Concepts, Data Sources and Methods for Compiling Quarterly National Accounts Estimates

1. Concepts and definitions

The quarterly estimates have been compiled according to guidelines provided in the IMF manual entitled "Quarterly National Accounts Manual – Concepts, Data sources and Compilation", which is itself based on the System of National Accounts (SNA) of the United Nations and are therefore consistent with annual estimates of the National Accounts.

2. Sources of data

The objective of the Quarterly National Accounts (QNA) is to provide the best indication of quarterly movements. Indicators for QNA have therefore been chosen according to their ability to capture the movements in the performance of the various sectors.

The main sources of data for compiling QNA estimates include quarterly production accounts of various organisations, quarterly surveys on income and expenditure among enterprises considered as drivers in specific sectors, quarterly quantity produced, quarterly expenditure of Government from the Accountant General Department, quarterly data from administrative sources such as building permits from local government, foreign trade and VAT data from the Mauritius Revenue Authority, tourism receipts from the Bank of Mauritius, as well as some indirect indicators such as employment.

3. Methods used

When data on both output and input are available, the quarterly value added estimates are computed as the difference between the output and the intermediate consumption (inputs consumed in the process). When the quarterly output only is readily available or is compiled on the basis of quarterly data on quantity produced, the value added is computed using the production structure of the industry obtained at the latest Census of Economic Activities or from the latest annual production accounts available. When indicators on quarterly volume produced and price only are available, these are applied to the last quarterly value added figures to have the estimates for the quarter under review.

Constant price estimates exclude price effects of prices and therefore provide real growths. The constant price estimates are computed using the double deflation method for sectors where information on both inputs and outputs is available. In practice such data are difficult to obtain, hence 'proxy indicators' of volume changes are used if available, otherwise value series are deflated by an appropriate price index.

As recommended in the Quarterly National Accounts Manual, the Annual Overlap Technique has been used to derive constant quarterly estimates, instead of the traditional fixed-base year constant price estimates. This technique entails compiling estimates for each quarter at the weighted annual average prices of the previous year. The volume data of QNA are then chain-linked to obtain the constant price series.

4. Seasonal adjustment of quarterly Gross Domestic Product

Value added by sector and total Gross Domestic Product (GDP) have been seasonally adjusted and are published on the web site of the office. The methodology adopted in the seasonal adjustment exercise is briefly given below. Seasonally adjusted time series has historically been a common practice in analyzing business cycles. Currently this is widely used by a majority of statistical offices, central banks and policy analysts to describe and understand the most recent economic developments.

4.1   Procedures for seasonal adjustment of quarterly GDP

QNA data are subject to seasonal variations which are recurrent within a year pattern. For example, activities of "Wholesale and retail trade" are usually lowest in the first quarters, but highest in the fourth quarters in line with the high demand for consumption goods at the end of the year; activities of "Hotels and restaurants" are highest in the first and last quarters in line with high tourist arrivals during these quarters. For meaningful comparison of quarter to quarter growth, particularly for identifying turning points, the seasonal component must be removed from the data.

The procedures for carrying out the seasonal adjustment exercise are as follows:

(i)   The software, Demetra, developed by Eurostat and which includes the X-12 program has been used.

(ii)   Forward adjustment, instead of concurrent adjustment, has been used for quarterly series up to the most recently completed year, that is seasonal factors for the four quarters ahead are estimated using the X-12 procedure. When a new data point becomes available, the seasonally adjusted value of the new data point is obtained by dividing it by the appropriate forward factor if model is multiplicative or subtracting from it the appropriate forward factor if the underlying model is additive.

(iii)   The seasonal adjustment exercise has been reworked using data estimated up to the most recently completed year. In the light of the new seasonal factors, the seasonally adjusted growth rates have been revised.

(iv)   Direct adjustment of the aggregate Gross Value Added (GVA) has been used to obtain seasonally adjusted GVA.

(v)   Adjustments have been made so that the sums of quarterly seasonally adjusted data are equal to the original yearly totals.

It should be noted that different seasonal adjustment methods, no matter how carefully they have been implemented, do not always yield identical results if applied to the same time series. In addition, even if the same seasonal adjustment method is applied, there may be substantial revisions, particular towards the end of the time series, when new data are included in the calculation and taking account of possible shifts in the seasonal movements. Consequently, seasonally adjusted data remain provisional for longer than unadjusted figures, which are also subject to revisions.

5.   Data sources, methods and indicators used for the estimation of Quarterly National Accounts

The table below gives the data sources, methods and indicators used for the estimation of quarterly national accounts estimates at current and constant prices.

1. **Production Approach**

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
A. Agriculture, forestry and fishing			
Sugar Cane	- Annual production and price of sugar. - Survey of sugar factories for the quarterly cost structure.	- Final estimates: Based on the final annual production accounts. Annual gross output and intermediate consumption are allocated to quarters according to cost structure of cane growing furnished by surveyed sugar factories. The value added is thereafter derived. - Preliminary estimates: value added for the year based on expected production and price of sugar is quarterlised using the latest value added structure.	- Double deflation using Producer Price Index – Agriculture (PPI-A) for output and a weighted price index based on relevant components of the Consumer Price Index (CPI) for inputs. - Preliminary quarterly changes are based on the annual price deflator.
Tea	- Quarterly production and prices of tea from Tea Board. Benchmark ratios from Agricultural Cost of Production Survey (ACOPS 2005).	- Output based on quarterly production and prices. - Value added derived using the production structure obtained at the ACOPS 2005.	- Double deflation using relevant component of PPI-A for output and a weighted price index based on retail prices of relevant inputs for intermediate consumption (IC).
Food crops	- Monthly quantities of food crops from Food and Agricultural Research and Extension Institute (FAREI). - Retail prices through the monthly consumer price surveys. - Benchmark ratios from ACOPS 2005.	- Output is based on quarterly quantities of food crops produced and producers' price obtained from retail prices adjusted for transport and trade margins. - Value added derived using the production structure obtained at the ACOPS 2005.	- Double deflation using relevant component of PPI-A for output and a weighted price index based on retail prices of relevant inputs for IC.
Flowers	- Quarterly exports of flowers from Trade Statistics. An estimate is worked out for locally sold flowers, based on number of weddings, deaths, religious ceremonies, etc.	- Output is based on quarterly quantities produced and on producers' price obtained from retail prices adjusted for transport and trade margins - Value added derived using the production structure obtained at the ACOPS 2005	- Double deflation using relevant component of PPI-A for output and a weighted price index based on retail prices of relevant inputs for IC.
Fruits	- Monthly production of some fruits from FAREI. - Quarterly production of other fruits based on 2014 Census of Agriculture, supplemented with data from other sources. - Benchmark ratios from ACOPS 2005.	- Value added based on quarterly quantities produced and on producers' price obtained from retail prices adjusted for transport and trade margins.	- Deflation using component of PPI-A.

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
Livestock, Poultry and Related Products	- Quarterly production of poultry from survey among main breeders. - Monthly quantity of livestock slaughtered from the Mauritius Meat Authority (MMA) adjusted for illegal slaughtering. - Retail prices.	- Value added based on quarterly quantities produced and on producers' price derived from retail prices adjusted for transport and trade margins.	- Deflation using component of PPI-A.
Government Services	- Expenditure of Budgetary Central Government from the Accountant General Department. - Expenditure for Rodrigues from Rodrigues Regional Assembly (RRA). - Expenditure for Extra Budgetary Units (EBUs) and Local Government is estimated.	- Value added is estimated at cost, that is, it is equal to compensation of employees and consumption of fixed capital.	- Compensation of Employees is deflated using the annual wage rate index based on salary compensation. - Consumption of Fixed Capital is deflated using the quarterly Construction Price Index (for Construction items), Vehicle Price Index (for vehicles) and a combination of PPI and Import Price Index (IPI) (for machinery and equipment excluding vehicles).
Fishing	- Quarterly quantities of fish caught from the Albion Fisheries Research Centre (AFRC) Retail prices.	- Value added based on quarterly quantities of fish caught and producers' price derived from retail prices adjusted for trade margins.	Deflation by quarterly changes in the estimated producers' price based on retail prices.
B. Mining and quarrying			
Mining and Quarrying	- Quarterly quantities of salt produced and sand extracted, and their prices through surveys of establishments.	- Value added derived using data collected from quarterly surveys	- Deflation using appropriate component of CPI.
	- Quarterly Value Added Tax (VAT) data from the Mauritius Revenue Authority (MRA).	- Value added compiled from quarterly VAT data.	- Deflation using component of Producer Price Index – Manufacturing (PPI-M).
C. Manufacturing			
Sugar Milling	- Annual production and price of sugar. - Final annual production accounts. - Survey of sugar factories to have the quarterly cost structure.	- Final estimates: Based on the final annual production accounts; Annual gross output and intermediate consumption are allocated to quarters according to cost structure of sugar milling activities furnished by surveyed sugar factories. The value added is thereafter derived. - Preliminary estimates: value added for the year based on expected production and price of sugar. The estimate is quarterlised using the latest value added structure.	- Double deflation using PPI-A for output and a weighted price index based on relevant components of the CPI for inputs. - Preliminary quarterly changes are based on the annual price deflator.

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
Export Oriented Enterprises (EOE)	- Quarterly exports from Trade statistics. - Quarterly survey of establishments. - Level of stock from quarterly stock surveys - Quarterly turnover from VAT data.	- Quarterly value added based on quarterly gross output compiled from these sources and last annual technical ratio.	- Volume index by industry from Quarterly Index of Industrial Production (QIIP).
Non – EOE	- Quarterly exports from Trade Statistics. - Quarterly turnover from the VAT data. - Production of excisable goods from Customs and Excise Department - Quarterly survey of establishments. - Level of stock from quarterly stock surveys.	- Quarterly value added estimates based on quarterly gross output compiled from these sources and latest annual technical ratio.	- Volume index by industry from QIIP.
D. Electricity, gas, steam and air conditioning supply			
Electricity, gas and steam	- Quarterly production accounts from Central Electricity Board (CEB)	- Value added compiled from quarterly accounts.	- Volume based on quarterly quantity of electricity sold (All sales by CEB).
	- Quarterly production data of the Independent Power Producers.	- Value added derived from the value of electricity purchased by CEB and quarterly technical ratio of the previous year.	
E. Water supply; sewerage, waste management and remediation activities			
Water supply	- Quarterly production accounts from Central Water Authority (CWA)	- Value added compiled from quarterly accounts of CWA.	- Volume based on quarterly quantity of water sold.
Sewerage and waste management activities	- Quarterly VAT data.	- Value added based on quarterly VAT data.	- Deflation by appropriate component of CPI.
F. Construction			
Construction	- Monthly building permits from Municipalities and District Councils. - Quarterly capital expenditure estimates of General Government from Ministry of Finance, Economic Planning and Development (MOFEPD). - Maintenance expenditure by households from latest Household Budget Survey. - Administrative sources, eg. Economic Development Board.	- Quarterly output based on these sources and quarterly value added derived using the production structure obtained at the 2013 Census of Economic Activities (CEA).	- Deflation by quarterly Construction Price Index.

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
G. Wholesale and retail trade, repair of motor vehicles and motorcycles			
Wholesale and Retail Trade	- Quarterly imports from Trade statistics - Local production from Agriculture statistics and Industrial statistics	- For imported goods, gross output based on trade margins computed from quarterly imports. - For local production, gross output based on trends of production of food crops and production of the non-EOE sector (local consumption). - Value added derived using the production structure obtained at the 2013 CEA.	- Change in volume of imports derived by deflating imports by sector by relevant IPI components. - For local component, deflation by overall CPI.
Repair of motor vehicles and motorcycles	- Imports of spare parts. - Quarterly VAT data. - Road transport statistics (number of vehicles registered and number of accidents).	- Quarterly estimates based on imports of spare parts, changes in number of vehicles registered and number of accidents.	- Deflation by overall CPI.
H. Transport and storage			
Bus	- Quarterly production accounts of bus companies and bus fleet from National Transport Authority (NTA).	- Value added compiled from quarterly accounts.	- Double deflation using bus fare for output and relevant CPI components for inputs.
Taxi	- Quarterly licences of taxi cars from NTA. - Taxi fares from monthly consumer price surveys.	- Output based on the quarterly number of licences delivered and taxi fare. - Value added derived using the production structure obtained at the 2013 CEA.	- Double deflation using relevant CPI components for output and inputs.
Lorries	- Quarterly licences of lorries from NTA. - Lorry charges based on 2013 CEA.	- Output based on the quarterly licences of lorries. - Value added derived using the structure obtained at the 2013 CEA.	- Double deflation using relevant CPI components for output and inputs.
Water transport	- Quarterly number of passengers from Mauritius Shipping Corporation.	- The number of passengers and fares charged as per CPI are used to estimate quarterly output. - Value added is derived using the production structure obtained at the 2013 CEA.	- Volume based on number of passengers.
Air transport	- Quarterly receipts and expenditure from Air Mauritius Ltd.	- Value added compiled from quarterly accounts	- Double deflation using airfare index for output and relevant CPI components for inputs.
Services allied to transport	- Quarterly receipts and expenditure from Mauritius Ports Authority and Cargo Handling Corporation. - Quarterly indicators such as tourist arrivals and number of Mauritian travelling abroad.	- Value added compiled from quarterly accounts where available. - For other related activities, annual estimates are quarterlised using the quarterly indicators.	- Goods: Volume based on tonnage of goods loaded and unloaded. - Passengers: Volume based on quarterly indicators.

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
Storage	- Quarterly VAT data.	- Value added compiled from the quarterly VAT data.	- Changes in quarterly export of sugar and relevant components deflated by overall CPI
I. Accommodation and food service activities			
Accommodation and food service activities	- Quarterly tourist arrivals and passenger traffic from Tourism statistics. - Quarterly tourist earnings from Bank of Mauritius. - Expenditure on food and accommodation by tourists from Survey of Inbound Tourism.	- Output for tourist component derived from quarterly tourist earnings and proportion of output sold to tourists as observed in 2013 CEA. - For output of local component, annual estimates are quarterlised using the spending pattern observed in the 2012 Household Budget Survey. - Output for food contractors serving airplanes is derived from change in number of passengers departing by air and change in the CPI component measuring price of meals in bars and restaurants. - Value added is estimated using the production structure obtained from 2013 CEA.	- Volume based on number of tourist arrivals for tourist component. - Local component and food contractors are deflated by CPI component measuring price of meals in bars and restaurants.
J. Information and communication			
Telecommunication services	- Quarterly VAT data.	- Value added compiled from quarterly VAT data.	- Deflation by changes in the price of telephone calls.
Activities related to information and communication	- Quarterly VAT data.	- Value added compiled from quarterly VAT data.	- Deflation by overall CPI.
K. Financial and insurance activities			
Financial and insurance activities	- Quarterly surveys of banks, insurance companies and other financial institutions	- Value added compiled from quarterly accounts.	- Central Bank: Deflation using a wage rate index. - Banks and similar institutions: Deflation using changes in "FISIM rate" and inflation rate. - Insurance: Volume based on changes in the number of life and non-life insurance policies. - Financial leasing and other credit granting institutions: Price indicator in line with deflator of commercial banks. - Other financial institutions: Deflation using changes in exchange rates and local inflation rate.

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
L. Real estate activities			
Ownership of dwellings	- Number of housing units from Housing Census - Household budget surveys - Interest on housing loans from the Bank of Mauritius. - Stock of residential building - Building permits from local authorities	- Value added is compiled annually according to the User Cost Method based on: • an operating surplus calculated on interest rate on housing loans, • taxes paid on dwellings and • consumption of fixed capital (depreciation of the building). - The annual figure is then quarterlised.	- Volume based on net stock of residential buildings.
Other real estate activities	- Quarterly VAT data.	- This sector includes agencies involved in the sale or lease of property.	- Deflation by overall CPI.
M. Professional, scientific and technical activities			
Professional, scientific and technical activities	- Quarterly VAT data. - Trends in related sectors - Indirect indicators such as cases lodged in court.	- This sector covers the units which offer their services to different activities both onshore and offshore including own account professional workers such as lawyers, accountants, notaries , surveyors etc.	- Deflation by overall CPI.
N. Administrative and support service activities			
Administrative and support service activities	- Quarterly VAT data. - Trends in related sectors - Indirect indicators such as tourist arrivals	- This sector covers units engaged in rental and leasing activities, cleaning activities, travel agencies, call centers and other business support activities	- Deflation by overall CPI.
O. Public administration and defense; Compulsory social security			
Public administration and defence; Compulsory social security	- Expenditure of Budgetary Central Government from the Accountant General Department. - Expenditure for Rodrigues from RRA. - Expenditure for EBUs and Local Government is estimated.	- Estimates are made at cost, that is, Gross output = Value added (VA) + purchase of goods and services (IC) - Value added = Compensation of employees + consumption of fixed capital	- Compensation of Employees is deflated using the annual wage rate index based on salary compensation. - Consumption of Fixed Capital is deflated using the quarterly Construction Price Index (for Construction items), Vehicle Price Index (for vehicles) and a combination of PPI and IPI (for machinery and equipment excluding vehicles). - Goods and services are deflated using quarterly CPI.

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
P. Education			
Education (Public)	- Expenditures related to education (preprimary, primary, secondary and tertiary sectors) incurred by the different levels of the General Government (mainly Budgetary Central Government (BCG) and EBUs) are used to estimate value added, intermediate consumption and gross output of education in the public sector.	- Estimate are made at cost, that is, - Gross output = Value added (VA) + purchase of goods and services (IC) - Value added = Compensation of employees + consumption of fixed capital	- Compensation of Employees is deflated using the annual wage rate index based on salary compensation. - Consumption of Fixed Capital is deflated using the quarterly Construction Price Index (for Construction items), Vehicle Price Index (for vehicles) and a combination of PPI and IPI (for machinery and equipment excluding vehicles). - Goods and services are deflated by using quarterly CPI.
Education (Private)	- Annual data on enrolment from the Ministry of Education - Enrolment from private schools and Mauritius Institute of Training and Development (MITD) Percentage change in fees charged for private tuition estimated from the sub-index for "Education" obtained from the CPI Unit	- Private schools and MITD: annual output is divided by 4. - Private tuition fees: output based on ten months only (February to November and quarterlised accordingly.	- Volume based on enrolment statistics. - Deflation by CPI component.
Q. Human health and social work activities			
Health and social work activities (Public)	- Expenditure related to Health and Social Work incurred by the different levels of the General Government (mainly BCG and EBUs) are used to estimate value added, intermediate consumption and gross output of Health and Social Work in the public sector.	- Estimate are made at cost, that is, - Gross output = Value added (VA) + purchase of goods and services (IC) - Value added = Compensation of employees + consumption of fixed capital	- Compensation of Employees is deflated using the annual wage rate index based on salary compensation. - Consumption of Fixed Capital is deflated using the quarterly Construction Price Index (for Construction items), Vehicle Price Index (for vehicles) and a combination of PPI and IPI (for machinery and equipment excluding vehicles). - Goods and services are deflated using quarterly CPI.

Industry Group	Data Sources	Methods	Indicator – Constant Price Estimates
Health and social work activities (Private)	- Annual production accounts of clinics. - Quarterly data on admissions in clinics and hospitals from the Ministry of Health. - No. of private medical practitioners from the Ministry of Health. - Fees charged from monthly consumer price surveys.	- Annual value added for private health services is computed using available production accounts of clinics and supplemented with indicators on private practitioners. The estimates are quarterlised using quarterly data on admissions to clinics and hospitals.	- Deflation by CPI component.
R. Art, entertainment and recreation			
Art, entertainment and recreation activities	- Quarterly VAT data. - Quarterly data on government revenue from gambling and betting taxes.	- Includes gambling, sports, amusement and recreational activities - Quarterly gross output derived from VAT data. - Value added estimated using technical coefficients obtained from latest available annual final production accounts.	- Deflation by overall CPI.
S. Other service activities			
Other service activities	- Quarterly turnover from VAT data. - Demographic statistics such as births, deaths and marriages. - Tourist arrivals	- Includes activities of membership organizations, units engaged in repair of computers and household goods and other personal service activities - Quarterly gross output derived from VAT data. - Value added estimated using technical coefficients obtained from latest available annual final production accounts. - For companies not registered at the VAT: annual estimates are quarterlised using indirect indicators such as quarterly number of births, deaths, marriages, and tourist arrivals.	- Deflation by overall CPI.
T. Activities of households as employers, etc			
Private households with employed persons	- Number of employees based on number of household with domestic employees as collected in Household Budget Survey (HBS). - Wage Rate from monthly consumer price surveys.	- Annual estimate, based on the number of persons employed and average wage, is divided by 4.	- Deflation by wage increase due to salary compensation of every year.

2. Expenditure Approach

Type of expenditure	Sources and Methodology	Indicator – Constant Price Estimates
A. Final consumption expenditure		
Household	Annual estimates are quarterlised using Continuous Multi-Purpose Household Survey (CMPHS) and HBS structure adjusted for conceptual difference with national accounts.	- Deflation by CPI.
General Government	Final Consumption Expenditure for the General Government is equal to **Gross Output** (Compensation of Employees + Consumption of Fixed Capital + value of goods and services purchased) <u>less</u> sales of goods and services <u>plus</u> expenditure on social benefits in kind <u>plus</u> output of the Central Bank. Quarterly data for Budgetary Central Government is available from the Accountant General Department. Quarterly data for Rodrigues is available from the RRA's finance department. Quarterly data for EBUs and Local Government are estimated.	- Compensation of Employees is deflated using the annual wage rate index based on salary compensation. - Consumption of Fixed Capital is deflated using the quarterly Construction Price Index (for Construction items), Vehicle Price Index (for vehicles) and a combination of PPI and IPI (for machinery and equipment excluding vehicles). - Value of goods and services is deflated using quarterly CPI.
B. Gross fixed capital formation (GFCF)		
Building and construction		
Residential building	Quarterly investment in residential buildings based on quarterly data on floor area from building permits (with a lag of 1 quarter) and quarterly Construction Price Index, together with quarterly data from Economic Development Board (EDB), MOFEPD and other sources, and an estimate for projects for which no permit has been issued. The cost per unit of floor area has been revised in 2018 based on the last revision in the Construction Price Index.	- Deflation by quarterly construction price index.
Non-residential building and other construction work	Quarterly investment in non-residential buildings and other construction work based on quarterly building permits for non-residential buildings (with a lag of 1 quarter) and quarterly Construction Price Index, and quarterly data from EDB and MOFEPD (PSIP).	
Machinery and equipment		
Aircraft	Based on information provided by Air Mauritius Ltd and MOFEPD (PSIP).	- Exchange rate of the currency in which asset is purchased.
Marine vessel	Based on information provided by MOFEPD (PSIP) and from administrative sources.	
Transport equipment	Based on information on registered vehicles provided by NTA classified as final consumption expenditure or investment according to purchasers. For transport equipment for which no registration is necessary, imports statistics are used.	- Deflation by a vehicle price index
Other machinery and equipment.	Estimates are mostly based on quarterly Trade Statistics given that most of the machinery and equipment are imported. The imported machinery and equipment goods are brought to purchasers' prices by adding all duties and taxes, landing cost, transport cost and margins. Duties and taxes are available from MRA, landing cost from MPA while rates of transport and margin are based on the results of the 2013 CEA. Annual installation cost obtained through surveys is quarterlised according to the quarterly trend of concerned machinery. Local production of machinery is estimated from outputs of companies producing capital goods.	A weighted deflator based on separate deflators for "locally produced goods" and "imported goods". For the "locally produced goods" PPI components are used whilst for "imported goods" IPI components for "Machinery and equipment" excluding transport equipment are used to construct the deflators.

Type of expenditure	Sources and Methodology	Indicator – Constant Price Estimates
C. Exports and Imports of goods and services		
Exports and Imports of goods and services	Data available from the Quarterly Balance of Payments (BOP) of the Bank of Mauritius adjusted for import and export of FISIM. For import and export of goods, import and export price indices are used as deflators. For export of services, each component is deflated with concerned output deflators. For import of services, a combined index is compiled based on exchange rate and inflation of trading countries.	- Deflation using respective quarterly price indices.

3. Financial intermediation services indirectly measured (FISIM)

Item	Sources and Methodology	Indicator – Constant Price Estimates
Allocation of FISIM by sector	The quarterly figure of FISIM calculated from data available on deposits, loans and prevailing rates is distributed by sector following recommendation in SNA.	- Deflated by an overall FISIM deflator