer manufacturer in country A. The computer manufacturer retains ownership of the components and finished goods throughout the whole process and pays the processor a fee for the assembly work.

As the computer manufacturer (principal) retains ownership of the goods throughout the process, there is no change of ownership and therefore no trade in goods transactions. Instead, the computer manufacturer buys a service from the processor, which is recorded as an import of processing service for country A, and an export of processing service for country B, under '*Manufacturing services on physical inputs owned by others*'.

Manufacturing services on physical inputs owned by others should be collected separately, and not derived as the difference between the value of goods sent abroad and subsequently returned. The value of the manufacturing services is not necessarily the same as the difference between the value of goods before and the value of goods after processing because of holding gains/losses and the inclusion of overheads in the finished goods price.

While goods sent abroad for processing with no change of ownership are excluded from general merchandise, freight transport and insurance costs may be incurred. Where these are provided by a non-resident, an import of transportation services should be recorded.

A series of adjustments are needed to translate IMTS source data to a recording of imports and exports based on transfer of ownership for national accounts:

Merchandise trade statistics from IMTS source	Exports	Imports
– Goods sent abroad for processing	Deduct	n/a
– Goods returned from abroad after processing	n/a	Deduct
– Goods sent abroad after processing in compiling economy	Deduct	n/a
– Goods received from abroad for processing	n/a	Deduct
+ Goods sold abroad after processing in other economies	Add	n/a
+ Goods acquired in other economies for processing abroad	n/a	Add
+ Net exports of goods under merchandising	Add	n/a
= Trade in Goods for National Accounts		

- Goods sent abroad for processing and the return of processed goods should be removed from exports and imports respectively in merchandise trade statistics as no change in ownership takes place. However, goods shipped after processing directly to foreign customers should be added to exports as these will remain unrecorded in merchandise trade statistics;
- Intermediate goods purchased abroad and shipped to foreign processors should be added to imports as they are unobserved in merchandise trade statistics;
- Goods received and returned under an inward processing arrangement should be removed from imports and exports respectively, as observed from the country's perspective in which the processor is resident;
- The goods purchased and sold under a merchandising arrangement will remain unrecorded in merchandise trade statistics. Supplementary surveys are needed to capture these international trade flows under merchandising.

Example 27: Recording goods sent for processing and returned after processing

Company X from Country A sends goods worth 400 units to Company Y in Country B for processing. Company X remains the owner of the goods. Company Y receives 50 units for the work done. The processed goods are then returned to Company X for a value of 450 units.

	IMTS	SNA 08
Country A	Exports of goods to B = 400 units Imports of goods from B = 450 units Balance = -50 units	Imports of services from B = 50 units Balance = -50 units
Country B	Imports of goods from A = 400 units Exports of goods to A = 450 units Balance = 50 units	Export of processing services to A = 50 units Balance = 50 units

Example 28: Recording of goods sent abroad for processing and subsequently sold to another country

Company X from country A sends goods worth 400 units to Company Y in country B for processing. Company X remains the owner of the goods. Company Y receives 50 units for work. The final products are then sold by Company X to Company Z in country C for 500 units. The processed goods are delivered from Company Y directly to Company Z.

In this case, Company X retains the ownership of the goods until they are sold on to Company Z. Country A imports manufacturing services from country B and exports goods to country C. Goods originally sent abroad to country B need to be *excluded* from the IMTS dataset as these are goods sent abroad for processing with no change of ownership. In contrast, the export of goods to Country C will not be captured by Country A's IMTS system since they do not cross Country A's border, and therefore will have to be added to the existing IMTS dataset of Country A.

	IMTS	SNA 08
Country A	Exports of goods to B = 400 units	Exports of goods to C = 500 units Imports of processing services from B = 50 units
Country B	Imports of goods from A = 400 units	Export of processing services to A = 50 units
Country C	Exports of goods to C = 500 units Imports of goods from B = 500 units	Imports of goods from A = 500 units

In practice, different scenarios can exist from extreme situations where all the production processes are outsourced to one where only a small part of the production is outsourced. Appropriate adjustments will have to be made depending on the various situations.

Data sources

Goods for processing and processing fees can be collected by business surveys or trade in services surveys.

In the case of inward processing, the following information are required:

- Value of the processing services provided to a non-resident;
- Value of the goods received from abroad for processing; and
- Value of the goods returned to the non-resident owner after processing.

The resident processor may not know the value of the goods received or the value of processed goods returned to the non-resident owner. It will therefore be necessary to estimate the goods flows from IMTS data.

For outward processing, the following information are needed:

- a. The value of the processing services provided by the non-resident processor;
- b. The value of the goods sent abroad for processing; and
- c. The value of the goods returned to the resident owner after processing by the non-resident processor.

For outward processing, the owner of the goods who will be reporting will be able to provide information on the value of goods originally sent abroad and returned after processing.

The survey questions must distinguish between processing undertaken on own account from processing undertaken on goods owned by others. Goods processed on own account will include purchases of goods from foreign suppliers. In this case, an import of goods is recorded in national accounts and in balance of payments, as there is a change of ownership.

7 PRICES AND VOLUME MEASURES

In the SNA, all flows and stocks are expressed in value, which enables the aggregation of a variety of goods and services produced in the economy. However, a major concern in economic analysis is to measure economic growth in volume terms between different periods.

Volume measures enable the analysis of real growth over time to be made: 'How much higher was GDP this year in comparison to previous years?'. In order to do this, the value changes for economic aggregates need to be split between those changes that arise only from changes in price and those from changes in volume.

Changes in value can be broken down into price and volume components only for variables that have price and quantity elements. All transactions involving the exchange of goods and services and the levels of stocks of non-financial assets have this characteristic, but income flows and financial assets and liabilities do not. Some balancing items have this characteristic, and others do not.

Price and volume measures should be made within an integrated system of price and volume indices. An integrated system of volume measures must meet three requirements:

- the goods and services account must be balanced for two successive years both in current and constant prices;
- each flow at the level of the total economy must be equal to the sum of the corresponding flow of the various industries;
- every change in the value of a transaction must be associated with a change in price or a change in volume, or a combination of the two.

The value of a homogeneous product is defined by

$$v = p \times q$$

where v = value
 p = price or unit value of the product
 q = quantity unit

For example, if a consumer purchases 10 bottles of soda at a cost of 3 units per bottle, the value of this transaction is 3 (price) * 10 (quantity) = 30 units. The aggregate value of multiple transactions involving different prices and quantities is the sum of the values of all the transactions as follows:

$$\bar{V}_t = \sum v_{i,t} = \sum p_{i,t} q_{i,t}$$

where i represents the individual transaction and t the period of time during which the transaction take place.

However, quantities of different products cannot be aggregated without a weighting mechanism.

If the consumer also purchases one carton of a dozen eggs at 10 units, the quantity of 11 items (10 bottles of soda and one carton of eggs) has no real meaning. Instead, there is need to aggregate the items in money terms. The aggregated value for all these 11 items is now equal to 40 units (30 units for the soda and 10 units for the eggs). In monetary values, the soda makes up for 3/4 of the total value and the carton of eggs makes up 1/4 of the value.

Assume that in the following week, the consumer purchases 15 bottles of soda and each bottle now costs 4 units. While the value of the soda purchased increased from 30 units to 60 units, there is need to know how much of this increase was due to changes in price and how much was due to changes in quantity.

It is observed that the value of soda purchased in week2 was twice the value in week1, that is $60/30 = 2$. It is also observed that the quantity of soda bought increased by 5 and the price of soda went up from 3 units per bottle in week1 to 4 units per bottle in week 2.

To decompose the increase in value (2 or 200%) into that part that is due to the change in price and that part which is due to the change in volume, there is need to construct a quantity index and a price index.

The quantity of soda purchased in week1 (base week) was 10 bottles. The quantity of soda purchased in week2 was 15 bottles. Therefore, the quantity of soda purchased in week2 relative to week1 is $15/10 = 1.500$.

The price of soda in week1 was 3 units and the price in week2 was 4 units per bottle. Therefore, the price of soda in week2 relative to the price of soda in week1 is $4/3 = 1.333$.

The value index can therefore be decomposed as:

$$\text{Value Index} = \text{Price Index} * \text{Volume Index}$$

Thus, the value index is:

$$2 \text{ (value index)} = 15/10 \text{ (price index)} * 4/3 \text{ (quantity or volume index)}.$$

Periods

An important issue in volume measure is the choice of the base year.

A base year is the year for which current price data at the most detailed level are collected and serve as benchmark data to weight different quantities to obtain one single volume index. *The change of a base year affects real rate of growth.*

The price base period is the period whose prices are used as denominators in calculating relatives price P_t/P_0 (0 is the price base period). The quantity base period is the period whose quantities are used as denominators in calculating relative quantities Q_t/Q_0 (0 is the quantity base period).

A *reference year* is any given year selected so that a series of values with different base years can be compared. The period in an index number time series is taken to be equal to 100.

The SNA favours the use of a moving base year. In practice, this means that t-1 will be the base year.

The advantages are:

- a. an up-to-date weighting scheme provides better estimates of growth rates;
- b. introduction of new goods or disappearance of them is simplified; and
- c. no burdensome rebasing of time series.

A change in the reference year should not change rates of growth.

The choice of base year and the choice of reference year are unrelated. For the calculation of price and volume measures, only the problem of the choice of base year is relevant.

Indices

A price index can be calculated as a weighted average of the relative changes in the prices of a specified set of goods and services between two periods of time, the reference period 0 and current period t.

Similarly, a volume index can be calculated as a weighted average of the relative changes in the volumes of a specified set of goods and services between two periods of time, say the reference period 0 and current period t.

The most frequently used index formulae in national accounts are those of Laspeyres, Paasche and Fisher. Essentially, Laspeyres uses weights from a base year and Paasche used weights from the current year.

Simplified, the relationships are as follows:

Value index

- = Laspeyres volume index * Paasche price index
- = Paasche volume index * Laspeyres price index
- = Fisher volume index * Fisher price index.

The Laspeyres indices are weighted with a base period; they represent an arithmetical weighted mean over the current quantities (or prices) divided by quantities (or prices) in the base period, in which the values from base period are weighting coefficients, as below:

$$L_P = \frac{\sum_{i=1}^n P_i^t Q_i^0}{\sum_{i=1}^n P_i^0 Q_i^0} = \frac{\sum_{i=1}^n \left(\frac{P_i^t}{P_i^0}\right) P_i^0 Q_i^0}{\sum_{i=1}^n P_i^0 Q_i^0} = \sum_{i=1}^n w_i^0 \frac{P_i^t}{P_i^0}$$

Where P_i^0 and Q_i^0 the prices, quantities, and values in period 0 of $i = 1, \dots, n$ products and the weight, $w_i^0 = \frac{P_i^0 Q_i^0}{\sum_{i=1}^n P_i^0 Q_i^0}$

The Laspeyres price index is more easily understood because of the 'fixed-basket' concept consisting of measuring the prices of a fixed market basket and comparing them to a base period.

While the Laspeyres index uses the weights of the base period to aggregate price or quantity changes, the Paasche formulae uses weights of the current period. Paasche index is the arithmetical weighted mean over the current quantities (or prices) divided by quantities (or prices) in the base period, in which the values from the current period are weighting coefficients.

$$P_P = \frac{\sum_{i=1}^n P_i^t Q_i^t}{\sum_{i=1}^n P_i^0 Q_i^t} = \frac{\sum_{i=1}^n P_i^t Q_i^t}{\sum_{i=1}^n \left(\frac{P_i^0}{P_i^t}\right) P_i^t Q_i^t} = \frac{1}{\sum_{i=1}^n w_i^t \left(\frac{P_i^0}{P_i^t}\right)}$$

Where P_i^0 and Q_i^0 the prices, quantities, and values in period 0 of $i = 1, \dots, n$ products and the weight, $w_i^t = \frac{P_i^t Q_i^t}{\sum_{i=1}^n P_i^t Q_i^t}$

The Fisher index is the geometric average of Laspeyres and Paasche indices; the weights are hence a combination of base year and current year values and are most representative of the periods compared.

$$F_P = \{L_P * P_P\}^{1/2}$$

Laspeyres volume indices have the convenient property that the volume data are additive when expressed in prices of the base year, but not necessarily when expressed in prices of another year. Additivity means that the volumes of sub-aggregates add up to the volume of the aggregate. On the other hand, even though the weights are the most representative of the periods compared, the Fisher volume data are not additive, even when the base year is a recent one. Furthermore, the Fisher index is very demanding in its data requirements (both base and current year weights are needed) and the volume results are not easy to interpret.

The Laspeyres and Paasche indices are symmetric: a price index of one multiplied with a volume index of the other gives a value index. This is why the combination of Paasche price indices and Laspeyres volume indices is preferred in practice as this combination of indices fulfils the requirements mentioned above.

In order to obtain a system of price and volume indices to compile annual national accounts in prices of the previous year, available indices must be often processed into Laspeyres volume indices and Paasche price indices.

Re-referencing and non-additivity problem

There is the need to re-reference or chain whenever data are calculated with the previous year as base year, and data are to be expressed with respect to a fixed reference year. This is known as 'chain indices'. However, for the calculation of the year-to-year price and volume changes, no chaining is required.

Non-additivity problem

It is important that a change of the reference year does not affect the year-to-year indices.

To keep all year-to-year growth rates unchanged when the reference year is changed, one should re-reference each variable separately, be it an elementary index, a sub-total or an overall aggregate such as GDP. The consequence is that, in the chained volume data of a fixed reference year, discrepancies will arise between individual elements and their totals. This is the 'non-additivity' problem.

These discrepancies have to remain in the published data without adjustment, as any adjustment would again distort the growth rates.

This above ensures transparency and indicates to users the extent of the problem. When reference year values are extrapolated by chain volume indices, an explanation has to be provided to users concerning the absence of additivity in the tables.

Example 29: Re-referencing aggregates and their components

Consider two products A and B and their total.

In the first part of the table, the volume changes of the total between t-1 and t are weighted together by the current price values of year t-1 (previous year = base year). As these are the most up-to-date weights these growth rates can be seen as the most accurate.

In the second part of the table, the data are expressed in a fixed reference year, say 2005, in an index form. Each series (Product A, Product B, and A & B combined) have been re-referenced separately to avoid distortion in the growth rates of the total.

For example, for year 2007, the volume index for A & B combined is 101.4 ($108.8 \times 93.2 / 100$) and for year 2008, the volume index for A & B combined is 98.8 ($101.4 \times 97.4 / 100$).

The last part of the table shows the volume with year 2005 as reference. The sum of A and B is no longer equal to A & B combined except for 2005 and 2006. This is the non-additivity problem.

The 'correct' volume for 2008 is 395.0 and not $110.3 + 282.2 = 392.5$.

		Product A	Product B	A & B combined
2005 current prices	(a)	100.0	300.0	400.0
Volume change 05-06	(b)	105.0	110.0	108.8
2006 at 2005 prices	(c)	105.0	330.0	435.0
Price change 05-06	(d)	110.0	95.0	98.6
2006 current prices	(e)	115.5	313.5	429.0
Volume change 06-07	(f)	102.0	90.0	93.2
2007 at 2006 prices	(g)	117.8	282.2	400.0
Price change 06-07	(h)	108.0	105.0	105.9
2007 current prices	(i)	127.2	296.3	423.5
Volume change 07-08	(j)	103.0	95.0	97.4
2008 at 2007 prices	(k)	131.1	281.4	412.5
Price change 07-08	(l)	105.0	102.0	103.0
2008 current prices	(m)	137.6	287.1	424.7
Volume index (2005 = 100)				
2005	(n)	100	100	100
2006	(o)=(n)*(b)/100	105.0	110.0	108.8
2007	(p)=(o)*(f)/100	107.1	99.0	101.4
2008	(q)=(p)*(j)/100	110.3	94.1	98.8
Volume with 2005 year as reference year				
2005	(r)=(a)	100.0	300.0	400.0
2006	(s)=(r)*(o)/100	105.0	330.0	435.0
2007	(t)=(r)*(p)/100	107.1	297.0	405.6
2008	(u)=(r)*(q)/100	110.3	282.2	395.0

The volume figure of 395.0 is consistent with the previously calculated growth rate of the combined products. The differences between A, B and their combined volume estimate must not be removed, but have to be explained to users. The differences should not be interpreted as an indication of the reliability of the results.

Contribution to growth

*Because of the loss of additivity due to chain-linking, some countries also publish **contributions to growth**.* Tables of contributions to growth are the only tables in volume that remain additive, regardless of whether Laspeyres or Fisher indices are used.

Taking as starting point the equation $GDP_t = C_t + X_t$,

$$GDP_{t+1} - GDP_t = C_{t+1} - C_t + X_{t+1} - X_t$$

$$\Delta GDP = \Delta C + \Delta X$$

Dividing through by GDP_t :

$$\frac{\Delta GDP}{GDP_t} = \frac{\Delta C}{GDP_t} + \frac{\Delta X}{GDP_t}$$

This can also be rewritten as follows, if we multiply and divide both terms on the right-hand side by the same term (either C or X):

$$\frac{\Delta GDP}{GDP_t} = \frac{C_t}{GDP_t} * \frac{\Delta C}{C_t} + \frac{X_t}{GDP_t} * \frac{\Delta X}{X_t}$$

GDP growth rate is calculated as the sum of the contributions to growth of each of the components of GDP, where the contribution to growth is equal to the growth rate of the components weighted by their share in the previous year GDP, or the change in the value at previous year's price of the components divided by previous year's GDP.

Table 28 – Calculation of contributions to growth

	Volume measures at previous year's prices		Q2-Q1	Contribution to growth in Q2
	Q1 2013	Q2 2013		
Change in inventories	-958	-274	684	0.15
Imports	131,850	134,137	2,287	-0.51
Exports	125,297	127,769	2,472	0.55
Net exports	-6,553	-6,368	185	0.04
Total final domestic demand excluding inventories	458,369	459,839	1,470	0.33
Total gross domestic product	450,858	453,197	2,339	0.52

The contributions of each element to growth are equal to the change (Q2-Q1) of the respective elements divided by the value of GDP in Q1 2013 multiplied by 100. Thus, the contribution of 'Total final domestic demand excluding inventories'

$$= \frac{1,470}{450,858} * 100 = 0.33$$

7.1 Techniques for deriving volume measures

Price and volume measures are important in national accounts. However, the principal focus of users is on the growth rates of volume measures, rather than prices. The compilation of national accounts in volume and current value terms reflects this priority. Quantities of different products cannot, however, be aggregated without a certain weighting mechanism. For aggregate products, the *term volume* is used instead of quantity. Price and volume measures have to be constructed for each aggregate of transactions in products within the accounts.

It is essential to understand the difference between an increase in quantities and an increase in volume to grasp the measurement of growth as recorded in the national accounts. In particular, volume takes into account differences in quality.

Techniques for deriving volume measure are:

- [The revaluation method](#) consists of multiplying the quantity or volume for the current year (t) by the base year (0) price. This method is mostly used **for homogenous products**. In many countries this method is used for agricultural goods and for goods produced for own final use.
- [The deflation method](#) is applied by dividing the current value of year t by a price relative or a price index with base year (0). The price indices could be PPIs, CPIs, charge-out rates, unit values, implicit price indices, etc. **Deflation should be done at the most detailed level as possible**. Price indices should be adjusted to take account of quality change. Deflation using a Paasche price index will give the same result as a quantity revaluation. Implicit price deflators (IPDs) are obtained by dividing a current price by its corresponding constant price value.
- [The extrapolation technique](#) is applied by multiplying the value of year 0 by a volume relative or volume index. True volume indices take account of both quantity and quality changes. If only quantity indices are available, **Volume indices should be used at the most disaggregated level** as possible to ensure homogeneity, and to be representative for all concerned outputs.

Example 30 – Deriving constant price values using revaluation, deflation and extrapolation methods

		2016	2017	2018	2019	2020
(a)	Quantities (Q_t)	100	120	130	140	180
(b)	Prices (P_t)	5	6	8	10	10
(c)=(a)*(b)	Value at current prices	500	720	1,040	1,400	1,800
	Revaluation method					
(d)=(b ₂₀₁₆)*(a)	Constant price estimates	500	600	650	700	900
	Deflation method					
(e)=(b)/(b ₂₀₁₆)	Price relative	1.0	1.2	1.6	2.0	2.0
(f)=(c)/(e)	Constant price estimates	500	600	650	700	900
	Extrapolation method					
(g)=(a)/(a ₂₀₁₆)	Quantity relative	1.0	1.2	1.3	1.4	1.8
(h)=(c ₂₀₁₆)*(g)	Constant price estimates	500	600	650	700	900

Deflation is expected to give more accurate results than volume extrapolation or quantity revaluation, since the variance in relative prices for a product in a particular month are usually less than the variance in relative quantities. However, this might not be so, in situations of high inflation and for products showing rapid quality change.

Deflation with a price index is generally preferred.

When deflation is not possible, other methods based on volume extrapolation can be applied.

Whenever the deflation method cannot be applied, specific methods based on volume extrapolation can be used, such as:

(1) Output indicator method

Output indicator method relates to direct measurement of the *volume of output*. In cases where there are very homogeneous products without large quality changes and where detailed quantity information is available, the method can be equivalent to price deflation.

It is not always easy to define exactly what the unit of output is. For individual goods and services, it is in principle possible to define the output, since an actual delivery of that output takes place from the producer to the consumer. For example, for education, the output is the amount of teaching consumed by a pupil. For cultural services, the output can be the number of theatre plays attended. For collective services such as defence or police services, however, it is very difficult to define the output.

The following criteria can be formulated for the appropriate use of output indicators:

- (a) to cover all services produced by the producer that are provided to external users;
- (b) to be weighted by the costs of each type of output in the base year;
- (c) to be defined with as much detail as possible; and
- (d) to be quality-adjusted.

(2) Secondary indicators

Secondary indicators are indicators not directly related to the output, but are used as proxies where there are no indicators to measure the target variables (also called indirect indicators). Thus, it may be possible to identify a downstream or upstream activity that can be used to produce the required indicators. The use of secondary indicators assumes ratios based on the benchmark data. Such ratios are expected to be stable in constant price terms.

For example, the supply of building materials can be used as a volume indicator of construction activity, based on the assumption that there is a stable relationship between building materials and outputs. This assumption will no longer hold when there are changes in the mix of types of buildings, techniques of building, productivity, and building materials.

For intermediate consumption, there are usually no specific aggregated deflators. There is therefore need to build them from components of other price indices for the relevant products. Even when fixed input-output ratios have been used to derive volume measures for an industry, it is desirable to deflate output and intermediate consumption separately, and calculate value added at current prices as a residual, rather than assuming fixed input-output ratios at current prices.

(3) [Input indicator methods](#)

Input indicator methods cover *input prices and input volume indicators*. In general, they are the less preferred methods for volume measures.

Input prices method takes prices of inputs (e.g., the price of labour or a weighted average of prices of intermediate inputs) as an approximation for the price of the output. However, if the output has a different path from the input, e.g., due to productivity changes, this method should be avoided.

Input volume indicators method uses indicators of volume of inputs to approximate the volume of output, such as the number of employees or the volume change of intermediate inputs. The use of such indicators overlooks changes in productivity due to improved procedures (e.g., increased use of PCs), and will wrongly estimate the true output change. An example is the use of the number of employees to estimate the volume of output; in this case it is assumed that twice as large a workforce would imply twice as much output, irrespective of how those additional personnel were deployed.

7.2 Criteria for appropriate price and volume

When measuring price and volume measures, one can either deflate the current year value with a price index, or extrapolate the base year value with a volume index to arrive at an estimate at prices of the base year. Therefore, only one of the two possible measures is required, the other one being derived as a residual.

Deflation with a price index is generally preferred. This is because:

- a. A sample of price observations is normally more representative than an equally sized sample of quantity observations, as prices of the same product by different producers vary less than quantities produced by different producers. For quantity indicators, a larger sample or a nearly exhaustive observation of all transactions is needed.
- b. Price index compilation is based on the fixed-basket. Prices of a basket of specified goods and services are compared over the period implying that the quality of the goods and services is held constant, and the price index measures pure price changes. It is more difficult to control for quality

changes when volume indicators are used, unless detailed quantity information by product specifications is available.

General criteria to assess the appropriateness of an indicator:

- a. the completeness of the coverage of the product heading by the indicator. For example, whether the indicator covers all products under the heading or just a selection of them, such as only products sold to households;
- b. the valuation basis of the indicator. For market output, the indicator should be at basic prices, while final consumption expenditure should be purchasers' prices;
- c. the indicator should take quality changes into account, recording the quality changes within the volume estimates; and
- d. the conceptual consistency between the indicator and the national accounts concepts.

Indicators satisfying all the above four criteria are considered as the recommended ones, though in practice it is not always possible. It is therefore important that some analysis is undertaken to determine whether a particular indicator is acceptable or can lead to systematically poor or biased estimates.

7.3 Main sources for price and volume measures

The deflation and extrapolation methods used for the volume measurement in national accounts call for the development of several indices.

The following price indices are the minimum required for deflation:

- a. [Producer price indices \(PPIs\)](#) provide measures of average movements of prices received by producers of commodities. PPIs cover both goods and services and are indices of basic prices. The most widely-compiled and widely-used is the industrial production price indices. PPIs are also calculated for agriculture products, measuring the change over time of the prices received by farmers for the sale of their products. PPIs for services are more difficult to estimate, but are becoming increasingly available.

PPIs can be used to deflate (i) domestic production and for this purpose, is weighted with an export price index, and (ii) intermediate consumption and for this, is weighted with an import price index.

- b. [Consumer price indices \(CPIs\)](#) reflects the actual payment by households on final consumption of goods and services. It relates to purchasers' price and may include imputed expenses such as services of owner-occupied dwellings. In many countries, only CPI for urban areas is computed; this may not be representative of price changes in rural areas. Also, using CPIs to deflate output relies on information on the share of the final consumption expenditure of households in total output, and the differences of changes in the price and structure in the intermediate and final use of the output.

CPI is mainly used to deflate household consumption expenditure, but not the total household consumption expenditure. Specific components of the CPI are used to deflate the relevant sub groups of the household consumption

- c. [Construction price index](#) provides measures of price changes in inputs or outputs of construction activity. Several construction price indices may be available: residential buildings, non-residential buildings, and other types of construction work such as roads.

It is used to deflate the output and the intermediate consumption of the construction activity.

- d. [Import and export price indices](#) measure the change over time in transaction prices (the market sale price) of goods and services imported into or exported from the country. Import prices are measured c.i.f. including duties, freight and insurance costs, and export prices are measured f.o.b. excluding duties, freight and insurance costs. They are used to deflate imports and exports respectively.

Other price indices are [labour cost indices](#) for compensation of employees where the unit is labour cost per hour by type of occupation/job and industry, and [unit value indices](#) for imports and exports of goods (homogeneous products).

7.4 Volume measures of GDP

Direct measurement of GDP in volume terms can be obtained only from the output and expenditure sides. The income approach cannot be used to measure GDP volume, since one of its components, the operating surplus, cannot be measured directly in volume terms.

[Value added in constant prices](#) is derived as the difference between output at constant prices and the cost of goods and services used in production, i.e., the intermediate consumption, at constant prices. Output price indices and composite price indices of goods and services used as intermediate consumption are needed. Weights for creating composite indices are based on the input structure of the base year.

[Final expenditures](#) are deflated by relevant price indices such as consumer price indices, price indices of gross capital formation, exports and imports price indices.

In many countries, the measurement of GDP volume growth is based on only one of the two approaches, depending on the strengths and weaknesses of the data sources in the country. That does not only depend on the quality of the price and volume information, but also on the quality of the current price data.

It is important to compile one unique measure of GDP volume growth.

Although conceptually differences may exist between GDP volume from the output and expenditure approaches, **in practice, it would be highly undesirable to publish two different GDP growth rates.**

Therefore, in general, the best result will be obtained when both approaches are combined using the same accounting framework as used in current prices.

The Supply and Use Table provides for an excellent framework through which price and volume measures can be established in a consistent and systematic way. Deflation of final uses combined with double deflation of value added through the use of Supply and Use table will avoid discrepancies in the volume of GDP by the two separate procedures.

7.5 Volume measures of GDP (Production)

For GDP (Production), volume measures should be obtained for output, intermediate consumption and value added by industry, and for taxes less subsidies on products.

Value added is a balancing item in the system of national accounts. There is conceptually no price or volume component of value added, since it is essentially an income concept. However, when GDP volume growth is calculated according to the production approach, the value added at constant prices of all branches is summed, so as to have a measure of GVA at constant prices.

Value added in volume terms is the difference between output in volume terms and intermediate consumption in volume terms. The theoretically correct method to calculate value added in volume terms is therefore by double deflation, i.e., deflating separately the two flows of the production account (output and intermediate consumption) and calculating the balance of those two flows at constant prices.

'Double deflation' (better expressed as 'double indicator') encompasses also methods that are based on volume extrapolation, the point being that separate and independent estimates of volume of output and intermediate consumption have to be made.

The alternative is a 'single indicator method' in which an output or input indicator is applied to the value added directly. The methods use either input or output price indices to deflate current year value added, or input or output volume indicators to extrapolate base year value added.

In the first case, it is assumed that prices of input and output develop in the same way. In the second case, it is assumed that volumes of input and output are changing at the same rate, i.e., the ratio between volumes of input and volume of output is constant.

Volume measures of GDP should be constructed at the most detailed level possible.

At minimum and according to international best practices, volume measures for both output and intermediate consumption should be compiled at the 2-digit level of ISIC or a similar activity classification.

However, to obtain more accurate volume measures, this level of aggregation is far from optimal and a more detailed breakdown (3 or 4-digit level of ISIC) should be used. Volume measures should start from a detailed breakdown of products for the different transaction categories. The more detailed the product breakdown is, the more accurate estimates are expected to be.

7.5.1 Single indicator methods

Single indicator methods use a single variable that is correlated with the movement of value added. In this case, an output or input indicator is directly applied to value added. Single indicator methods are classified according to whether the indicator is from output volume indicator methods or input indicator methods, according to whether deflation or extrapolation is used and according to the variable chosen as a proxy for measuring volume changes in value added

- a. *Single output indicator methods* consist of
 - Direct deflation of current price value added by an *output price index* such as a consumer price index or its relevant components;
 - Direct extrapolation of base year value added using an *output volume index* or physical quantity output index.
- b. *Single input indicator methods* consist of
 - Direct deflation of current price value added by an *input price index* such as intermediate consumption price index or by a wage rate index;
 - Direct extrapolation of base year value added by *input related indicators* such as: volume index of intermediate consumption, an index based on physical quantities of inputs other than labour, an index of numbers of employed, an index of man-hours worked adjusted for change in productivity, etc.

In these cases, the volume index for output is preferred to one based on input. The input volume index has greater bias, the number of intermediate goods and services consumed in the production process being larger than the number and variety of outputs. Also, the composition of inputs changes over time.

Example 31: Single indicator method (extrapolation and deflation of value-added using output indicator)

	Description	2005	2006	2007
Output at current prices	(1)	3,300.0	3,000.0	3,650.0
Paasche price deflator for output	(2)	100.0	98.0	118.7
Intermediate consumption current prices	(3)	2,500.0	2,160.0	2,700.0
Value added current prices	(4)=(1)-(3)	800.0	840.0	950.0
Output at constant prices	(5)=(1)/(2)*100	3,300.0	3,061.2	3,075.0
Laspeyres volume index of output (2005 = 100)	(6)=(5) _t /(5) ₂₀₀₅ *100	100.0	92.8	93.2
Value added at 2005 constant prices				
Single indicator extrapolation	(7)=(4)₂₀₀₅*(6)/100	800.0	742.1	745.4
Single indicator deflation	(8)=(4)/(2)*100	800.0	857.1	800.3

The single indicator method - extrapolation of base year value added using output at constant prices as volume indicator is based *on the underlying assumption of a constant relationship between volume of output and of intermediate consumption*.

The single indicator method – deflation of current year value added using the price deflator for output as the deflator for value added is based *on the underlying assumption of a constant relationship between the prices of output and intermediate consumption*.

While it is reasonable to expect the relationship between output and intermediate consumption at constant prices to change only gradually, there is no reason to expect a stable relationship between the prices of output and intermediate consumption.

The single deflation technique should therefore be avoided.

7.5.2 Double indicator methods

Double indicator methods take into account changes in both output and intermediate consumption, value added being obtained as a residual. Estimation methods encompass deflation and volume extrapolation. They are superior to single indicator methods. However, the availability of data to implement these methods can be limited for some activities. The methods are:

- Double deflation*: both the current price output and intermediate consumption are deflated by price indices, such as relevant components of PPIs or CPIs adjusted to the correct price base. **This method is preferred.**
- Double extrapolation*: base year values of output and of intermediate consumption are extrapolated using volume or physical quantity indices, and the constant price value added being derived by subtraction.
- Extrapolation/deflation* consists in deriving constant price value added from an extrapolated series of base year estimates of output using output volume or physical quantity indices, and a series of deflated intermediate consumption using suitable price indices, or vice versa.

The choice of method, whether single indicator or double indicator method, need not be the same for all industry groups. In general, market output is estimated in constant prices using double indicator methods. Non-market output is usually estimated in constant prices using single indicator methods because of the difficulty in isolating price changes.

Example 32: Calculating total GVA using double indicator method

Table 29(a) - Gross output, intermediate consumption, and value added at current prices, 2005 and 2006

	2005			2006		
	GO	IC	GVA	GO	IC	GVA
Mining	500	350	150	560	400	160
Electricity	90	65	25	110	80	30
Construction	700	400	300	800	450	350
Total	1,290	815	475	1,470	930	540

Table 29(b) – Available price indices, 2005=100

	PPI	ICI	CPI	Average wage index
Mining	108	106		
Electricity	105	?		
Construction		105		107
Total			108	

Table 29(c) - Intermediate consumption shares for electricity production, 2005

	%
Mining	50
Electricity	10
Construction	35
Services	5
Total	100

Available information is as above.

Step 1: Compute the implicit deflator for the output of construction for 2006

- Deflating IC using ICI = $450/1.05=429$
- Deflating GVA using average wage index = $350/1.07 = 327$
- GO at constant 2005 prices = $429 + 327 = 756$
- GVA deflator = $800/756*100 = 106$

Step 2: Compute deflator for IC of electricity using shares and corresponding price indices

	%	Deflators
Mining	50	108
Electricity	10	105
Construction	35	106
Services	5	108
Total	100	107

- Implicit deflator = $108*0.5+105*0.1+106*0.35+108*0.05$
= 107

Step 3: Compute GVA for 2006 at constant 2005 prices

- Calculate individual GOs at constant 2005 prices by deflating using their output deflators
- Calculate IC at constant 2005 prices by deflating using their corresponding deflators

- Sum total GOs at constant prices
= 519 + 105 + 756
= 1,379
- Sum total ICs at constant prices
= 377 + 75 + 429
= 881
- GVA for 2006 at constant 2005 prices
= 1,379 – 881
= **498**
- Volume index (2005 = 100) = 498/475*100
= **105**
- Implicit deflator (2005 = 100) = 540/498*100
= **108**

Table 29 (d) – Gross output, intermediate consumption and gross value added at 2005 prices, 2006

	GO at 2005 prices	IC at 2005 prices	GVA at 2005 prices	Implicit deflator, 2005=100, %	Volume index, 2005=100, %
Mining	519	377	141	113	94
Electricity	105	75	30	100	120
Construction	756	429	327	107	109
Total	1,379	881	498	108	105

7.5.3 Single deflation bias

The use of single deflation results in a bias in the estimates of value added compared to the double deflation method, with the size of the bias relating to the relative change of input and output prices. The use of output and input price indices in the double deflation method is as below:

$$(\overline{VA}) = \overline{O} - \overline{IC} = \frac{O}{D_0} - \frac{IC}{D_{IC}}$$

where O is the output,
VA is the value added,
IC the intermediate consumption, and
D_o and D_{IC} are the deflators of output and intermediate consumption respectively

Comparatively, deflating the value added by an output price in the single indicator method is as below:

$$(\widetilde{VA}) = \overline{O} - i\overline{C} = \frac{O}{D_0} - \frac{IC}{D_0}$$

The resulting volume estimates of value added (single deflator method) will be biased with respect to the one derived by double deflation if the prices of output and intermediate consumption differ. The bias will be as follows:

$$\text{Bias} = IC \left(\frac{D_0 - D_{IC}}{D_{IC} * D_0} \right)$$

The volume of value added will be overstated when the bias is positive and understated when the bias is negative. Overstatement will occur when $D_0 > D_{IC}$, and understatement will occur when $D_0 < D_{IC}$. If prices of intermediate consumption (input) are used for single deflation, the bias will be in the same direction but of higher magnitude.

7.6 Volume measure of market output and output for own final use

Volume measures of output for market output and for own final use are calculated in the same way. When measuring volume measures of output, it is the price or volume of the output itself that is being measured and not of a proxy for the output, such as an input.

Deflating output using appropriate PPIs is the preferred method to calculate volume.

In the absence of appropriate PPIs, the compiler can use alternative indicators / methods to get acceptable results, such as deflating by a less appropriate PPI in terms of coverage and quality adjustment, deflating with a CPI adjusted to basic prices, extrapolating with volume indicators, and input methods for unique products.

7.6.1 Price deflation method

PPIs and SPPIs

Deflation by PPIs and SPPIs can normally be considered to be the preferred method, since they directly measure product prices, and quality changes can be taken into account. Each product should be deflated separately using appropriate PPIs where the PPIs have the characteristics mentioned above. However, PPI compilation requires specific surveys, which can be expensive and difficult to organise, especially those for services.

PPIs are usually compiled as monthly or quarterly indices. For annual estimates, it is necessary to take into account the structure of the flow through the year. If the volume produced is reasonably constant throughout the year, a simple average of monthly or quarterly indices is adequate. *However, if there are large fluctuations in the volume through the year, the sub-annual indices should be weighted by the volumes in each month or quarter concerned.*

Model pricing or specification pricing

'Model price' or 'specification price' approach is used in situations where the PPI compilation is difficult, for example when companies produce different products each year so that no prices can be compared.

The main advantage of model pricing is that it has an in-built consistency, since the same output is priced in different periods; in theory, product quality is unchanged. In situations of rapid product change, it may no longer be representative, hence the need for regular update. Another significant disadvantage is that contributors often have difficulties with furnishing model-price estimates.

Charge-out rate or hourly rate

Where it is difficult to identify the products, as is the case of services, payment can be related to the number of hours worked instead of to the output delivered (e.g., services of a lawyer). In such cases, the charge-out rate or price charged per hour can be used as a price indicator. Similarly, hourly fees calculated as total turnover per hour worked can be used. Whilst these have the advantage of ease of collection, changes in the amount of work done per hour will be reflected as price changes rather than productivity changes.

The hourly fee method is best applied at a very detailed level of the products and by distinguishing between different types of labour.

Consumer price indices

The use of CPI for deflating output, rather than household final consumption, should be done with caution, since business consumption and exports can differ significantly from household consumption in both the mix of products and price changes. The appropriateness of using CPI information therefore depends on the share of household consumption in total output and on the difference in price changes and composition between intermediate use and final use of the product group in question.

Also, the use of CPIs warrants adjustment to the correct base price (basic price) if used for deflating output, taking account of changes in trade and transport margins, and changes in the rates of taxes and subsidies on products.

CPI becomes fully equivalent to a PPI if no distribution margins exist and no changes in tax or subsidy rates occur, and if households consume all output (e.g., personal services).

Unit value

A 'unit value' is calculated by dividing the total value with the total quantity. Comparing this unit value in two different periods gives a unit value index, which can be used as a measure for the price trend. While complete and representative coverage is guaranteed, the problem lies in the heterogeneity of products, which can cause a large variability in the index.

Also, any changes in the composition of the products can influence the unit value index resulting in a price change when such changes should in fact be included in the volume component. It is not possible to adjust unit value indices for quality changes in the products in the same way as can be done for price indices.

Input prices

Prices of inputs (e.g., the price of labour or a weighted average of prices of intermediate inputs) could be used as an approximation for the price of the output. However, if the output has a different path than the input, e.g., due to productivity changes, *this method would have a clear bias and should be avoided*.

In situations where price measurement does not seem possible or feasible, input methods can be considered.

7.6.2 Volume extrapolation methods

When using extrapolation methods, volume indicators that best describe the changes in the volume of output are collected. Volume indices are applied to the value of output in the base year to arrive at the volume of output in the current year.

Output volume indices

The direct measurement of the volume of output can be considered when price measurement is not feasible. This is the case, for example, for areas of services where consumers are implicitly charged for services provided, such as in banking and insurance. In other cases, where there are very homogeneous products without large quality changes and detailed quantity information is available, it can be equivalent to price deflation.

The use of output volume indicators might be necessary in cases of high inflation. This is because when prices change very rapidly, price indices become increasingly unreliable.

Input volume indicators

Indicators on the volume of inputs (e.g., the number of employees or the volume change of intermediate inputs) are used to approximate the volume of output. The use of inputs indicators produces biased results when productivity changes occur, and should be avoided as in the deflation method using input prices.

7.7 Non-market output

Non-market output is defined as that output that is provided free, or at prices that are not economically significant, to other units. Non-market producers are either public producers or non-profit institutions, classified in the general government or NPISH sectors respectively.

Non-market output can be subdivided into two types of output:

- a. Individual goods and services: those that are consumed by individual households, such as education, health, social security, recreation services and cultural services; and
- b. collective services: those that are provided simultaneously to the society as a whole, such as general public administration, defence, and police services.

The problem of measuring prices and volumes for non-market output arises because by definition no market prices exist. For that reason, the value of non-market output at current prices is defined as the sum of costs (compensation of employees, intermediate consumption, consumption of fixed capital and other taxes less subsidies on production) minus market output or output for own final use of the unit. Without prices for the output, volume can only be measured by (i) deflating inputs and (ii) direct volume measurement.

Measuring volumes by deflating inputs assumes that the change in the volume of inputs is representative of the change in the volume of output, with no change in productivity.

Volume indicators can relate to:

- a. Inputs such as number of employees. This assumes that twice the number of employees mean twice as much output, irrespective of the categories of employees. The method is easily implemented and the required data are readily available, but it ignores changes in productivity.
- b. Activity such as the number of operations in hospital or the number police patrols in a month. Activity indicators reflect what the non-market units are actually doing with their inputs and are therefore closely related to output.
- c. Output is the preferred approach, although it is not always easy to define exactly the unit of non-market output. For individual goods and services, it is in principle possible to define the unit of output. For example, the amount of teaching received by pupils by pupil-hours, the numbers of students attending public schools, numbers of surgeries or in-patient nights in public hospitals, numbers of benefit recipients of government social assistance, and the number of theatre plays

consumed for cultural services. But, for collective services such as defence or police services, it is very difficult to define the unit of output.

In an output method (or direct volume measurement), the volume is measured by applying unit costs of the previous year to the number of units produced in the current year. The method is based on the calculation of a volume indicator of total output using weighted measures of output of the various categories of nonmarket goods and services produced. The output method fully reflects changes in both quantity and quality.

Since the value of non-market services is determined by the costs involved, it is possible to calculate the volume by the value of the input costs at base period prices, i.e., by the value at base period prices of intermediate consumption, compensation of employees, other taxes net of production subsidies and consumption of fixed capital. When using this method (input method), the output at the cost of the previous year is approximated by deflating each category of the current year input costs (deflating inputs) or extrapolating the previous year input costs.

For individual non-market services, the recommended methods are those that measure output, in particular, for health and education services. However, due to difficulties to distinguish homogeneous products, input methods are acceptable for the other individual services.

For collective services, input methods are mostly used. Volume estimates of each category of inputs should be computed separately, taking quality changes of the inputs into account, in particular of compensation of employees.

7.8 Intermediate consumption

Deflating intermediate consumption is necessary when double deflation is used to measure value added in previous year's prices, or when price and volume measures are estimated in a system of supply and use tables.

Ideally, genuine price data on intermediate uses collected from the purchasers (and reflecting purchasers' prices), should be used to deflate. Such data is rarely collected. As an alternative, intermediate consumption of domestically produced products can be deflated using the same methods as for the output of that product, taking into account that intermediate consumption is valued at purchasers' prices. Intermediate use of imported products should be deflated by import price indices, adjusted PPIs, or UVI as appropriate.

The recommended method for deflating intermediate consumption:

- Deflation should be deflated product by product;
- Domestically produced products and imported products should be deflated separately;
- Products are valued at purchasers' prices; and
- Price indices used should be consistent with the product classification of value data being deflated.

7.9 Summary of output volumes measures by industry

ISIC rev 4	Activity	Methods	Deflators	Remarks
A	Agriculture, forestry and fishing	- Direct estimation based on (exhaustive) volume and price data	Unit value of products	
B	Mining and quarrying	- Deflation with PPIs - Deflation by actual price - Deflation with UVI (for homogeneous products) - Extrapolation with industrial production volume indices (IPIs) - Extrapolation by quantities produced (for homogeneous products)	PPIs Actual price UVI	- Deflation and extrapolation should be done at the lowest possible details with corresponding product group indices - PPIs should be adjusted for quality
C	Manufacturing Repair and installation services of machinery and equipment	- Deflation with PPIs - Extrapolation with IPIs - Extrapolation by quantity data (homogeneous products) - Input indicator method (such as employees-hours by grade) - Deflation with suitable SPPIs or other suitable price indicators	PPIs Detailed CPI data adjusted to basic prices SPPIs Hourly rates	
D	Electricity, gas, steam and air conditioning supply	- Deflation with PPIs - Extrapolation with IPIs - Extrapolation with quantity data available on products sufficiently detailed (such as by tariff and customer type)	PPIs	
E	Water supply; sewerage, waste management and remediation activities	- Deflation with PPIs - Extrapolation with IPIs - Extrapolation with quantity data available on detailed products	PPIs	
F	Construction	- Deflation - Input indicator method (such as men hours)	- Construction output price indices - Indices of construction input costs, adjusted for profit - Hourly rates or quotes for 'model' jobs – for repair/maintenance	- For own-account construction by households or informal construction, to deflate by the closest market-based construction index such as one related to residential dwelling - Civil engineering work which are unique: to use model pricing or specification pricing - Volume indicators such as number of building permits and floor areas are not recommended

ISIC rev 4	Activity	Methods	Deflators	Remarks
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	Trade: - Output indicator: implicit index obtained from the ratio of the value index for total output and a quantity index based on total trade margins – at detailed product breakdown Maintenance and repair of motor vehicle: - Deflation	- PPIs - CPIs adjusted to basic prices for repairs	
H	Transportation and storage	<i>Passenger transport by different mode of travel:</i> - Deflation - Output volume indicator method (such as passenger-kilometres) <i>Freight transport by different mode of transport:</i> - Deflation - Output volume indicator methods (such as on tonne-kilometres transported) <i>Storage:</i> - Deflation - Output volume indicator methods (such as cubic metre-days) <i>Postal services:</i> - Deflation - Output volume indicator methods (as number of letters broken down by different postage rate)	- PPIs - CPIs adjusted to basic prices for services provided to households - UVIs for post and courier	- Lowest level of detail possible given different nature of services
I	Accommodation and food service activities	- Deflation - Output volume indicator methods (such as bed-nights/meals sold) - Input volume indicator methods (such as number of clients)	- PPIs - CPIs adjusted to basic prices - Hotel Price Index	- Use of CPI data assumes that prices for businesses and households move in a similar way and the compositions of consumption are comparable - Method based on the use of input data, or crude volume data (such as number of clients in a hotel or bar) is the least appropriate.

ISIC rev 4	Activity	Methods	Deflators	Remarks
J	Information and communication	<ul style="list-style-type: none"> - Deflation - Output volume indicator methods for the full range of output 	<ul style="list-style-type: none"> - PPIs - Prices reported by producers/production companies for some model products or representative service - Sub-indices of CPIs adjusted to basic prices for services provided to households - UVIs for homogenous products 	
K	Financial and insurance activities	<p><i>Financial intermediation FISIM:</i></p> <ul style="list-style-type: none"> - Output indicator methods: number of banks accounts/loans and deposits, etc. by business and consumer markets - Implicit deflator obtained using the 'interest margin' and the quantity index given by the amounts of stocks of loans and deposits deflated with the GDP deflator or implicit price deflator for domestic final demand <p><i>Financial intermediation outside FISIM:</i></p> <ul style="list-style-type: none"> - Deflation using average of the consumer price and business services deflator - Output volume indicator methods (e.g., using number of transfers for transfer of funds, number of cheques processed, number of transfers, number of new customer loans granted, number of credit cards issues, etc.) <p><i>Insurance:</i></p> <ul style="list-style-type: none"> - Output volume indicator methods using detailed indicators (e.g., using acquisition and administration of policies and claims) <p><i>Service auxiliary:</i></p> <ul style="list-style-type: none"> - Deflation - Output volume indicators 	<ul style="list-style-type: none"> - Implicit index for domestic final demand - Implicit index of output prices - PPIs - Sub-indices of CPI adjusted to basic prices for services provided to households 	

ISIC rev 4	Activity	Methods	Deflators	Remarks
L	Real estate activities	<ul style="list-style-type: none"> - Deflation - Output volume indicators methods (e.g., number of houses sold by types of houses) <i>Owner-occupied dwellings:</i> <ul style="list-style-type: none"> - Deflation - Output volume indicators methods (stock of owner-occupied dwellings) 	<ul style="list-style-type: none"> - CPIs adjusted to basic prices - House pricing - Price index of investments in new dwellings - Charge-out rates 	For services on a fee basis, where the fee is a percentage of a property price, a proper price index would combine the change in fee percentages and the change in house prices
M	Professional, scientific and technical activities	<ul style="list-style-type: none"> - Deflation - Output volume indicator methods - Input indicator methods 	<ul style="list-style-type: none"> - PPIs - Indices of actual prices - CPIs adjusted to basic prices - Charge-out rates/hourly fees 	
N	Administrative and support service activities	<ul style="list-style-type: none"> - Deflation - Output volume indicator methods - Input indicator methods 	<ul style="list-style-type: none"> - PPIs - Indices of actual prices - CPIs adjusted to basic prices - Charge-out rates/hourly fees 	
O	Public administration and defence; compulsory social security	<ul style="list-style-type: none"> - Output indicator method - Input indicator method 	<ul style="list-style-type: none"> - Price indices of inputs 	
P	Education	<i>Market output:</i> <ul style="list-style-type: none"> - Deflation - Output indicator method by education stratification level (e.g., using pupil-hours indicators) <i>Non-market output:</i> <ul style="list-style-type: none"> - Output indicator method in detail (e.g., pupil hours/number of pupils indicators) - Input indicators methods (e.g., teacher-hours) 	<ul style="list-style-type: none"> - PPIs - CPIs adjusted to basic prices 	
Q	Human health and social work activities	<i>Market output:</i> <ul style="list-style-type: none"> - Deflation - Output indicator method in detail <i>Non-market output:</i> <ul style="list-style-type: none"> - Output indicator method in detail - Input indicators methods 	<ul style="list-style-type: none"> - PPIs - Sub-indices of CPI adjusted to basic prices 	
R	Arts, entertainment and recreation	<i>Market output:</i> <ul style="list-style-type: none"> - Deflation - Output indicator method in detail <i>Non-market output:</i> <ul style="list-style-type: none"> - Output indicator method in detail - Input indicators methods 	<ul style="list-style-type: none"> - Sub-indices of CPI adjusted to basic prices 	

ISIC rev 4	Activity	Methods	Deflators	Remarks
S	Other service activities	<ul style="list-style-type: none"> - Deflation - Output indicator methods (such as number of members by types) 	<ul style="list-style-type: none"> - Sub-indices of CPI adjusted to basic prices 	
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	<ul style="list-style-type: none"> - Deflation - Input indicator methods (e.g., number of staff) 	<ul style="list-style-type: none"> - Sub-indices of CPI adjusted to basic prices 	

7.10 Final consumption expenditure

Volume measures for the expenditure components of GDP may be derived through:

- a. direct deflation
- b. extrapolation
- c. revaluation

The method to be used depends on the data sources available, but should be attempted at the most detailed level possible. For most of these expenditure items, the common practice is to derive a constant price estimate by deflating the current price estimates rather than by volume extrapolation. Changes in inventories at constant prices are a special case that need careful consideration.

7.10.1 Household final consumption expenditure

The use of detailed consumer price indices is the obvious approach to deflate components of the household final consumption expenditure since CPIs are intended to show the change in consumer prices.

It is desirable to deflate the components of Household final consumption expenditure at the lowest possible level with the corresponding components of the CPIs and sum up the deflated estimates to obtain volume measures of HFCE at previous year or base year price.

The use of an all-items CPI is not recommended for the deflation of individual components of the household final consumption expenditure or the total final household consumption expenditure.

Countries may compile different types of CPIs for their own needs and national accountants should be aware of the methods employed if CPIs are used, as there may be some differences between the CPI and national accounts methodology. The differences could be in coverage and concepts, such as consumption of own-produced goods and services, goods and services received in kind, goods and services purchased abroad by resident households, services of owner-occupied dwellings, insurance services, etc. Other differences may lie in the index calculation method and the base periods used. Some attention may have to be given to these elements, although in many cases they may not be substantial.

Where a detailed CPI is not available, other available indicators covering completely or partially the products in question such as PPIs adjusted for valuation differences, import/export prices, or volume indicators can be used. Adjusted PPIs is not ideal as they will generally cover products consumed by businesses as well as those consumed by households.

The index is appropriate to deflate HFCE if it:

- a. is an index of the price that consumers pay for that specific group of products;
- b. takes proper account of changes in the quality of products;
- c. is valued at purchasers' prices including VAT; and
- d. follows the same concepts as the national accounts.

7.10.2 Government final consumption expenditure

The final consumption expenditure of general government and NPISHs consists of

- a. the value of non-market goods and services produced by government or NPISHs other than own account capital formation and sales;
- b. purchases by general government and NPISHs of goods and services produced by market producers that are supplied, without any transformation, to households as social transfers in kind.

Final consumption expenditure consists of both individual and collective consumption whose value is measured by convention as the sum of costs — compensation to employees, intermediate consumption (including the cost of products purchased for social transfers in kind), consumption of fixed capital and other taxes less subsidies on production — less any sales to households and other units:

$$\text{GFCE} = \text{Government Output} - \text{Output for own account capital formation} - \text{Sales of goods and services} \\ + \text{Goods and services purchased from market producers for households}$$

Methods used to derive volume of final consumption expenditure by government and NPISHs are

- a. *the input method for output destined for collective consumption* (deflation of value of inputs by suitable deflator)

The volume measure is computed as the sum of the deflated inputs, namely, compensation of employees, intermediate consumption, consumption of fixed capital and other taxes less subsidies on production. The indices for the various input costs are wage indices of civil servants, and relevant components of price indices reflecting input costs such as rents, electricity, stationery, and repairs. By deflating inputs, it is assumed that the change in the volume of inputs is representative of the change in the volume of output.

- b. *the output method for individual consumption*, in particular education and health services and NPISHs using *detailed* output indicators covering adequately the various categories of non-market goods and services, such as 'pupil hours' for education, 'patient treatments by type' for health, and 'members by type' for NPISHs.

For social transfers in kind consisting of goods or services purchased by government from the market, deflation is made using suitably detailed CPIs, adjusted for any discounts which Government may have negotiated directly with suppliers and any contributions which are payable by those receiving the transfers.

Compensation of employees constitutes the largest component of government output and final consumption expenditure. Therefore, it would be important to develop an appropriate wage rate index, which together with deflated goods and services can be used to construct a composite index to measure volume of GFCF.

Compensation of employees

For the purpose of measuring the volume of input from employee labour, the quantity unit for compensation of employees may be considered to be an hour's worked of a given type of work and level of skills. The price associated with each type of work is the compensation paid per hour. A volume measure of work done may be calculated as a weighted average of the quantity relatives for different kinds of work, weighted by the compensation of employees of the previous year or of a fixed base year.

Alternatively, a wage rate index may be calculated by calculating a weighted average of the proportionate changes in hourly rates of compensation (price change) for different types of work, using compensation of employees as weights.

If a Laspeyres type of volume index is calculated indirectly by deflating the changes in compensation of employees at current values by an index of the average change in hourly compensation, the latter should be a Paasche-type index.

Example 33: Calculating volume measure of compensation of employees

Grades	2020		2021		Change in hours worked	Weighted change in hours worked using 2020 CE as weights
	Hours worked	Compensation of employees (CE)	Hours worked	Compensation of employees (CE)		
1	2,080	10,000	2,100	11,100	1.010	10,096
2	4,160	18,000	4,250	20,200	1.022	18,389
3	8,320	32,000	8,450	36,000	1.016	32,500
4	12,480	36,000	12,600	40,000	1.010	36,346
5	12,480	24,000	12,600	27,000	1.010	24,231
6	41,600	60,000	41,900	67,000	1.007	60,433
7	62,400	60,000	62,800	67,000	1.006	60,385
8	47,840	27,600	48,500	31,000	1.014	27,981
9	20,800	10,000	21,000	11,500	1.010	10,096
10	83,200	28,000	84,000	32,000	1.010	28,269
Total		305,600		342,800		308,726

The volume increase is equal to $\left[\frac{308,726}{305,600} - 1 \right] * 100 = 1.02\%$

Value change in compensation of employees is equal to $\left[\frac{342,800}{305,600} - 1 \right] * 100 = 12.17\%$

Price increase is equal to $\left[\frac{1.1217}{1.0102} - 1 \right] * 100 = 11.04\%$

7.10.3 Gross fixed capital formation

Gross fixed capital formation (GFCF) represents a large range of different products, many of which can be unique, for example, an oil rig or a specialised piece of plant and machinery. The large range of products therefore call for methods to be applied at a detailed product level to ensure good quality estimates of GFCF in volume terms.

At a minimum, separate estimates should be made for fixed capital formation in buildings and other construction works, machinery and equipment, and motor vehicles and other transport equipment, although a more detailed disaggregation is preferred.

Valuation is an important issue when considering the suitability of price indices for the deflation of GFCF. For price indices to be entirely appropriate, they should measure changes in the purchasers' price of the particular products, including any non-deductible VAT included in the price.

In the absence of genuine investment price indices, appropriate PPIs and Import Price Indices (IPIs) at a sufficiently detailed product level can be used for deflating locally produced and imported machinery and equipment, motor vehicles and other transport equipment. The indices should however be adjusted to purchasers' prices. Otherwise, it would be assumed that the change in basic prices / CIF prices and in purchasers' prices is the same, i.e., taxes, transport, installation and the other costs of ownership remain constant in volume terms.

For imported items, if no import price indices are available, partner country producer price indices, adjusted for exchange rates can be used.

Fixed capital formation in buildings and other construction work at constant prices can be derived as part of the calculation of estimates for output at constant prices for the construction industry using relevant

price indices, such as construction output price indices for standard types of buildings and other types of construction, or indices based on construction input costs. Alternatively, in the absence of price indices, output at constant prices could be derived by extrapolation, using volume indicators of output such as square meters of intended construction work from administrative data source on building permits or input indicators such as the supply of building materials (e.g., such as imports of cement or construction bars), although these are not recommended.

7.10.4 Changes in inventories

The calculation of changes in inventories (CI) at current and previous year's prices are closely interlinked. In practice, the data available for the calculation of changes in inventories do not allow a perfect estimation. Assumptions and approximations have to be made. The estimation methodology for CI (both at current and previous year's prices) is highly dependent on the type of information that is available.

Changes in inventories are measured by the value of entries to inventories less the value of withdrawals from inventories, and the value of any recurrent losses of goods held in inventories during a given period. Volumes at the prices of the previous year can be derived by the deflation of these components. In practice, information on entries and withdrawals of stocks are rarely available, and often the only available information is the value of the stocks at the start and at the end of the period.

When information of value of the level of inventories at the beginning and end of period is known and prices are available, the values of the level can be deflated to obtain the quantities. The change in quantity then has to be multiplied with the average price of the desired year to obtain volume change of the inventories.

If a price index is available that describes the price development of the stock according to the known or assumed bookkeeping practice, the values can be deflated to arrive at CI at previous year's prices directly.

The price indexes to be used should be in accordance with the kind of inventory in question. For inventories of finished products, PPIs at basic prices are the appropriate choices. For inventories of materials and supplies, indices used for intermediate consumption should be used such as PPIs adjusted to purchasers' prices. For inventories of goods for resale, PPIs can be used; for retailers, strictly speaking, the PPI should be adjusted for wholesale trade margins. As regards work-in-progress, deflation should be consistent with that of the output, i.e., output price indexes at basic prices.

Often only data on the total inventory are available, not by product. The assumption to be made is that inventories relate to the main output for inventories of finished products and work-in-progress, to main inputs for inventories of materials and supplies, and to main traded products for inventories of goods for resale.

In the absence of direct data, CI is often estimated in an indirect way by countries using 'commodity flow method', that is, as the difference between total supply (output and imports) and total use (intermediate consumption, final consumption expenditure, gross fixed capital formation and exports). The outcome of this method is more likely to reflect measurement errors in the various aggregates than the measurement of actual CI.

The use of the 'residual' method in calculating 'Changes in inventories' is discouraged.

It is also not recommended to estimate volume change by directly deflating the current values of changes in inventories, as holding gains accrue to the total level and not on the change.

Example 34: Calculating changes in inventories at current and constant prices

1. Book value of inventories of raw materials:
At 31 December 2018 = 1,000
At 31 March 2019 = 1,500
2. Price indices of the raw materials (2020=100)

	2018	2019
January	94.5	106.5
February	95.5	107.5
March	96.5	108.5
April	97.5	109.5
May	98.5	110.5
June	99.5	111.5
July	100.5	112.5
August	101.5	113.5
September	102.5	114.5
October	103.5	115.5
November	104.5	116.5
December	105.5	117.5
Average	100.0	112.0

Step 1: Derive average deflators for inventories (2018 = 100)

$$\begin{aligned}\text{Average price index for period ending 31 December 2018} \\ &= \frac{103.5 + 104.5 + 105.5}{3} \\ &= 104.5\end{aligned}$$

$$\begin{aligned}\text{Average price index for period ending 31 March 2019} \\ &= \frac{106.5 + 107.5 + 108.5}{3} \\ &= 107.5\end{aligned}$$

Step 2: Calculate CI at constant prices (2018 = 100)

	Dec. 31, 2018	Mar. 31, 2019
Book value of inventories	1,000	1,500
Deflators	104.5	107.5
Constant price value of inventories	956.9	1395.3
Change in inventories at constant prices		438.4

$$\text{Opening stock at constant prices (2020 prices)} = \frac{1,000 * 100}{104.5} = 956.9$$

$$\text{Closing stock at constant prices (2020 prices)} = \frac{1,500 * 100}{107.5} = 1,395.3$$

Change in inventories at constant 2018 prices = 1,395.3 – 956.9 = 438.4

Step 3: Reflate the constant price CI with the average price during the period to obtain CI at current prices

$$\begin{aligned}\text{Average price (January – March 2021)} \\ &= \frac{106.5 + 107.5 + 108.5}{3} \\ &= 107.5\end{aligned}$$

$$\begin{aligned}
 \text{Change in inventories at current prices} &= \frac{438.4 * 107.5}{100} \\
 &= 471.3
 \end{aligned}$$

7.10.5 Acquisition less disposals of valuables

The main challenge to valuing acquisitions and disposals of valuables flows in volume terms is that such products are generally unique or available in only very limited quantities (for example a painting is unique). This is compounded by the fact that the quality of valuables is very difficult to define.

The most appropriate method is deflation with a suitable PPI for an industry producing similar valuables, adjusted for changes in quality (the jewellery industry for example), or comparison with closely related products either domestically or internationally (such as a painting by the same painter).

7.10.6 Exports and imports of goods

Potential deflators for the estimation of volume of exports and imports of goods are:

- a. Actual export and import prices
- b. Unit value indices (UVIs)
- c. Adjusted PPIs, and
- d. Export prices of a foreign country.

Actual export and import prices

Export and import price indices are compiled based on the prices actually charged by exporters of goods, in the case of exports, or paid by importers, in the case of imports. These indices cope better with the problem of heterogeneous products as they reflect a fixed specification that allows price effects to be isolated and quality changes to be controlled. However, their coverage may be incomplete with respect to actual exports and imports of products to which they are applied as deflators.

Unit value indices (UVIs)

UVIs are produced at low cost and are readily available from trade statistics, being derived as the ratio of value to volume (weight or quantity). They do not generally control for changes in the product mix within one item of the trade classification, resulting to quality changes mistakenly included in the price component. Their coverage of products is generally complete, but can include a range of different products even at the most detailed level of trade classification. Furthermore, the products within an item of the trade classification may appear to be homogeneous, but may vary in term of quality.

UVIs are not unsuitable for products that are unique or whose specification change quickly.

Adjusted PPIs

PPIs can be used to deflate exports and imports in the same way as actual export and import price indices. PPIs reflect prices on the domestic market and may not, in some circumstances, reflect prices charged for exports or imports (for example, luxury goods). However, PPIs can be used to deflate exports or imports when there is little difference between domestic prices and imports or exports prices and where they compete with each other in the market.

PPIs could be adjusted to better reflect the actual export and import prices by:

- a. taking into account exchange rate movements between the domestic currency and that of the importing / exporting countries. This assumes that movements in export and import prices differ from domestic price movements only in respect of movements in the exchange rate.

- b. applying an adjustment factor based on the ratio of UVI to PPI of similar group of products to a PPI that represents the range of products for which other more suitable price or volume indicators are not available.

Adjusted PPIs are used for products for which no other suitable price or volume indicators are available.

Adjusted export prices from foreign countries

The export prices from a foreign country can also be used to deflate imports. Such an approach is most appropriate for unique products of a specialized nature. Adjustments may be necessary to account for exchange rate movements. Additional adjustments that take account of other factors that affect prices between the exporting and importing countries, such as transport margins, may be made.

Goods under merchanting

For goods under merchanting, the ideal method is the double deflation of the goods acquired under merchanting (negative export) and the goods sold under merchanting (positive exports) with PPIs of the good in the country of origin and in the country of destination. The difference between the two deflated figures provides the volume of the merchanting margin. An adjustment for exchange rate effects may be necessary.

If suitable PPIs are not available, the export price index of the country of origin and the import price index of the country of destination for the good under merchanting adjusted for exchange rate effects can be used.

Other possibility is to deflate the merchanting margin with a suitable domestic wholesale trade margin index. An adjustment for exchange rate effects may be necessary.

7.10.7 Exports and imports of services

Exports and imports of services consist of a large range of different services. The estimation of prices and volumes for exports and imports of services are less well developed than for goods. This is not unexpected considering that methods for domestically produced services are also less well developed.

Actual price indices are generally the preferred method for deflation. For exports and imports, these prices need to reflect the actual prices charged for exports and the prices paid for imports, and will differ from those in the domestic market because of exchange rate influences and of potentially different pricing policies for domestic and export sales. A further difficulty associated with the collection of export and import prices is the identification of the sampling frame necessary for the collection of prices.

If actual prices are not available, the methods to be used should be guided by those used for similar domestically produced services. Methods used for domestically produced services are, in general, the same as those used for market output of services: charge-out rates, output indicator methods, input indicator methods. For example: volume estimates of freight transport services could be derived using PPIs according to the type of transport; volume estimates of accommodation services could be derived using the appropriate CPIs; for other imported services, price indices of the countries exporting the services such as appropriate components of CPI or PPI-services (SPPI) adjusted for changes in the exchange rate may have to be used.

For the *expenditure of non-residents within the domestic territory*, these should be deflated using CPIs consistent with the range of products purchased by non-residents.

Similarly, for the *expenditure of domestic residents abroad*, detailed and appropriate CPIs of the visited country, adjusted for exchange rates, can be used.

Different options exist for estimating the *volume of export of processing services on inputs owned by others*. The ideal method is deflation using appropriate SPPI for the processing service. This would require sufficiently detailed information on the processing service through an exactly corresponding suitable SPPI. However, such SPPIs may not exist.

Other options are:

- a. deflation using a suitable domestic SPPI of the similar type of processing service, adjusted for exchange-rate effects. The price movement of the domestic processing activity may however differ for the export processing activity.
- b. double-deflation by deflating separately the import value and export value of the goods under processing using suitable import and export prices,
- c. deflating the exported processing fee by the export price index of the goods concerned. This should be done at a detailed product level and the export price index should be as close as possible to the good processed and exported.
- d. In cases where there are no other options, appropriate wage indices linked to employment in the processing activity might be used to extrapolate the processing service over time, assuming that domestic wages follow the same path as the price of the exported processing service. Such a method should be considered as a last resort.

Similar methods will apply for *volume of import of processing services*.

- a. If a suitable SPPI or PPI of the processing industry is available from the country of origin of the imported service, the price index can be used to deflate the current value processing fee. An adjustment of the price index for exchange rate effects might be necessary.
- b. double-deflation by deflating separately the import value and export value of the goods under processing using suitable import and export prices,
- c. deflating the imported processing fee by the import price index of the processed goods. Potential issues are the heterogeneity of the products processed and the possible different price developments of the goods and the processing fee.
- d. As a last resort, the development of wage indices in the main processing country might be used. An adjustment for exchange rate effects might be necessary.

7.11 Other

7.11.1 Volume measures of FISIM

The price of FISIM has two components: the first is the difference between the bank rate of interest and the reference rate (the reverse in the case of deposits) which represents the margin earned by the financial intermediary; the second is the price index used to deflate the stocks of loans and deposits to base period prices.

Volume measures of FISIM are calculated using the deflation method. It consists of applying base-period interest margins on loans and deposits to the stocks of loans and deposits which are deflated to base-period prices.

$$\text{FISIM in volume on loans granted to the institutional sector} = \frac{\text{Stock of loans granted to the institutional sector}}{\text{price index}} \times \text{base period margin}$$

$$\text{FISIM in volume on deposits of the institutional sector} = \frac{\text{Stock of loans on deposits of the institutional sector}}{\text{price index}} \times \text{base period margin}$$

The base-period interest margin on loans is the difference between the effective interest rate on loans and the reference rate, and the base-period interest margin on deposits is the difference between the reference rate and effective interest rate on deposits.

The base-period interest margins on loans and deposits can also be obtained by dividing the base-period value of FISIM on loans and deposits by the corresponding base-period average stocks of loans and deposits.

Base-period interest margins should be applied to each type of loans and deposits, since different kinds of loans and deposits have different margins between their interest rates and reference rate. The resultant volume measures for each type of loan and deposit should then be aggregated to produce chain-linked volume measures of FISIM.

An ideal deflator for the stocks of loans and deposits should measure the actual change in the price of money. However, this is not possible in practice. Price indices that can be used are GDP deflator, the deflator for final domestic demand and the all-items CPI. The first two indices should exclude FISIM.

In principle, the deflation method should be applied to imports of FISIM, provided data on base-period interest margins on loans and deposits with non-resident deposit-taking corporations are available. If such information is not available, the compiler can consider using appropriate price indices for FISIM from partner economies.

Example 35: Calculating FISIM at constant prices

Tables 30(a) and (b) show the data on the breakdown of interest receivable by type of loan and interest payable by type of deposit for five years, and the data on the average stock of types of loans and deposits of the resident deposit-taking corporations for the same time period.

Table 30(a) – Data on interest receivable on loans and interest payable on deposits offered by resident deposit-taking corporations

Line number	Item	t	t+1	t+2	t+3	t+4
(1)	Interest receivable on loans	150.1	162	201	235.3	279.1
(1a)	Mortgage loans	20	25	56	89	130
(1b)	Automobile loans	16.1	17	18	18.3	19.1
(1c)	Commercial loans	114	120	127	128	130
(2)	Interest payable on deposits	62.9	66.2	69.9	73.5	77.1
(2a)	Demand deposits	36	38.3	40.6	43	45.4
(2b)	Time deposits	5	5.3	5.7	6	6.4
(2c)	Saving deposits	21.9	22.6	23.6	24.5	25.3

Table 30(b) – Data on average stock of loans and deposits of resident deposit-taking corporations

Line number	Item	t	t+1	t+2	t+3	t+4
(3)	Average stock of loans	1,851	1,928	2,302	2,720	3,212
(3a)	Mortgage loans	235	285	632	1,023	1,488
(3b)	Automobile loans	200	207	214	221	228
(3c)	Commercial loans	1,416	1,436	1,456	1,476	1,496
(4)	Average stock of deposits	1,141	1,185	1,229	1,273	1,317
(4a)	Demand deposits	655	685	715	745	775
(4b)	Time deposits	95	99	103	107	111
(4c)	Saving deposits	391	401	411	421	431

Step 1 - Table 30(c): Calculate the average interest rate on loans, the average interest rate on deposits, and the reference rate.

The average interest rate is computed by dividing the interest receivable / payable for the year by the average stock of loan or deposit and multiplying the result by 100.0.

The domestic reference rate (rr_{DOM}) is the simple average of the two values obtained above.

GDP deflator excluding FISIM at the prices of the previous year is given in this example.

Table 30(c) - Average interest rates, the reference rate and the GDP deflator (excluding FISIM)

Line number	Item	Description	t	t+1	t+2	t+3	t+4
(5)	Average interest rate on loans	$[(1)/(3)]*100$	8.11	8.40	8.73	8.65	8.69
(5a)	Mortgage loans	$[(1a)/(3a)]*100$	8.51	8.77	8.86	8.70	8.74
(5b)	Automobile loans	$[(1b)/(3b)]*100$	8.05	8.21	8.41	8.28	8.38
(5c)	Commercial loans	$[(1c)/(3c)]*100$	8.05	8.36	8.72	8.67	8.69
(6)	Average interest rate on deposits	$[(2)/(4)]*100$	5.51	5.58	5.68	5.77	5.85
(6a)	Demand deposits	$[(2a)/(4a)]*100$	5.50	5.59	5.68	5.77	5.86
(6b)	Time deposits	$[(2b)/(4b)]*100$	5.26	5.35	5.50	5.62	5.74
(6c)	Saving deposits	$[(2c)/(4c)]*100$	5.60	5.64	5.74	5.82	5.87
(7)	Reference rate domestic (rr _{DOM})	$[(5)+(6)]/2$	6.81	6.99	7.21	7.21	7.27
(8)	GDP deflator (excluding FISIM) (previous year = 100.0)			103.00	105.00	107.00	110.00

Step 2 - Table 30(d): Calculate FISIM at current prices for each type of loans and deposits

FISIM on loans is calculated as follows:

- Compute the difference between the average interest rate on loans and the domestic reference rate (rr_{DOM})
- Multiply the average stock of loans by this difference to get the FISIM on loans.

FISIM on deposits is calculated as follows:

- Compute the difference between the domestic reference rate (rr_{DOM}) and the average interest rate on deposits.
- Multiply the average stocks of deposits by this difference to get the FISIM on deposits.

Table 30 (d) - FISIM at current prices

Line number	Item	Description	t	t+1	t+2	t+3	t+4
(9)	FISIM on loans	(9a)+(9b)+(9c)	24.0	27.2	35.1	39.2	45.6
(9a)	Mortgage loans	[(5a)-(7)]/100.0*(3a)	4.0	5.1	10.4	15.2	21.8
(9b)	Automobile loans	[(5b)-(7)]/100.0*(3b)	2.5	2.5	2.6	2.4	2.5
(9c)	Commercial loans	[(5c)-(7)]/100.0*(3c)	17.6	19.6	22.1	21.6	21.2
(10)	FISIM on deposits	(10a)+(10b)+(10c)	14.8	16.7	18.7	18.3	18.7
(10a)	Demand deposits	[(7)-(6a)]/100.0*(4a)	8.6	9.6	10.9	10.8	11.0
(10b)	Time deposits	[(7)-(6b)]/100.0*(4b)	1.5	1.6	1.8	1.7	1.7
(10c)	Saving deposits	[(7)-(6c)]/100.0*(4c)	4.7	5.4	6.0	5.9	6.0
(11)	Total domestic FISIM	(9)+(10)	38.8	43.9	53.8	57.5	64.3

Step 3 - Table 30 (e): Calculate the average stock of loans and deposits at the prices of the previous year by deflating using the given GDP deflator excluding FISIM

Table 30 (e) - Deflated average stock of loans and deposits at the prices of the previous year

Line number	Item	Description	t+1	t+2	t+3	t+4
(12)	Deflated average stock of loan	(12a)+(12b)+(12c)	1871.8	2192.4	2542.1	2920.0
(12a)	Mortgage loans	(3a)/(8)*100.0	276.7	601.9	956.1	1352.7
(12b)	Automobile loans	(3b)/(8)*100.0	201.0	203.8	206.5	207.3
(12c)	Commercial loans	(3c)/(8)*100.0	1394.2	1386.7	1379.4	1360.0
(13)	Deflated average stock of deposits	(13a)+(13b)+(13c)	1150.5	1170.5	1189.7	1197.3
(13a)	Demand deposits	(4a)/(8)*100.0	665.0	681.0	696.3	704.5
(13b)	Time deposits	(4b)/(8)*100.0	96.1	98.1	100.0	100.9
(13c)	Saving deposits	(4c)/(8)*100.0	389.3	391.4	393.5	391.8

Step 4 – Table 30 (f): Calculate the unchained Laspeyres volume measure of FISIM for each type of loan and deposit at the prices of the previous year.

For each type of loan starting from year t+1, the volume measures of FISIM are obtained as follows:

- Compute the difference between the average interest rate on the loan and the reference rate for the previous year and divide the result by 100.0 (this is known as the base-period interest margin for loans).
- Multiply the deflated stock of loans in the current year by this difference to obtain the volume measure of FISIM at the price of the previous year.

For example, the volume measure of FISIM on mortgage loans for year t+1 is obtained as

$$276.7 * \frac{8.51 - 6.81}{100} = 4.7 \text{ units}$$

The resultant volume measures of FISIM of each type of loans are then summed up to get the total unchained volume measures of FISIM on loans at the prices of the previous year.

For each type of deposit starting from year t+1, the volume measures of FISIM are obtained as follows:

- Compute the difference between the reference rate and average interest rate on the deposit for the previous year and divide the result by 100.0 (this is known as the base-period margin for deposits).
- Multiply the deflated stock of deposits in the current year by this difference to obtain the volume measure of FISIM at the price of the previous year.

For example, the volume measure of FISIM on demand deposits for year $t+1$ is obtained as

$$665.0 * \frac{6.81 - 5.50}{100} = 8.7 \text{ units}$$

The resultant volume measures of FISIM for each type of deposits are then summed up to get the total unchained volume measures of FISIM on deposits at the prices of the previous year.

The total unchained volume measures of FISIM on loans and deposits are then summed up to get the unchained volume measures of total FISIM at the prices of the previous year.

Table 30 (f) -Unchained Laspeyres volume measures of FISIM at the prices of the previous year

Line number	Item	Description	t+1	t+2	t+3	t+4
(14)	FISIM on loans	(14a)+(14b)+(14c)	24.5	29.9	35.9	42.4
(14a)	Mortgage loans	(12a)*[(5a)_t-(7)_t]/100.0	4.7	10.2	16.3	23.0
(14b)	Automobile loans	(12b)*[(5b)_t-(7)_t]/100.0	2.5	2.5	2.6	2.6
(14c)	Commercial loans	(12c)*[(5c)_t-(7)_t]/100.0	17.3	17.2	17.1	16.9
(15)	FISIM on deposits	(15a)+(15b)+(15c)	14.9	15.2	15.5	15.6
(15a)	Demand deposits	(13a)*[(7)_t-(6a)_t]/100.0	8.7	9.0	9.2	9.3
(15b)	Time deposits	(13b)*[(7)_t-(6b)_t]/100.0	1.5	1.5	1.5	1.6
(15c)	Saving deposits	(13c)*[(7)_t-(6c)_t]/100.0	4.7	4.7	4.8	4.7
(16)	Total domestic FISIM	(14)+(15)	39.4	45.2	51.4	58.0

Step 5 - Table 30 (g): Calculate the growth rates of the Laspeyres volume of FISIM at the prices of the previous year for each type of loans and deposits.

Table 30 (g) - Growth rate of unchained Laspeyres volume measures of FISIM at the prices of the previous year

Line number	Item	Description	t+1	t+2	t+3	t+4
(17)	Growth rate of volume measures of FISIM on loans	[(14)_t]/[(9)_t-1]	1.02	1.10	1.02	1.08
(17a)	Mortgage loans	[(14a)_t]/[(9a)_t-1]	1.18	2.02	1.56	1.51
(17b)	Automobile loans	[(14b)_t]/[(9b)_t-1]	1.01	1.00	0.99	1.09
(17c)	Commercial loans	[(14c)_t]/[(9c)_t-1]	0.99	0.88	0.78	0.78
(18)	Growth rate of volume measures of FISIM on deposits	[15_t]/[10_t-1]	1.01	0.91	0.83	0.85
(18a)	Demand deposits	[(15a)_t]/[(10a)_t-1]	1.02	0.93	0.84	0.86
(18b)	Time deposits	[(15b)_t]/[(10b)_t-1]	1.01	0.94	0.88	0.92
(18c)	Saving deposits	[(15c)_t]/[(10c)_t-1]	1.00	0.87	0.79	0.81
(19)	Growth rate of total volume measures of domestic FISIM	[16_t]/[11_t-1]	1.02	1.03	0.96	1.01

The growth rate is calculated by dividing the value at the prices of the previous year obtained at Step 4 by the current-price value of the previous year obtained at Step 2.

For example, the growth rate of volume measures of FISIM at the prices of the previous year for year t+1 is obtained:

$$\frac{4.7 \times 100}{4} = 1.18$$

Step 6 - Table 30 (h): Calculate the chained Laspeyres volume of FISIM (reference year t) for each type of loans and deposits.

For each, the annually chained volume measures from year t+1 are obtained by multiplying the annually chained volume measure for the previous year by its growth rate. Except for years t and t+1, the annually chained volume measures of FISIM are not additive. The loss of additivity is the natural outcome of chaining.

Table 30 (h) - Annually chained Laspeyres volume measures of FISIM (reference year = t)

Line number	Item	Description*	t	t+1	t+2	t+3	t+4
(20)	FISIM on loans	$[20_{t-1}] \times [17_t]$	24	24.5	27	27.6	29.9
(20a)	Mortgage loans	$[(20a)_{t-1}] \times [(17a)_t]$	4	4.7	9.5	14.8	22.3
(20b)	Automobile loans	$[(20b)_{t-1}] \times [(17b)_t]$	2.5	2.5	2.5	2.5	2.7
(20c)	Commercial loans	$[(20c)_{t-1}] \times [(17c)_t]$	17.6	17.3	15.2	11.8	9.2
(21)	FISIM on deposits	$[21_{t-1}] \times [18_t]$	14.8	14.9	13.6	11.2	9.5
(21a)	Demand deposits	$[(21a)_{t-1}] \times [(18a)_t]$	8.6	8.7	8.1	6.8	5.8
(21b)	Time deposits	$[(21b)_{t-1}] \times [(18b)_t]$	1.5	1.5	1.4	1.2	1.1
(21c)	Saving deposits	$[(21c)_{t-1}] \times [(18c)_t]$	4.7	4.7	4.1	3.2	2.6
(22)	Total domestic FISIM	$[22_{t-1}] \times [19_t]$	38.8	39.4	40.6	38.7	39.1

7.11.2 Volume measures of output of non-life insurance

Volume of the output of non-life insurance can be measured using the deflation method. The method involves deflating current-price measures of premiums earned and premium supplements for each line of non-life insurance by an appropriate price index and then using the results to extrapolate the level of output of non-life insurance in the base year to obtain the volume measures. The price index for insurance premiums could be available from the CPI or PPI for insurance services.

Should changes in equalization provisions be included in the measurement of current-price non-life insurance, they should be deflated by a general price index that measures the change in the underlying purchasing power of money. Examples include the GDP deflator, the deflator for final domestic demand and the all-items CPI. The first two indices should exclude non-life insurance. The resultant volume measures of each line of non-life insurance are then aggregated to produce chain-linked volume measures of non-life insurance output.

In the case where the current price output of non-life insurance is obtained using the sum of costs method, deflating the output by a composite index of input prices to obtain the volume measures is to be considered.

Another method is the volume indicator method. The method makes use of detailed activity-level indicators, such as the acquisition and administration of policies and the administration claims which are weighted according to cost to construct a volume index for each line of non-life insurance. The volume index is then used to extrapolate the base-period output of non-life insurance. The volume measures of each line of insurance are then aggregated to form chain-linked volume measures of insurance output. This method is very resource intensive since requires activity-level details on the different services produced together with detailed cost information for the weights.

Example 36: Calculating volume measures of output of non-life insurance

Table 31 (a) shows the input data from insurance corporations that provide three classes of non-life insurance and Table 31 (c) the available price indices.

Table 31 (a) - Data from insurance corporations on non-life insurance transactions

Line number	Item	t	t+1	t+2	t+3	t+4
(1)	Earned premiums	2,055.0	2,226.0	2,640.0	2,910.0	3,135.0
(1a)	Motor vehicle insurance	750.0	771.0	876.0	945.0	990.0
(1b)	Medical and health insurance	765.0	900.0	1,134.0	1,260.0	1,380.0
(1c)	Home insurance	540.0	555.0	630.0	705.0	765.0
(2)	Unearned premiums	537.0	583.5	675.5	717.5	774.0
(2a)	Motor vehicle insurance	195.0	202.5	220.5	232.5	249.0
(2b)	Medical and health insurance	207.0	240.0	263.0	270.0	285.0
(2c)	Home insurance	135.0	141.0	192.0	215.0	240.0
(3)	Claims paid	560.0	612.0	612.0	633.0	616.0
(3a)	Motor vehicle insurance	195.0	222.0	200.0	210.0	198.0
(3b)	Medical and health insurance	210.0	230.0	245.0	255.0	260.0
(3c)	Home insurance	155.0	160.0	167.0	168.0	158.0
(4)	Changes in claims outstanding	447.0	450.0	450.0	465.0	487.0
(4a)	Motor vehicle insurance	166.0	155.0	152.0	160.0	167.0
(4b)	Medical and health insurance	170.0	180.0	186.0	187.0	200.0
(4c)	Home insurance	111.0	115.0	112.0	118.0	120.0
(5)	Changes in equalization provisions	567.0	521.6	525.2	494.3	488.9
(5a)	Motor vehicle insurance	180.0	163.6	178.2	165.5	172.7
(5b)	Medical and health insurance	167.0	154.3	148.8	141.6	132.5
(5c)	Home insurance	220.0	203.6	198.2	187.3	183.6
(6)	Investment income	173.0	179.3	174.6	173.9	179.9
(6a)	Motor vehicle insurance	63.0	65.3	63.6	63.3	65.6
(6b)	Medical and health insurance	65.0	67.4	65.6	65.3	67.5
(6c)	Home insurance	45.0	46.7	45.5	45.3	46.8

Step 1 - Table 31 (b): Calculate the current price of the output using the accounting approach for each line of insurance as follows:

Output

= premiums earned

+ premium supplements

- adjusted claims (claims paid + changes in reserves against outstanding claims + changes in equalization provisions)

Table 31 (b) - Output of non-life insurance at current prices

Line number	Item	Description	t	t+1	t+2	t+3	t+4
(7)	Output of insurance corporations	(7a)+(7b)+(7c)	654.0	821.7	1,227.4	1,491.6	1,723.0
(7a)	Motor vehicle insurance	(1a)+(6a)-(3a)-(4a)-(5a)	272.0	295.6	409.4	472.8	517.8
(7b)	Medical and health insurance	(1b)+(6b)-(3b)-(4b)-(5b)	283.0	403.1	619.7	741.7	855.0
(7c)	Home insurance	(1c)+(6c)-(3c)-(4c)-(5c)	99.0	123.0	198.3	277.0	350.2

Table 31 (c) - Price indices for constructing volume measures of non-life insurance output

Line number	Item	t+1	t+2	t+3	t+4
(8)	Price index for insurance premiums (year t-1 = 100.0)				
(8a)	Motor vehicle insurance	103.5	102.1	103	103.8
(8b)	Medical and health insurance	106	105	105.6	104
(8c)	Home insurance	104	103.2	104.8	105.4
(9)	All-items CPI (year t-1 = 100.0)	105.2	104.5	104	104.7

Step 2 - Table 31 (d): Compute the unchained volume measures at the prices of the previous year, using price indices for insurance premiums and the All-items CPI.

- deflate the current-price premiums earned and premium supplements by the price index for each line of non-life insurance to obtain the corresponding unchained volume measures at the prices of the previous year.
- deflate the current-price changes in equalization provisions by the all-items CPI for each line of non-life insurance to obtain the corresponding unchained volume measures at the prices of the previous year.
- calculate the volume measures of earned premiums and premium supplements less changes in equalization provisions (difference between the unchained volume measures of premiums earned and premium supplements and changes in equalization provisions) for each line of non-life insurance.
- compute the growth rate of the unchained volume measures of premiums earned and premium supplements less changes in equalization provisions for each line of non-life insurance for each line of non-life insurance.
- compute the unchained volume measure by extrapolating the current-price output of previous years using the growth rates obtained at d.
- sum up the unchained volume measures to obtain the unchained volume measures of non-life insurance output at the prices of the previous year.
- compute the growth rate of the unchained volume measures of total non-life insurance output.

Table 31 (d) - Unchained Laspeyres volume measures of non-life insurance output at the prices of the previous year

Line number	Item	Description	t+1	t+2	t+3	t+4
(10)	Volume measures of earned premiums and premium supplements					
(10a)	Motor vehicle insurance	$[(1a)+(6a)]/(8a)$	808	920.3	978.9	1016.9
(10b)	Medical and health insurance	$[(1b)+(6b)]/(8b)$	912.6	1142.5	1255	1391.9
(10c)	Home insurance	$[(1c)+(6c)]/(8c)$	578.5	654.5	715.9	770.2
(11)	Volume measures of changes in equalization provisions					
(11a)	Motor vehicle insurance	$(5a)/(9)$	155.5	170.5	159.1	165
(11b)	Medical and health insurance	$(5b)/(9)$	146.7	142.4	136.1	126.6
(11c)	Home insurance	$(5c)/(9)$	193.6	189.6	180.1	175.4
(12)	Volume measures of earned premiums and premium supplements less changes in equalization provisions					
(12a)	Motor vehicle insurance	$(10a)-(11a)$	652.4	749.8	819.8	851.9
(12b)	Medical and health insurance	$(10b)-(11b)$	766	1000	1118.9	1265.3
(12c)	Home insurance	$(10c)-(11c)$	384.9	464.9	535.9	594.8
(13)	Growth rate of volume measures of earned premiums and premium supplements less changes in equalization provisions					
(13a)	Motor vehicle insurance	$[(12a)_t]/[(1a)_{t-1}+(6a)_{t-1}-(5a)_{t-1}]$	1.031	1.115	1.077	1.011
(13b)	Medical and health insurance	$[(12b)_t]/[(1b)_{t-1}+(6b)_{t-1}-(5b)_{t-1}]$	1.155	1.23	1.065	1.069
(13c)	Home insurance	$[(12c)_t]/[(1c)_{t-1}+(6c)_{t-1}-(5c)_{t-1}]$	1.055	1.168	1.123	1.056
(14)	Volume measures of non-life insurance output	$(14a)+(14b)+(14c)$	711.7	969	1323.4	1563.5
(14a)	Motor vehicle insurance	$[(7a)_{t-1}]*[(13a)_t]$	280.3	329.5	440.8	477.9
(14b)	Medical and health insurance	$[(7b)_{t-1}]*[(13b)_t]$	327	495.8	659.9	792.8
(14c)	Home insurance	$[(7c)_{t-1}]*[(13c)_t]$	104.4	143.7	222.6	292.7
(15)	Growth rate of volume measure of non-life insurance output	$[14_t]/[7_{t-1}]$	1.088	1.179	1.078	1.048

Step 3 - Table 31 (e): Calculate annually chained Laspeyres volumes measures of non-life insurance output of each of the three lines of non-life insurance by extrapolating the current-price output of year t (base year) by the real growth rates calculated in Table 30(d).

To note: except for years t and t+1, the annually chained Laspeyres volume measures of non-life insurance output are not additive. The loss of additivity is due to chaining.

Table 31(e) - Annually chained Laspeyres volumes measures of non-life insurance output (reference year=t)

Line number	Item	Description*	t	t+1	t+2	t+3	t+4
(16)	Non-life insurance output	$[(16)_{t-1}]*[(15)_t]$	654.0	711.7	839.2	904.8	948.4
(16a)	Motor vehicle insurance	$[(16a)_{t-1}]*[(13a)_t]$	272.0	280.3	312.5	336.5	340.1
(16b)	Medical and health insurance	$[(16b)_{t-1}]*[(13b)_t]$	283.0	327.0	402.1	428.2	457.7
(16c)	Home insurance	$[(16c)_{t-1}]*[(13c)_t]$	99.0	104.4	121.9	136.9	144.6

7.11.3 Volume measures of output of life insurance

There are two methods to obtain volume measures of life insurance: the deflation method and the volume indicator method. Given difficulties in the volume indicator method as explained above, the deflated premiums approach to construct volume measures of life insurance output is preferred.

For volume measures of imports of life insurance, the deflation method would involve using a composite price index comprising appropriate price indices from partner countries adjusted for changes in exchange rates. Alternatively, a composite volume index comprising the volume measures of the output or exports of life insurance from partner countries can be used to extrapolate the base-period imports of life insurance service charge. If such data are not available, the price indices used to deflate the domestically produced current-price output of life insurance can be considered. Otherwise, the volume measures can be estimated by extrapolating the base-period value using the volume growth of domestically produced life insurance output.

Example 37: Calculating volume measures of output of life insurance

Table 32 (a) shows the data from insurance corporations to compute current-price life insurance output for five years, as well as the price index to deflate earned premiums and premium supplements, i.e., investment income attributable to policyholders. If a price index for insurance premiums is not available, an alternative could be the overall CPI.

Table 32 (a) : Data on life insurance and the CPI

Line number	Item	Description	t	t+1	t+2	t+3	t+4
(1)	Earned premiums		750	771	810	864	900
(2)	Unearned premiums		195	203	212	226	243
(3)	Benefits due		195	222	200	210	198
(4)	Increase in actuarial reserves		240	262	146	85	117
(5)	Investment income		63	68	69	69	70
(6)	Output of life insurance at current prices	(1)+(5)-(3)-(4)	378	355	533	638	655
(7)	Price index for life insurance premiums (year t = 100.0)		100	103	104.1	104.7	103.8

Table 32 (b) shows how to compute volume measures of life insurance output using the above data.

Step 1: Deflate the premiums earned and premium supplements by the price index for life insurance premiums to obtain the corresponding volume measures.

Step 2: Compute the growth in the volume measures of premiums earned and premium supplements.

Step 3: Extrapolate the output of the life insurance from year t using the growth obtained in Step 2 to compute its volume measures.

Table 32 (b) : Calculating volume measures of life insurance output

Line number	Item	Description	t	t+1	t+2	t+3	t+4
(8)	Volume measures of premiums and premium supplements	$[(1)+(5)]/(7)*100.0$	813.0	814.6	844.4	891.5	934.5
(9)	Growth rate of premiums and premium supplements*	$[(8)_t]/[(8)_{t-1}]$		1.002	1.037	1.056	1.048
(10)	Volume measures of life insurance output	$[(10)_{t-1}]*[(9)_t]**$	378.0	378.7	392.6	414.5	434.5

* Represents the growth rate of volume measures of life insurance output.

** Applies to data from year t+1

7.11.4 Volume measures of Taxes and subsidies on products

Taxes and subsidies on products may be based on the value of products ('ad valorem') or on the quantity of products.

Taxes related to quantities of products

In case of taxes related to quantities of products, taxes represent a fixed amount per unit of quantity of the product which is the subject of the transaction. The value of the revenue from such a tax depends upon

- a. the quantity of products involved in the transaction, and
- b. the amount levied per unit, i.e., the taxation price.

The breakdown of the value change of such tax into its two components is simple. The variation in volume is determined by the change in the quantities of products taxed while the price variation corresponds to the change in the amount levied per unit, i.e., to the change in the taxation price.

The volume of the tax is derived by applying the tax rate prevailing in the base year to the volume of products in the current year.

If a new tax is introduced, or the scope of a tax is extended to include more products, this is recorded as a price effect rather than a volume effect.

	Product A		Product B		Total tax revenue
	Quantity	Tax rate per unit	Quantity	Tax rate per unit	
Year T-1	100	10	200	0	1,000
Year T	100	10	180	10	2,800

The total tax revenue above has increased by 180% between year T-1 and year T, due to the extension of the tax to product B. In this case, when the tax rates of year T-1 (0%) are applied to the quantities of year T, the volume measure of the tax remains unchanged and the entire rise in tax revenue is attributed to a price effect, i.e., the tax-price has risen by 180%.

The example below considers the *introduction of a new product*, which is subject to a common product tax of 10 per unit.

	Product A		Product B		Total tax revenue
	Quantity	Tax rate per unit	Quantity	Tax rate per unit	
Year T-1	100	10	0	0	1,000
Year T	100	10	180	10	2,800

As before, the tax revenue has increased by 180%. In this case, the rise in tax revenue should be entirely attributed to a volume effect. This is because treatment of new products for taxes and subsidies is analogous to the more general treatment of new products where a specific price change is inferred from the overlap or other method. This means that a tax rate is inferred in period T-1 for product. Since this tax rate has remained unchanged between T-1 and T, *the rise in tax revenue is viewed as a volume effect*.

Taxes related to values of products

Such tax represents a certain percentage of the *value* of the transaction. The value of the tax depends upon:

- the quantity of products involved in the transaction;
- the price of the products involved in the transaction; and
- the tax rate (as a percentage).

The taxation price is obtained by applying the tax rate to the price of the product.

The change in value of the revenue from such tax can be divided into a volume change, determined by the change in the quantities of products taxed, and a price change corresponding to the change in the taxation price ($b \times c$).

	Quantity	Price	Tax rate per monetary value	Total tax revenue
Year T-1	100	10	20%	200
Year T	120	12	25%	360

In the above example, the value of the tax revenue has increased by 80% as a result of changes in each of the determining variables. The volume change is only 20% — at a constant 'taxation price' (where 'taxation price' represents the combined effect of tax rate and price, that is a 50% increase between Year T and Year T-1). The volume change can be derived by dividing the value change by the taxation price change (in index format, 180 divided by 150). Undertaking this calculation across many products means that the volume measure is a weighted combination of changes in the volume of products based on weights derived from the taxation price rates that apply to each product.

Taxes on products, excluding VAT, is measured in terms of volume by *applying the taxation prices of the base year to the quantities of products produced or imported, or by applying the tax rates of the base year to the value of output or imports, revalued at the prices of the base year.*

Similarly, subsidies on products in volume terms is measured *by applying the subsidy prices of the base-year to the quantities of products produced or imported, or by applying the rates of subsidy of the base-year to the value of output or imports, revalued at the prices of the base-year.*

Non-deductible VAT in volume terms can be calculated *by applying the VAT rates in force in the previous year to the flows expressed in the prices of the previous year.*

Any change in the rate of VAT for the current year will be reflected in the price index and not in the volume index of non-deductible VAT.

A change in the amount of deductible VAT resulting from a change in the right to deduct VAT (change in the tax law) will, by the method described, be treated as a change in the taxation price, as will a change in the rate of invoiced VAT.

On the other hand, a change in the amount of deductible VAT resulting from a change in the pattern of uses of the product (e.g., change in the proportion of uses on which VAT may be deducted) constitutes a change in the volume of deductible VAT to be reflected in the index of the volume of VAT on products.

Because the tax system is rarely 100% successful, the actual tax revenue depends on the collection rate. This is equivalent to adding a further variable to the calculation:

$$\text{Actual Tax Revenue} = \text{Quantity} * \text{Price} * \text{Tax Rate} * \text{Collection Rate}$$

The collection rate is analogous to the tax rate and therefore should be included as part of the taxation price effect.

To note:

- Taxes and subsidies on products should never be deflated.
- Introduction of new taxes is recorded as a price effect rather than a volume effect.
- Introduction of new products is viewed as a volume effect.
- Collection rate increase is considered as a price change.

Example 38

(a) Applying the base tax rate to sales at basic price at 2020 prices

		2020			2021		
		Footwear	Textiles	Total	Footwear	Textiles	Total
(1)	Sales at basic prices (units)	450	400	850	450	480	930
(2)	Taxes (units)	50	100	150	50	120	170
(3)	PPI , 2020=100 (%)	100	100		98	103	
(4)=(2)/(1)	Implicit tax rates (%)	11	25	18	11	25	18
(5)=(1)/(3)*100	Sales at basic prices, at 2020 prices (units)	450	400	850	459	466	925
(6)=(4) ₂₀₂₀ *(5)	Taxes at 2020 prices (units)	50	100	150	51	117	168

(b) Extrapolating using volume of sales

Volume indices (2020 = 100)

		2020			2021		
		Footwear	Textiles	Total	Footwear	Textiles	Total
(7)	Sales at basic prices	100	100	100	102	117	109
(8)=(2) ₂₀₂₀ *(7)/100	Taxes at 2020 prices (units)	50	100	150	51	117	168

7.11.5 Volume measures of Central Bank

Volume measures of the output of the Central Bank depends on the nature of the output. In the case of explicit charges such as supervisory services, volume measures can be obtained by deflating the current price value of the output by an appropriate sub-index of the PPI (adjusted for quality changes), or using a PPI with a broader coverage if such sub-index is not available. Alternatively, the use of volume indicators can be considered.

In the case of output related to financial intermediation, volume measures can be obtained using the method to compute volume measures of FISIM as described earlier.

In the case of the non-market output of collective services, the “input method” can be used. The “input method” consists of measuring the volume of output by the weighted sum of volume measures of all the inputs. The latter are derived by deflating the various input costs by corresponding price indices or, if such

price indices are unavailable, by using volume indicators that reflect input volume change (for example, the number of hours worked by employees).

7.11.6 Volume measures of R&D

Given the unique nature of R&D, it is not possible to collect meaningful prices of the same R&D in two successive periods. For this reason, input methods are used.

For marketed output, deflating by a general measure of inflation in combination with an index of average wage rates will give a measure in volume terms. The rationale for using a combined inflation and wage rates deflator is that many services use a high proportion of labour and purchased goods and services in the production process, so both affect the output price. Similarly, for in-house production, wage rates and price movements of the goods and services purchased can be weighted to give a price movement of inputs. This can be used as a proxy for the implied price of the in-house production

For non-market output by government and non-profit bodies, the usual methods for producing volume growth estimates of collective services using the cost approach are to be used.

7.11.7 Main recommendations for estimation in volume terms

- Volume estimates of transactions in goods and services are best compiled in a supply and use framework, preferably in conjunction with the current value estimates.
- The method recommended to measure volume in national accounts is deflation.
- Main price indices needed to derive volume measures in national accounts are consumer price index, producer price index, construction price index, export and import price index, and unit value index for imports and exports.
- For this, it is important to develop a comprehensive system of price indices.
- The estimations could be made at the most detailed level of products as data sources and resources permit.
- If it is not practical to derive estimates of value added in real terms from a supply and use framework, and either the volume estimates of output and intermediate consumption are not robust or are not available, then satisfactory estimates can be obtained using an indicator of output in the short term. An output indicator derived by deflation is generally preferred to one derived by quantity extrapolation.
- The preferred measure of year-to-year movements of GDP volume is a Fisher volume index; changes over longer periods are obtained by chaining, that is, by cumulating the year-to-year movements.
- Chain indices that use Laspeyres volume indices to measure year-to-year movements in the volume of GDP and the associated implicit Paasche price indices to measure year-to-year inflation provide acceptable alternatives to recommended Fisher indices.
- Volume measures of GDP can be obtained from the output and expenditure sides. Although one may argue, whether or not, conceptual differences may exist between GDP volume from the output and expenditure sides, in practice, it would be highly undesirable to publish two different GDP growth rates.
- Three methods are generally used to obtain value added at constant prices: double deflation, single extrapolation, and single deflation. Double deflation is the ideal method. Single deflation is not recommended as it leads to a bias in the estimates of value added.
- Taxes on products at constant prices should not be estimated by deflating taxes with a price index for products or by extrapolating taxes using a volume index.
- Volume measures of changes in inventories should not be measured by directly deflating the current values of changes in inventories.
- The use of the 'residual' method to calculate volume measures of changes in inventories is discouraged.
- The SNA favours the use of a moving base year, rather than a fixed base year. In practice, this means that $t-1$ will be the base year.
- It is recommended that growth rates and contributions to growth figures are also computed to represent volume growth. Contributions to growth are additive when calculated from additive accounts.

7.12 Summary of methods for volume measures and deflators by SNA aggregates

SNA aggregates	Methods (not exhaustive)	Deflators - recommended	Remarks
Output, market	<ul style="list-style-type: none"> - Deflation method - Volume extrapolation method - Output indicator - Secondary indicator - Input indicator 	<ul style="list-style-type: none"> - PPIs - CPIs detailed data adjusted to basic prices - Charge-out rates 	<ul style="list-style-type: none"> - Examples of secondary indicators: supply of building materials (for construction industry) - Input indicators: man-hours worked
Output, non-market	<i>Individual:</i> <ul style="list-style-type: none"> - Output indicator method - Input indicator method <i>Collective:</i> <ul style="list-style-type: none"> - Input indicator method - Volume indicators 	<ul style="list-style-type: none"> - Price indices of inputs 	<ul style="list-style-type: none"> - Volume indicators: number of employees - Output indicators: number of operations in hospitals, pupil-teaching hours
Output for own final use	<ul style="list-style-type: none"> - Deflation method - Volume extrapolation method - Output indicator - Secondary indicator - Input indicator 	<ul style="list-style-type: none"> - PPIs of similar products on the market - CPIs detailed data adjusted to basic prices - Output price indices of fixed assets 	
Intermediate consumption	<ul style="list-style-type: none"> - Deflation product by product 	<ul style="list-style-type: none"> - Price indices data from purchasers - Same prices applied for output of the products - Import Price index - UVI 	
Value added	<ul style="list-style-type: none"> - Double indicator method - Single output indicator method - Single input indicator method 		<ul style="list-style-type: none"> - Double indicator method includes Double deflation Double extrapolation Extrapolation/deflation
Final consumption expenditure by households	<ul style="list-style-type: none"> - Deflation method - Volume indicators - Secondary indicators 	<ul style="list-style-type: none"> - Detailed CPIs - PPIs adjusted for valuation differences - Import/export prices 	
Final consumption expenditure by government and NPISHs	<ul style="list-style-type: none"> - Output indicator method, input indicator method, as for non-market output - Deflation for social transfers in kind (purchases from the market) 	<ul style="list-style-type: none"> - CPIs suitably detailed for social transfers in kind - Wage rate index 	
Gross fixed capital formation	<ul style="list-style-type: none"> - Deflation by types of assets - Deflation for related services - Input methods 	<ul style="list-style-type: none"> - Genuine investment price indices - PPIs adjusted to purchasers' prices - Charge-out rates - Import prices 	

SNA aggregates	Methods (not exhaustive)	Deflators - recommended	Remarks
Changes in inventories	<ul style="list-style-type: none"> - Deflation - Commodity flow method - Secondary indicators 	<ul style="list-style-type: none"> - PPIs - CPIs - Implicit price deflators 	The use of 'residual' (through commodity flow approach method is not recommended, since the outcome will reflect measurement errors in the different aggregates rather than the measurement of actual CI.
Acquisition less disposals of valuables	<ul style="list-style-type: none"> - Deflation 	<ul style="list-style-type: none"> - PPIs for industries producing valuables 	
Exports and imports of goods and services	<i>Goods:</i> <ul style="list-style-type: none"> - Deflation 	<ul style="list-style-type: none"> - Actual export or import prices - UVIs - Suitable PPIs (adjusted, when the case) - Export prices of a foreign country, adjusted for exchange rate movements 	
	<i>Services:</i> <ul style="list-style-type: none"> - Deflation - Input indicator method 	<ul style="list-style-type: none"> - Actual export or import prices - Suitable PPIs (adjusted, when the case) - Export prices of a foreign country, adjusted for exchange rate movements 	
	<i>Expenditure of non-residents on the domestic territory:</i> <ul style="list-style-type: none"> - Deflation <i>Expenditure of domestic residents abroad:</i> <ul style="list-style-type: none"> - Deflation 	<ul style="list-style-type: none"> - CPIs for country - CPIs for visited country adjusted for exchange rates 	

8 REVISIONS AND BACKCASTING

8.1 Revisions

Revisions in national accounts figures are carried out for the benefits of users. They provide users with data that are as timely and accurate as possible while incorporating up-to-date and more accurate information without introducing breaks in the time series. At times, revisions may reflect negatively on the trustworthiness of official statistics. To avoid such situation and unwarranted criticism, a well-designed and carefully managed revision policy is important. Essential features of a well-designed revision policy are predictability and openness, advance notice of causes and effects together with explanations, and easy access to reasonably long time series of revised data.

The development of the national accounts statistics is very data-intensive. The more detailed the source data are, the higher will be the quality of the GDP estimates. In practice, it is not feasible to collect data that are very detailed due to financial constraints as well as practical considerations such as timeliness and respondents' burden. Many countries therefore conduct detailed censuses of businesses once every five years and use the results as benchmark for the computation of national accounts statistics. They then have resource to economic sample surveys of higher frequency (quarterly or annual) where limited data are collected, to administrative data sources and to other indirect methods to estimate national accounts for the inter-censal years. When new sets of benchmark statistics become available through subsequent censuses of businesses, the already-published estimates do not match the new national accounts benchmark dataset. Therefore, there is a need to review the previous estimates to be in line with the new benchmark figures and also to remove breaks between the two series.

The main objectives are to have updated data that are temporally consistent with the new benchmark national accounts data, and to preserve as far as possible the annual growth movements.

There are two types of revisions: revisions applied by reason and revisions applied by scheduling.

Revisions by reasons include (i) incorporation of better data sources, (ii) capturing routine recalculation, (such as updating of base periods and incorporation of updated seasonal factors for quarterly national accounts), (iii) improvement in methodology (such as changes in methods, concepts, definitions and classifications); and (iv) error corrections.

Revisions by scheduling (expected revisions) comprise (i) routine revisions, (ii) major revisions, and (iii) ad hoc revisions.

The routine revisions occur in the following circumstances:

- a. Quarterly data are revised in line with the annual estimates. This introduces a new annual benchmark for the intra-annual quarters, and also for any subsequent quarter.
- b. 'Annual benchmark' revision when the annual estimates are revised after data for all the months or quarters of a year become available, and whenever more complete data from annual surveys become available. E.g., revisions of annual GDP from first estimates to final estimates.
- c. Seasonal and calendar adjustment.

Major revisions are substantial changes and occur when

- a. a new structural source that is only collected at long intervals (5 to 10 years), such as a census or input-output tables, becomes available;
- b. a new methodology is developed which incorporates new concepts to be integrated in the current estimates;
- c. A legal act is brought into force, such as a new classification by industry or product, or a new international national accounts methodology (e.g., the 2008 SNA)

Ad hoc revisions are non-scheduled as they are the result of unforeseeable events, such as errors or accidents, or are due to the absence of a scheduling procedure. Non-scheduled revisions are not pre-announced nor reflected in dissemination plans. They confuse users and undermine the confidence in the quality of statistics and the trust in compiling agencies, and therefore should be avoided.

Usually, the national statistical agency takes the opportunity of a major revision to introduce methodological improvements, which is good practice to avoid too frequent revisions. It is therefore common for major revisions to be determined by a combination of factors rather than one single cause. They are expected and planned in advance based on a detailed strategy taking into account the following:

- a. pre-announcing to users the implementation of a major revision, its calendar and the date of dissemination of the new estimates, and the reasons for doing it;
- b. communicating and explaining the elements of the revision in advance, as well as the causes of the revisions; and
- c. informing users of the expected magnitude, scope and impact.

Best practices indicate the need to conduct a revision analysis and to publish a document to enlighten users on the objectives, the methods used as well as the impact of the revisions and reasons. A more detailed report could be for institutional memory.

Examples of published results from Statistics South Africa and Statistics Mauritius are given in Annex 5 and 6 respectively.

8.2 Back-casting

Back-casting is needed to ensure the coherence of the time series after a major revision while maintaining the economic history of the country.

The techniques used for back-casting are:

- a. Recompilation or bottom-up estimation
- b. Linking (splicing)
- c. Estimation / modelling
- d. Metadata approach
- e. Or a mix of the above

Recompilation or bottom-up estimation refers to compiling the new estimates by building up from source data components to estimate the variable or account in question. This may imply using a new data source for the past period and compiling the new estimates using a bottom-up methodology, or transforming the previously used data sources to the new basis using transition matrices or supplementary information and then compiling using the method which matches the new approach. This could involve using micro data and a complete re-estimation from the individual transactions or institutional units up to the aggregates.

This approach is often used for time periods that are not too distant in the past for which the source data is available in an electronic form and the quality is known. Examples for use of bottom up could be a re-sectorization exercise.

In terms of quality, the recompilation or bottom-up approach produces the most robust results. However, it has several drawbacks: resources (financial and human constraints), lengthy process, and availability of detailed source data in the form of consistent time series for the past periods.

Linking or splicing is generally used when no direct data source is available to re-compile the variables according to the new basis. It requires that the new national accounts dataset and the old national accounts dataset overlap for at least one period.

Retropolation refers to backward estimation and is done by applying the ratio of the new to old series at the overlap period to extend the series back to the first recorded date. It raises or lowers the level of the historical series, but maintains the movements of the vintage dataset in the new series. This method assumes that the phenomenon leading to the discrepancy is present throughout the whole historical time series in constant proportion to the old series.

Interpolation refers to extending a series backwards through till a specific value in the past. The method assumes that the discrepancy was generated over the period of the time series, and that the discrepancy has grown over time. The method therefore changes the growth of the original series by a constant fraction. It is used when the new variable was estimated using sound statistical procedure and the level at that year is to be considered a benchmark, such as when data from a new economic census becomes available.

The advantages of linking or splicing method are that it is simple to implement and it does not require any detailed vintage source data. However, the method assumes that the impact of the changes in the overlap period is the same for the entire period being backcasted.

For the **estimation and modelling approach**, no directly measured data exist for the historical period, but there are data that are related or could be used in some form of modelling to create the estimates. The main disadvantage is that the method can usually be done for selected variables only. Also, the new estimates do not benefit from being constructed with a framework as it assumes that the relationships between the national accounts variables and the instrumental variable holds for the entire time period.

In the **metadata approach**, the national agency compiling national accounts statistics does not attempt to link the old and the revised national accounts series, but provides metadata explaining the differences between the old and the new national accounts series. In this case, users may find it difficult to compile the series by themselves, while there can be multiple versions of the time series worked out by different users.

Example 39:

a. Retropolation

	2015	2016	2017	2018	2019	2020	2021
New series					110	125	140
Historical series	59	72	85	97	105	119	135
Historical growth rate		22.0%	18.1%	14.1%	8.2%	13.3%	13.4%

In the above, a change in methodology in 2019 increases the figure from 105 to 110 in 2019. If nothing is done, there will be a break in the series with a sudden increase from 8.2% to 13.4% between 2018 and 2019. Splicing method recalculates the historical series by applying the ratio of the value at the slice period (year 2019 to the historical series.

$$\text{The ratio is } \frac{110}{105} = 1.04762$$

The new series is recalculated as below. The level in the historical series has increased, but the vintage growth rates have been maintained.

	2015	2016	2017	2018	2019	2020	2021
New series	62	75	89	102	110	125	140
New series growth rate		22.0%	18.1%	14.1%	8.2%	13.6%	12.0%
Historical series	59	72	85	97	105	119	135
Historical growth rate		22.0%	18.1%	14.1%	8.2%	13.3%	13.4%

b. Interpolation

	2015	2016	2017	2018	2019	2020	2021
New series	59	73	87	100	110	125	140
Factor	1	1.011905	1.02381	1.035714	1.047619		
Historical series	59	72	85	97	105	119	135
Historical growth rate		22.0%	18.1%	14.1%	8.2%	13.3%	13.4%
New series growth rate		23.5%	19.4%	15.4%	9.5%	13.6%	12.0%

In the above example, the values for 2015 and 2019 are the benchmark. The factor will be from 1 (2015) to 1.04762 (2019 – the splice year) over the 4-year period.

Principles for splicing

- Splicing should be undertaken at the lowest possible level of disaggregation.
- There is need to ensure economic plausibility. It is important that business cycles are not changed due to splicing.
- The choice of the splicing indicator is important.
- Care should be taken to ensure that the splice point is not an outlier.

c. Bridging factors - converting historical series from old classification to new classification

1999/2000	Values	Share
New classification		
Property and business services	133,677	
Rental, hiring and real estate	26,901	0.20
Professional, scientific and technical	73,891	0.55
Admin and support services	32,885	0.25

	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
Old classification							
Property and business services	76,491	86,989	95,193	102,844	111,289	122,919	133,677
New classification							
Rental, hiring and real estate	15,393	17,506	19,157	20,696	22,396	24,736	26,901
Professional, scientific and technical	42,281	48,084	52,619	56,848	61,516	67,944	73,891
Admin and support services	18,817	21,400	23,418	25,300	27,377	30,238	32,885

The share of the items under the new classification (year 1999/2000) is first calculated. These are then used to distribute the vintage data set into the sub-items under the new classification.

Principles for bridging factors

- Similar to splicing, this method works best when undertaken at the lowest possible level of disaggregation (sub-division or even class level of ISIC).
- Bridging factors should ideally be calculated to cover a period so as to minimize short term fluctuations in industries.
- There is need to ensure key economic events such as rise or fall of industries are not removed as part of the bridging factors.

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ANNEX 1: SCOPE OF THE IMPLEMENTATION OF SNA 2008

Table A - Milestones

Implementation milestones	Complementary data systems	SNA-related data and development
Pre-SNA phases	Basic data on production, turnover, consumption, investment, exports and imports Consumer and producer price indices Balance of payments goods and services account Monetary survey statistics	
Milestone 1. Basic indicators of gross domestic product (GDP) Final expenditures on GDP current and constant prices GDP by industry at current and constant prices	Supply and use table worksheets Balance of payments: current, capital and financial accounts Government finance statistics (GFS) transaction accounts	
Milestone 2. Gross national income and other primary indicators for rest of the world External account of primary incomes and current transfers Capital and financial accounts	Capital stock statistics International investment position GFS transactions and stocks in assets and liabilities Monetary and financial statistics	Quarterly national accounts Regional accounts Satellite accounts for environment and other satellite accounts Input-output analysis
Milestone 3. Institutional sector accounts: first step: 1. Production account for all institutional sectors 2. For general government: - Generation of income, - Allocation of primary income, - Secondary distribution income, - Use of disposable income, - Capital and financial accounts	Same as for milestone 2	Same as for milestone 2
Milestone 4. Institutional sector accounts: intermediate step 1: For all institutional sectors: - Generation of income - Allocation of primary income - Secondary distribution of income - Use of disposable income - Capital account	Same as for milestone 2	Same as for milestone 2
Milestone 5. Institutional sector accounts: intermediate step 2: For all institutional sectors: Financial account	Same as for milestone 2	Same as for milestone 2
Milestone 6. Institutional sector accounts: final step: For all institutional sectors: - Other changes in assets account - Balance sheet	Same as for milestone 2	Same as for milestone 2

Table B - Scope of the implementation of 2008 System of National Accounts – Data sets

NAQ Table Number		Annual accounts	Quarterly accounts
GDP, value added and employment			
	Nominal and volume measure of GDP by industry or by expenditure components	Minimum requirement	Minimum requirement
1.1	Expenditures of the GDP in current prices	Minimum requirement	Optional Min Req
1.2	Expenditures of the GDP in constant prices	Minimum requirement	Optional Min Req
2.1	Value added and GDP in current prices by industry	Minimum requirement	Optional Min Req
2.2	Value added and GDP in constant prices by industry	Minimum requirement	Optional Min Req
2.3	Value added components by industry	Minimum requirement	Recommended
	Employment by industry	Minimum requirement	Recommended
Integrated accounts and tables, including integrated satellite accounts			
1.3/4.1	Accounts for the total economy (until net lending)	Minimum requirement	Minimum requirement
	Supply and use table	Recommended	Desirable
5.1	Cross-classification of output/value added by industries and sectors	Recommended	
	Tourism accounts, environmental accounts and other socio-economic	*	
Purpose classification of expenditures			
3.1	General government final consumption (and other) expenditure by purpose in current prices	Recommended	
	General government final consumption expenditure by purpose at constant	*	
3.2	Individual consumption (and other) expenditures by purpose in current	Recommended	
	Individual consumption expenditures by purpose at constant prices	*	
	Purpose classification of intermediate and final consumption across all	*	
Institutional sector accounts (until net lending)			
4.2	Rest of the world accounts (until net lending)	Minimum requirement	
4.3	Non-financial corporations sector accounts (until net lending)	Minimum requirement	Recommended
4.4	Financial corporations accounts (until net lending)	Minimum requirement	Recommended
4.5	General government sector accounts (until net lending)	Minimum requirement	Recommended
4.6	Household sector accounts (until net lending)	Minimum requirement	Recommended
4.7	Non-profit institutions serving households sector accounts (until net lending)	Minimum requirement	Recommended
Financial accounts			
4.1-4.7	Financial accounts for all sectors	Recommended	Desirable
Balance sheets and other changes in asset accounts			
	Balance sheets, revaluation and other volume changes in asset accounts for	Recommended	Desirable

Note: Minimum requirement indicates an adequate scope of implementation of the 2008 SNA, when relevant.. Recommended: recommended for compilation by all countries. Desirable: Useful statistics that should be compiled, if possible. * Other data sets that would count in assessing the degree of 2008 SNA implementation. Tables shown without a number are not included in the annual United Nations questionnaire (NAQ). For the Institutional sector accounts the Household accounts and the non-profit institutions serving households could be presented together.

ANNEX 2: KEY DIMENSIONS OF THE SDDS OF THE IMF

There are four dimensions of the SDDS.

Data coverage, periodicity, and timeliness. Comprehensive economic and financial data, disseminated on a timely basis, are essential to the transparency of macroeconomic performance and policy. Countries subscribing to the SDDS are obliged to disseminate the prescribed categories of data with the specified coverage, periodicity, and timeliness.

Access by the public. Dissemination of official statistics is an essential feature of statistics as a public good. The SDDS calls for providing the public, including market participants, with ready and equal access to the data. Countries subscribing to the SDDS are obliged to

- (1) disseminate advance release calendars (ARCs) for the data and
- (2) release the data to all interested parties simultaneously.

Integrity. To fulfil the purpose of providing the public with information, official statistics must have the confidence of their users. In turn, confidence in the statistics ultimately becomes a matter of confidence in the objectivity and professionalism of the agencies producing the statistics. Transparency of its practices and procedures is a key factor in creating this confidence.

The SDDS obliges subscribing countries to

- (1) disseminate the terms and conditions under which official statistics are produced, including those relating to the confidentiality of individually identifiable information;
- (2) identify internal government access to data before release to the public;
- (3) identify ministerial commentary on the occasion of statistical releases; and
- (4) provide information about revision and advance notice of major changes in methodology.

Quality. A set of standards that deals with the coverage, periodicity, and timeliness of data must also address the quality of statistics. Although quality is difficult to judge, monitorable proxies, designed to focus on information the user needs to judge quality, can be useful. The SDDS obliges subscribing countries to

- (1) disseminate documentation on methodology and sources used in preparing statistics, including the identification of methodological deviations from internationally accepted statistical methodologies, encouraging them to undertake and publish data modules of the Reports on the Observance of Standards and Codes (Data ROSCs) or other quality assessments every seven to ten years; and
- (2) disseminate component detail, reconciliations with related data, and statistical frameworks that support statistical cross-checks and provide assurance of reasonableness.

Source: IMF, Statistics Department

ANNEX 3: DATA SOURCES

Compilation of National Accounts estimates is based on information collected from two main data sources: statistical sources (censuses and surveys) and administrative registers.

A **Census** is a complete enumeration of a given population. Censuses though complete are very costly, do not provide timely results, and are usually carried out every five to ten years. Data obtained through censuses may be used for estimating some specific national accounts indicators or as a basis for further compilation. The three main censuses are:

Agricultural census: the observation unit is the agricultural holding, which is the economic unit of agricultural production (i.e., crop-producing and livestock establishments). Agricultural censuses provide detailed statistical information, such as location, areas cultivated, uncultivated, under crop, types of crops, irrigated/rain-fed, number and type of animals, animal production obtained, expenditures, number of persons engaged, etc.

Economic census: for non-agricultural units: the observation unit is the non-agricultural establishment with a fixed structure (size) and location characterized by a unique economic activity. Economics censuses produce specific information on individual establishments, such as location, name, address, type of economic activity, legal and ownership status, turnover, expenditure, number of employees, etc.

Population census: the observation unit is the household and the person. It is generally carried out together with the housing census. The population census provides an inventory of the nation's population in great geographical, demographic and socio-economic detail. In respect of the housing census, the units of enumeration are buildings, living quarters, households and occupants. The main topics included in the housing census refer to the type of ownership of the housing, type of building, construction materials, access to water and electricity, location, number of rooms, etc.

The disadvantages of a census are:

- a. It is very costly to enumerate all population and process the data collected;
- b. The results are not timely, they are available only many months after it is collected;
- c. The census is conducted once every five or ten years.

Surveys provide more up-to-date statistics and are less costly than a census. They are normally carried out monthly, quarterly or annually. Timeliness requires prompt data processing, thus less information may be gathered.

Main economic statistical surveys are:

- a. **Agricultural surveys** to obtain data concerning crop, livestock, prices, etc.;
- b. **Enterprise surveys** to obtain information about the output, intermediate consumptions, investments, employment, wages, etc.;
- c. **Household surveys** are an important source of socio-economic data, providing important indicators about the revenues and expenditures of the households and the use of labour force. In developing countries, they have become a dominant form of data collection, supplementing or sometimes even replacing other data collection programmes and civil registration systems (Demographic and Health Survey). The main ones relevant to national accounts are:
 - **Household Income and Expenditure Survey:** The survey collect detailed information on the total consumption expenditure of private households and groups of private households, broken down by household characteristics such as income, size and composition, socio-economic characteristics, region and so on. The data are used for measuring household

consumption expenditure in national accounts and updating the 'weightings' for the basket of goods used in Consumer Price Indices.

- **Labour Force Survey:** It provides data on working-age persons living in private households. Its main emphasis is on employment, unemployment and inactivity. The LFS is usually conducted on a quarterly basis, but there are countries where this survey is carried out once a year. The main use of LFS in national accounts is for estimating the Non-Observed Economy (NOE), although it is also used to refine the measurement of wages and employment by sector.
- d. **Mixed household-enterprise surveys:** The sampling units are households whose member(s) own and operate an unincorporated enterprise. It can provide coverage of small enterprises that are not included in list-based enterprise surveys, and helps to measure of the non-observed economy;
- e. **Price surveys** are used to obtain data on prices, which may involve collection from enterprises or households, or direct observation of prices in the market

Minimum surveys required for implementing the SNA

Statistical survey	Used for the estimation of:
Surveys of enterprises on performance	Production, intermediate consumption by industry; investment and inventory
Survey of enterprises on trade turnover and sales of services	Production, intermediate consumption of specific industries; investment and inventory; household final consumption
Household budget survey (HBS)	Production, intermediate consumption for agriculture; inventory in agriculture; household final consumption
Consumer Price Index survey	Indicators in constant price

Administrative data emanate from fiscal, taxation or other authority systems, created to facilitate the administration or operation of government programmes, or to supervise and oversee compliance with legal obligations by certain segments of society.

Administrative sources contain information that is not primarily collected for statistical purposes, but is used by statistical offices. Their use for statistical purposes therefore requires a careful evaluation of their conceptual base, classification and time reference.

Examples of administrative sources include:

- a. value added tax (VAT) data;
- b. other tax data (personal and business income tax, excise, sales tax, etc.);
- c. imports and exports data;
- d. social security data;
- e. business registration data and licences;
- f. business accounts of corporations;
- g. revenue and expenditure records of government (central and local);
- h. records held by Central Banks;
- i. records held by associations of employers, of employees and of businesses and professions;
- j. records held by other private sector bodies, e.g., credit-rating agencies, non-profit units, etc.

Administrative data sources are cheaper than censuses and surveys and are very often free. They provide complete or almost complete coverage of the population to which the administrative programmes apply. Generally, they have very high response rates, no survey errors, providing accurate and detailed information on sub-populations. They are timelier, can be of high frequency and reduce the response burden on households and businesses.

Although administrative sources have many advantages, there are several issues attached to their use:

- a. access to administrative sources, both legal and practical aspects. There may not be a legal framework in place that allow statistical offices to access the information from authorities gathering the data. There may also be practical problems relating to the data transfer. This may be avoided if agreements and memoranda of understanding are signed between the parties defining the terms and conditions of the data sharing (for example: responsibilities of counterparts; how, when and which datasets will be supplied; and confidentiality conditions).

Custodians of administrative data are usually not reluctant to share their data, if in return the statistical offices provide some form of assistance to the supplying agencies; for example, by assisting revenue agencies in updating and managing their industry classifications, or eventually sharing their business registers.

- b. The administrative data do not directly correspond to the statistical indicator definitions.
- c. The classification systems used within administrative sources may be different to those used for national accounts.
- d. Timeliness may at times be an issue. Data may either not be available in time to meet statistical needs or refers to a period that does not coincide with that required for statistical purposes, e.g., a tax year may not coincide with the calendar year.
- e. They are susceptible to political change. E.g., improvement in tax compliance, change in coverage and thresholds of taxation, or their abolition.

Administrative data sets involve large volumes of data. Data acquisition, storage, management, and transformation therefore require robust IT systems and software to clean and process millions of records into aggregated information for use in compilation.

Main administrative data sources

Administrative sources	Used for the estimation of
Financial statements of non-financial and financial corporation	Production, intermediate consumption, gross fixed capital formation, changes in inventory.
Financial statements of government (income and expenditure)	Production and intermediate consumption of government; gross fixed capital formation; changes in inventory; final consumption of government; taxes and subsidies on products; taxes and subsidies on production.
Custom declaration for import and export	Import and export of goods.
Balance of Payments	Import and export of services

Characteristics of censuses, surveys and administrative data sources in national accounts

Characteristics	Censuses	Surveys	Administrative data sources
Coverage	Complete	Requires statistical methods to gross up	High, but depends on related policy and compliance
Detail	Very high; can cover statistical needs	Low; focus on specific objectives	Low to high. Depends on related policy
Concepts	Can differ from SNA concepts	Usually good; but can require updating to SNA concepts	Require updating to SNA concepts
Frequency	5 to 10 yearly; economic shocks in reference periods or during inter-censal periods undermine the use of the results	Can be monthly, quarterly or annual. Can help to observe economic shocks	Can be of very high frequency (example customs trade data)
Timeliness	Not timely; data collection and processing are very time-consuming	Very timely	Very timely
Cost	Very high	Medium to low	None or marginal
Sampling error	None	Can be high; need a good sampling design	None
Non-sampling error	Can be high, need quality checks throughout all processes	Can be high; need quality checks throughout all processes	None

Big data sources are becoming increasingly popular macroeconomic statistics. They consist of by-products found in business and administrative systems, social networks, and the internet of things.

Big data can benefit macroeconomic and financial statistics including national accounts, and policymaking as they provide real-time and granular data thus supporting timelier forecasting of existing indicators.

However, data quality, access, and required skills and technologies to clean and process the data are the main challenges of big data. While big data potentially measure insights, correlations, trends, and sentiments, bringing the data in line with internationally agreed standards remain crucial for measuring and monitoring countries' economic performance over time.

Some examples of current applications of big data in national accounts:

Data source	Potential use
Google (search data)	Nowcast GDP Nowcast employment Consumer sentiment
Swift data on transactions	Global financial flows Imports and exports indicators
GPS positioning and tracking data	Regional and international travel
Traffic or road sensors	Economic growth
Satellite imagery	Agriculture and environment
Smart electricity meters	Economic growth Household consumption

ANNEX 4: THE INFORMAL SECTOR

According to rough estimates, the informal sector accounts for up to 40, 55 and 70 percent of total urban or non-agricultural employment in Latin American, Asian and African countries respectively. Its contribution to GDP is lower, but not negligible.

The informal sector manifests itself in different ways in different countries, different regions within the same country, and even different parts of the same city. The informal sector encompasses different kinds of activities, different types of enterprises, and different reasons for participating. Informal activities range from street vending, shoe shining, food processing and other minor activities requiring little or no capital and skills and with marginal output, to those involving a certain amount of investment in skills and capital and with higher productivity, such as manufacturing, tailoring, car repair and mechanised transport. While some informal sector activities resemble traditional activities in handicrafts, food processing or personal services, others such as car repair, recycling of waste materials or transport, are new and arise from modernisation.

The SNA defined the informal sector as below:

(1) The informal sector may be broadly characterised as consisting of units engaged in the production of goods or services with the primary objective of generating employment and incomes for the persons concerned. These units typically operate at a low level of organisation, with little or no division between labour and capital as factors of production and on a small scale. Labour relations - where they exist - are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees.

(2) Production units of the informal sector have the characteristic features of household enterprises. The fixed and other assets used do not belong to the production units as such but to their owners. The units themselves cannot engage in transactions or enter into contracts with other units, nor incur liabilities, on their own behalf. The owners have to raise the necessary finance at their own risk and are personally liable, without limit, for any debts or obligations incurred in the production process. Expenditure for production is often indistinguishable from household expenditure. Similarly, capital goods such as buildings or vehicles may be used indistinguishably for business and household purposes.

The criteria used to identify the informal sector in the SNA framework may be classified as follows:

- a. legal organisation of the enterprise: *unincorporated enterprise*;
- b. ownership of the enterprise: *belong to a household*;
- c. type of accounts: *absence of separate complete accounts*;
- d. production destination: *at least some production is destined for sale or barter*; household enterprises with no market production (own-account agriculture or construction), services of paid domestic workers, and services from owner-occupied dwellings being excluded.

In addition, the coverage of the informal sector is restricted by using additional criteria of numbers of employees or registration. The minimum number of employees chosen is left to the country to decide based on national circumstances. Only those not registered under specific national legislations (such as tax and social security laws and regulatory laws) should be treated as informal.

It is obvious that by its very nature the informal sector does not easily lend itself to statistical measurement. Besides, encompassing a variety of activities with different modes of operation, the number of informal sector units to be surveyed is large in many countries while these units are often characterized by features which make their measurement difficult. The features include their small size, high mobility and turnover, seasonal variations in business activity, clustering in specific areas, lack of recognizable features for identification and location, lack of usable records, possible reluctance to survey participation, etc.

Several approaches may be used to estimate the activity in the informal sector. The choice or combination of methods will depend on the objectives. These can be very simple such as collecting information about the evolution of number and characteristics of persons involved in the informal sector, or more complex such as obtaining detailed information about the characteristics of the enterprises, the main activities, number of employees, income generation, capital equipment, etc. The main methods are:

Direct methods based on surveys or the results from tax audits used to construct estimates of the total economic activity and its official and unofficial (or measured and unmeasured) components. Several approaches can be used:

- a. conduct special surveys on the informal sector; even though most appropriate, they are very costly and often entail sizeable human resources.
- b. expand the coverage of the existing regular surveys, such as labour force or household surveys, with information pertaining to the informal sector; and
- c. carry out mixed household–enterprise surveys.

Indirect methods combine various economic variables and a set of assumptions for producing estimates of the total economy (that is, measured and unmeasured, official and unofficial). *Only the size of the informal sector may be estimated, not any other relevant information and indicators about the country.* The methods include:

- a. Discrepancy methods rely on differences between aggregate income and expenditure that capture the economic activity of the informal sector or between labour force and formal employment. This estimation of the informal sector based on the differences between aggregates requires independent measures of GDP using expenditure and income approaches and thus, limiting its application in practice.
- b. Monetary methods are the most used in the empirical literature. They are based on the assumption that hidden transactions use only cash. Estimating the quantity of money in circulation and then taking away the incentives that induce agents into informality (such as taxes) should give a good approximation of the money used in informal activities.
- c. Physical input methods use discrepancies in electricity consumption and GDP. This method has limitations due to the assumption of a constant coefficient of use per unit of GDP which does not consider technological progress and starts its estimation from a base year in which the magnitude of the informal economy is zero or negligible (an unrealistic assumption for most countries).

Model approaches involves using structural equations to link unobserved variables to observed indicators and cause. The most common method is that of the Multiple Indicator–Multiple Cause (MIMIC) model that imputes a level of underlying informality from a set of presumed causes of informality, on the one hand, and measurable consequences of it, on the other. The use of the model is not recommended for compiling national accounts

A major challenge for developing countries and economies in transition is the statistical measurement of the informal sector with respect to size, characteristics and contribution to GDP. Not many countries conduct regular surveys to measure employment in the informal sector, and even fewer measure its contribution to GDP. This is mainly due to limited resources which do not allow for integrating regular data collection on the informal sector, bearing in mind that resources are often even more limited in countries with large informal sectors.

Depending on their objectives, countries use a variety of survey tools for measuring the informal sector, including independent ad hoc surveys, mixed household-enterprise surveys, labour force or other household surveys, enterprise/establishment surveys and economic censuses. Some countries adopt a fragmented approach using different methods, questionnaires and reference periods in conducting ad hoc surveys of informal sector units to reflect, for instance, the relative importance attached to a particular industry at a given point in time. Other countries limit their surveys to major urban areas only.

Household surveys

These surveys include labour force surveys (LFS) and household income and expenditure surveys. They are the best data collection tools if the objective is to monitor the evolution of informal sector employment and informal employment in terms of the number and characteristics of the persons involved and the conditions of their employment and work. For this purpose, questions pertaining to the definition of the informal sector can be incorporated into LFS survey questionnaires and asked in respect of all persons employed during the survey reference period, irrespective of their employment status. A household income and expenditure survey provides information about household demand for goods and services produced in the informal sector.

The method is however not an appropriate source of information for estimating the total number of informal sector enterprises, and is limited as far as disaggregation by industry, estimation of the total demand for informal production and other economic characteristics are concerned.

Enterprise surveys

Enterprise and establishment surveys are most appropriate when the objective is to monitor the number and characteristics of the informal sector units. These types of surveys provide reliable information on different aspects, such as the number and characteristics of the businesses involved; their production activities, income generation, and fixed capital; the conditions and constraints under which they operate, their organisation and relationship with the formal sector, etc.

However, enterprise surveys do not capture the diversity and mobility of informal sector activities as they do not cover households.

A crucial aspect underlying the quality of the statistics produced by such surveys is the frame used, particularly how complete and up-to-date it is. A business register, where it exists, in general does not cover informal sector enterprises. An establishment census offers an alternative, even if it represents an 'upper' frame for the informal sector, especially for identifiable establishments. However, constraints in using such data sources are high costs, possible overlaps, failure to capture enterprises such as in-home food processing, ambulant trade, construction, etc. For these reasons, countries considering the possibility of establishing a regular statistical programme for the informal sector based on this approach need to plan on how the approach would fit within the overall data collection schedule and with the financial and human resources available.

Mixed household and enterprise surveys

The surveys consist of:

- a. *The modular approach*: In this case, a special questionnaire for evaluating the informal sector is attached to the existing LFS or household survey (ad hoc module) and the two surveys can be conducted simultaneously or subsequently (first the household survey followed by the informal sector survey). This permits monitoring of trends of the sector over time, if the LFS or the household survey is conducted regularly and an informal sector module is attached at frequent intervals.
- b. *The stand-alone approach*: The use of this approach is based on a multi-stage design involving the following steps: (i) selection of census enumeration areas as primary sampling units; (ii) listing or interviewing of all households in the sample areas to identify those with owners of informal sector

enterprises (household unincorporated enterprises with some market production); (iii) selection of sample households; and (iv) interview of sample householders and enterprise owners. The advantages in the quality of the results obtained using this approach must be balanced against the complexity of the survey and operations required (sample design, estimation procedures, qualified survey staff, sound training of interviewers, etc.).

- c. *Integrated approach*: informal sector surveys as part of a survey system designed to meet several objectives. These are seen as special types of modular surveys, that can meet several measurement objectives at the same time, such as data collection for the informal sector, labour force characteristics, household income and expenditure, etc. This approach is especially useful for countries that do not have a regular household survey to which an informal sector survey can be attached.

ANNEX 5: EXAMPLE OF A QUESTIONNAIRE ON MANUFACTURING SERVICES

(Source: Manual on goods sent abroad for processing, 2014 Edition (Eurostat))

Part A: Manufacturing services undertaken by your company

In the period covered by this survey, did your company perform manufacturing (processing) services on goods belonging to foreign owners? Yes [] No []

If 'yes', please

- a. Provide a short description of
 - ii) the goods received for manufacturing, and
 - iii) the manufactured (finished) goods

- b. Complete the table below with information regarding the manufacturing of these goods.

Information on manufacturing services sold by your company

(Report in foreign or local currency)

Country of origin	Currency	Value of goods received/dispatched during the quarter		Value of manufacturing services during the quarter		Value of goods sold in the country on behalf of the foreign owner
		Goods received from non-residents for manufacturing	Goods dispatched to non-residents after manufacturing	Total	of which payment in kind (estimated value of goods)	
A	B	C-1	C-2	D-1	D-2	E
Total						

Part B: Manufacturing services undertaken by non-residents abroad for your company

In the period covered by this study, did your company send goods for manufacturing (processing) abroad? Yes [] No []

If 'yes', please

- a. Provide a short description of
 - (i) the goods sent abroad for manufacturing, and
 - (ii) the returned manufactured (finished) goods

- b. Complete the table below with information regarding the manufacturing abroad of these goods.

Information on manufacturing services purchased abroad

(Report in foreign or local currency)

Country of manufacturing	Currency	Value of goods dispatched/received during the quarter		Value of manufacturing services during the quarter		Value of manufactured goods sold abroad on behalf of your company
		Goods dispatched to non-residents for manufacturing	Goods received from non- residents after manufacturing	Total	of which payments in kind (estimated value of goods)	
A	B	C-1	C-2	D-1	D-2	E
Total						

ANNEX 6: ANALYSIS OF CHANGES IN VALUE ADDED IN THE NEW BASE YEAR (2015) – STATISTICS SOUTH AFRICA

(GDP by production)

Major division	Total change (R billion)	Main reasons for change from previous benchmark
Agriculture (SIC 1)	+14	<i>Data sources:</i> Census of Commercial Agriculture (2017) and annual Agricultural Survey. <i>Improved methodology:</i> Improved estimates of the non-observed economy, including subsistence farming.
Mining (SIC 2)	-54	<i>Data sources:</i> SIS – Mining (2015) increased intermediate consumption by +R67bn and increased output by +R13bn. <i>Improved methodology:</i> Implemented an establishment approach to closely represent mining commodities.
Manufacturing (SIC 3)	+67	<i>Classification:</i> Improved reclassification where the main economic activity is manufacturing within the AFS, but partially offset by the reclassification of manufacturing trade services from manufacturing to trade.
Electricity (SIC 4)	-22	<i>Improved methodology:</i> Improved estimates of input cost structure from the SIS – Electricity, Gas & Water Supply (2013). Intermediate consumption increased by +R32bn and output increased by +R10bn in the 2015 base year.
Construction (SIC 5)	+4	<i>Improved methodology:</i> Improved estimates of the non-observed economy.
Trade (SIC 6)	+12	<i>Improved methodology:</i> Improved estimates of the non-observed economy. <i>Classification:</i> Reclassification of manufacturing trade services from manufacturing to trade.
Transport (SIC 7)	-11	<i>Data sources:</i> Improved estimates of intermediate consumption expenditure from the SIS – Transport and Storage, and the SIS – Post and Telecommunications (2013). Intermediate consumption increased by +R144bn and output increased by +R133bn in the 2015 base year. <i>Improved methodology:</i> Improved estimates of the informal sector. <i>Classification:</i> Reclassification of municipal transport trading entities from general government to the transport, storage and communication services industry as other scheduled passenger land transport.
Finance and business services (SIC 8)	+191	<i>Data sources:</i> Improved coverage of other business services (+R120bn) and computer and related services (+R40bn). <i>Improved methodology:</i> Improved estimates of owner-occupied housing (+R30bn).
Government (SIC 91)	-283	<i>Improved methodology:</i> Improved estimates of public education and health from general government. <i>Classification:</i> Reclassification of public education and health from general government to their respective industries based on data available from Vulindlela website and 2014 Government Finance Statistics.

Major division	Total change (R billion)	Main reasons for change from previous benchmark
Personal services (SIC 92–96)	+439	<p><i>Data sources:</i> Sewage and refuse disposal and sanitation (+R20bn) now includes local trading entities (+R12bn) (waste water and sewage activities) and improved coverage of sewage and refuse disposal and sanitation (+R8bn). Recreational, cultural and sporting activities (+R25bn) now includes municipal sport, recreation and environmental protection activities (+R5bn), all derived from the QFSM, and improved coverage of recreational, cultural and sporting activities (+R20bn).</p> <p><i>Improved methodology:</i> Non-observed economy increased (+R16bn) as a result of improved methodology for estimates of the informal sector and illegal activities. Education industry includes new estimates for private education based on HFCE. Improved methodology to move public education and health from general government to the education and healthy industries respectively.</p> <p><i>Classification:</i> Reclassification of public education and health from general government to their respective industries based on data available from Vulindlela website and 2014 Government Finance Statistics. The new estimates for the public and private education industry are R244bn higher compared with the previous estimate of private education only. The new estimates for the public and private health industry are R128bn higher compared with the previous estimate of private health only.</p>
Total value added	+357	
Taxes less subsidies	+14	<p><i>Improved methodology:</i> Improvement of tax information to be closer to an accrual basis</p>
Total gross domestic product (production approach)	+371	

Source: National Accounts: Sources and Methods, Report No. 04-04-04 (August 2021) – Statistics South Africa

ANNEX 7: IMPACT OF BENCHMARKING AND IMPROVED METHODOLOGIES (STATISTICS MAURITIUS)

GDP at current market prices, 2018 - 2021

Year	Before benchmarking (Rs M)	After benchmarking (Rs M)	Change (%)
2018	481,256	500,047	3.9
2019	498,254	511,991	2.8
2020	429,937	448,495	4.3
2021	465,144	480,511	3.3

Real GDP growth rate, 2018 - 2021

Year	GDP growth rate (%)		GVA growth rate (%)	
	Before benchmarking	After benchmarking	Before benchmarking	After benchmarking
2018	+3.8	+4.0	+3.6	+3.8
2019	+3.0	+2.8	+3.2	+2.9
2020	-14.9	-14.6	-14.7	-14.4
2021	+4.0	+3.6	+4.7	+4.2

Summary of changes in the main aggregates for the period 2018 to 2021

	Aggregates	Change	Remarks
(i)	Nominal GDP at market prices	Increase of 2.8% to 4.3% throughout 2018 to 2021	Increase mainly in nominal GVA
(ii)	Nominal GVA at basic prices	Increase of about R 13.1 billion	In 2018, benchmarking on the 2018 SUT account for around Rs 8.4 billion and improved methodologies about Rs 4.7 billion
(iii)	Real growth rate of GVA at basic prices	Moderate changes ranging from -0.5 to +0.3 percentage point, but trend is similar as previous series based on 2013 Census of Economic Activities	Positive growth in some sectors offsetting the negative growth in others
(iv)	Final consumption expenditure	Decrease of around Rs 3 billion between 2018 and 2019, and increase of about Rs 10 billion between 2020 and 2021	Mostly due to reconciliation with the 2018 SUT and integration of new data (2017 Household Budget Survey)
(v)	Investment	No significant change	The amount of capitalization of expenditure on software development is not significant.
(vi)	Savings rate	Increase of around 0.4 and 3.9 percentage points between 2018 and 2021	Mainly due to an increase in nominal GDP
(vii)	Investment rate	Modest changes ranging from -0.8 to -0.5 percentage point	No significant change in investment coupled with a sizeable increase in nominal GDP

Source: Statistics Mauritius, Economic and Social Indicators, National Accounts estimates (2018 – 2022), June 2022 issue