

Note on the benchmark revisions and rebasing of South Africa's national accounts statistics

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Introduction

The outcome of the five-yearly benchmarking and rebasing of South Africa's national accounts statistics, jointly undertaken by Statistics South Africa (Stats SA) and the South African Reserve Bank (the Bank), is disseminated in this issue of the *Quarterly Bulletin*. In addition to the comprehensive revision of national accounts aggregates and time series data, the current revisions also reflect the incorporation of conceptual, methodological and classification changes following the partial implementation of the latest edition of the *System of National Accounts* (2008 SNA). Further to making revised and comparable data covering the period 2006 up to the third quarter of 2014 available in this publication, revised national accounts estimates for the years 1946 to 2014 will be published in a supplement to the March 2015 *Quarterly Bulletin*.

Comprehensive revisions to South Africa's national accounts statistics are typically done every five years in order to incorporate new or additional information that became available, to reclassify transactions where necessary and to rebase estimates at constant prices. Market developments and the concomitant emergence of new products and services furthermore continuously necessitate changes to compilation practices. The 2008 SNA provides an international standard macroeconomic statistical framework for this purpose and replaced the 1993 version of the SNA; both publications were compiled under the auspices of the United Nations, the European Commission, the International Monetary Fund (IMF), the World Bank and the Organisation for Economic Co-operation and Development (OECD).

The five-yearly comprehensive revisions differ from the regular annual national accounts revisions due to the scope of the changes being made and the length of the period to which the revisions apply. The most recent set of revisions drew upon information from all relevant censuses released by Stats SA during the period 2009 to 2014, a number of sectoral surveys and technical reports, and more detailed producer and consumer price information. Most notable were the 2010/11 *Income and Expenditure Survey of Households*; the results of the *Population Census* of 2011; the 2010 *General Household Survey*; various issues of the *Annual Financial Statistics* (AFS) survey; various issues of the *Quarterly Financial Statistics* (QFS) survey; the *South African National Survey of Research and Experimental Development* produced by the Centre for Science, Technology and Innovation Indicators (CeSTII) on behalf of the Department of Science and Technology (DST); technical reports from the Department of Agriculture, Forestry and Fishing; the *Abstract of Agricultural Statistics* for various years; and information sourced from the Department of Human Settlements.

The purpose of, and background to, benchmarking and rebasing

National accounts estimates are based on a variety of data sources differing in terms of accuracy, frequency, scope and level of detail. Short-term estimates are often based on trends derived from available indicators due to the lack of detailed source data.

The purpose of benchmarking is to review high-frequency data and statistics that tracked short-term developments in the economy in the base year (2010 in this instance) and to reconcile these developments with more accurate and detailed but less frequent data to determine a revised level in the base year on which future estimates could be based. The process is done based on nominal data and therefore affects all ratios that use the gross domestic product as the denominator.



Rebasing is the process whereby the reference year for the real or constant price estimates of national accounts aggregates is changed. The further the estimates are from the previous benchmark reference year, the more scope there is for the estimates to deviate from the actual situation as the pattern of the relative prices in the base period tends to become progressively less relevant to the economic situations of the later period over time. The base period will typically be considered as a fairly 'normal' year in the economy for which the required periodic data are readily available.

National accounts data at constant prices reflect changes in the volume or quantity of goods and services produced or utilised. The statistical procedure for measuring volume changes in a macroeconomic aggregate between a chosen base period and the current period consists of revaluing the aggregate in question in the current period at the prices that prevailed in the base period, and thereafter calculating the change between these two periods. This procedure eliminates the effects of price changes from the base period to the current period by recalculating the value of aggregate output and expenditure in terms of the prices of goods and services in the base period. The prices in the selected base period are therefore a factor in determining the real values of the different goods and services that are included in the total output and expenditure in other periods.

Relative values change over time because prices generally do not change at the same pace from one period to another. Shifts in relative prices may be brought about by changes in supply and demand that in turn reflect factors such as different rates of change in productivity in different industries, changes in the quality of products, technological advances, tax changes, international price movements and exchange-rate adjustments, and changes in tastes and preferences. To ensure that relative values, and therefore weighted average volume changes, approximate the current structure of the economy as closely as possible, base periods and weights have to be changed from time to time.

The shift in the base year changes the units (rand value) in which output and expenditure volumes are measured, and the difference in the level between the previously published and revised series primarily reflects the difference in the unit of measurement. For example, rebasing from 2005 prices to 2010 prices increased the level of real gross domestic product, essentially reflecting the increase in the level of prices from 2005 to 2010. It does not indicate an increase of the same magnitude in the output or expenditure volumes.

The new constant price series, with 2010 as the base year, have been recalculated from 2006 onwards. This allows for changes in the growth rates on account of changes in the weighting structure (as a result of adjustments to nominal data and deflated by new or re-indexed deflators), while at the same time ensuring that the weights used in the measurement of changes in real national accounts aggregates between 2005 and 2010 reflect reasonably closely the relevant new price and quantity structure for this period. The previously estimated series expressed in terms of constant 2005 prices have been retained for the period up to 2006 and have been linked to the new series without being reweighted. However, due to the magnitude of some revisions, it was necessary to allow for a gradual phasing-in period prior to 2006 to accommodate the underlying revisions to certain aggregates. This implies that in those cases, the growth rates at constant prices before 2006 could change accordingly.

In order not to disturb the previously identified growth patterns in volume series up to 2006, subtotals and totals up to 2006 have been converted to 2010 prices independently of their components. Consequently, these converted subtotals and totals for periods before 2006 are not equal to the sum of their components. This means that the constant price figures do not aggregate in an accounting sense, with the difference being reflected in the residual.

Changes that will affect South Africa's national accounts statistics following the partial implementation of the 2008 SNA and other methodological changes

In the context of a set of internationally agreed concepts, definitions, classifications and accounting rules, the SNA provides a conceptual framework for compiling a coherent, consistent and integrated set of macroeconomic accounts. National accounts statistics compiled in accordance with these guidelines are used for analysing and evaluating economic performance, research and policy formulation. As indicated in the attached table, roughly 1,2 per cent of the total change of 2,8 per cent in the level of the gross domestic product in 2010 could be attributed to the partial implementation of the 2008 SNA.

Table 1 Reasons for changes to the 2010 level of nominal gross domestic product

	R billions	Percentage of 2010 GDP
Level of 2010 gross domestic product before revisions.....	2 673,77	100,0
<i>Plus: Implementation of 2008 SNA</i>		
Research and development	16,47	0,6
Gross fixed capital formation.....	13,33	0,5
Consumption of fixed capital.....	3,14	0,1
Weapon systems	8,47	0,3
Consumption of fixed capital.....	8,47	0,3
Livestock	2,47	0,1
Gross fixed capital formation.....	2,47	0,1
FISIM	5,72	0,2
Final consumption expenditure	5,72	0,2
Total, 2008 SNA implementation	33,13	1,2
<i>Plus: Enhanced measurement of economic activity</i>	41,11	1,6
<i>Equals: Level of 2010 gross domestic product after revisions.....</i>	2 748,01	102,8
<i>Memo: Impact of overall revision.....</i>	74,24	2,8

FISIM: Financial intermediation services indirectly measured

The revision of the SNA was a significant step forward in the modernisation of national accounts statistics and the underlying and related accounting and statistical systems, which are designed to improve measurement of an increasingly globalised economy in an integrated and consistent framework. Although the 2008 SNA retains the basic approach and statistical framework as captured by the 1993 SNA, a number of enhancements were introduced to facilitate improved measurement and analysis in a changing global economic environment. Major changes resulting from the implementation of the 2008 SNA include the following:

– Research and development

In the 1993 SNA, spending on research and development (R&D) was treated as intermediate consumption. Intermediate goods and services are used only once whereas capital assets could be used repeatedly in production processes year after year. The 2008 SNA recognises that because the output of R&D is an intellectual property product that is long-lasting, is used repeatedly in production, and provides benefits to its owners, it should therefore be included in capital formation. Investment spending on R&D as a capital asset contributed 0,5 percentage points to the total change in gross domestic product while 0,1 percentage point resulted from consumption of fixed capital on these assets.



– Information, computer and telecommunications (ICT) equipment and computer software

Capital outlays on computer hardware and software were previously included under the broader heading of 'computers and related equipment'. Outlays on these items have now been split between information, computer and telecommunications equipment and computer software, with no material impact on either total gross fixed capital formation or gross domestic product.

– Capitalisation of military weapon systems

According to the 1993 SNA, purchases of military weapon systems were treated as consumption expenditure by general government. The 2008 SNA recommends that spending on military weapon systems, such as warships, military aircraft, tanks and missile carriers be classified as fixed assets. This change recognises that weapon systems are long-lasting assets that may be used for activities that provide defence services, including deterrence and which have value on the government's balance sheet. As a result, gross domestic product was boosted by the consumption of fixed capital on weapon systems, and the acquisition of the systems has been reclassified from final consumption expenditure by general government to a number of asset categories in total gross fixed capital formation. Consumption of fixed capital on these assets contributed 0,3 percentage points to the total change in the level of gross domestic product in 2010.

– Cultivated biological resources

The aggregate amount recorded for cultivated biological resources included in total gross fixed capital formation took account of the reclassification of capital expenditure on tree, crop and plant resources yielding repeat products which were previously classified as construction works, as well as the creation of a new capital asset, namely animal resources yielding repeat products. The latter capital asset includes animals whose natural growth and regeneration are under the direct control, responsibility and management of institutional units. New data include breeding stocks of dairy cattle and sheep and contributed just more than 0,1 percentage point to the change in the 2010 level of gross domestic product.

– Financial intermediation services indirectly measured

The 2008 SNA proposes that financial intermediation services indirectly measured (FISIM) be refined to also include non-bank financial intermediaries. Previously, FISIM applied only to deposits received and loans extended by the banking sector. By expanding this calculation, roughly 0,2 percentage points were added to the level of gross domestic product in 2010.

– Other methodological changes

Other methodological changes affecting the national accounts statistics include the following:

- The capitalisation of low-cost housing has been revisited since the early 1990s. Improved estimates for these assets were accordingly incorporated into the balance sheet of the household sector. These assets will be subject to a depreciation period of 30 years.
- Total consumption of fixed capital and the capital stock were affected by the alignment of the depreciation period of residential buildings to international best practice, adopting 75 years rather than 50 years as the average lifespan.

Table 2 indicates the lifespans of the various asset classes identified in gross fixed capital formation. These have been revised in the case of residential buildings and provision has been made for the newly introduced asset classes as part of the implementation of the 2008 SNA.

Table 2 Changes in lifespans of different asset classes in gross fixed capital formation

Component	Before benchmarking revisions	After benchmarking revisions
	Years	
Residential buildings		
Low-cost housing.....	50	30
Other housing	50	75
Non-residential buildings.....	50	50
Construction works		
Government sector.....	80	80
Public corporations.....	25	25
Mining sector, not included elsewhere	30	30
Other sectors	50	50
Mineral exploration	Not included	30
Transport equipment	8	8
Machinery and equipment		
Public corporations involved in mining or electricity production	16	16
Manufacturing sector.....	8	8
Other sectors	10	10
Computers	5	5
Livestock.....	Not included	6
Research and development	Not included	10
Military weapon systems.....	Not included	30
Tree, crop and plant resources	25	25
Transfer cost.....	50	75

- Capital outlays on mineral exploration were reclassified and shown as a separate asset class in gross fixed capital formation. These expenses were previously categorised as part of construction works.
- Similar to other types of financial services, the output of non-life insurance services is also estimated as premiums earned *plus* premium supplements *less* claims. In accordance with the 1993 SNA, the recommended treatment reflected the difference between premiums paid and claims accrued – a calculation that often led to irrational volatility in the output of insurance services. The 2008 SNA instead recommends that the calculation be based on a more steady measure of adjusted claims and adjusted premium supplements incurred. As a result, the compilation method of the output of non-life insurance services, reinsurance and direct insurance services was aligned with the methodology proposed in the 2008 SNA; the treatment of reinsurance services was also brought into line.
- The implementation of the *Balance of Payments and International Investment Position Manual*, Sixth Edition (BPM6), as discussed in a further note in this *Quarterly Bulletin* has also resulted in enhanced estimates of national accounts aggregates, particularly those related to the external sector.

Changes due to comprehensive revisions

As previously mentioned, the current revision of national accounts statistics was conducted in close co-operation between Stats SA and the Bank. Stats SA focused on the re-estimation of the gross domestic product at current and constant prices using the production approach, whereas the Bank was responsible for the revision of the gross domestic expenditure at current and constant prices, as well as for the revision of South Africa's national and institutional sector accounts. In addition, the National Department of Agriculture was mainly responsible for re-estimating the output of and intermediate, capital and other expenditure incurred by the agricultural sector.

Revision of gross domestic product

The underlying contributions by kind of economic activity to total gross value added for the 2005 and 2010 benchmark estimates are presented in Table 3. Revisions, such as the incorporation of R&D and the allocation of FISIM among the various sectors of the economy, affected the relative weights of the aggregates accounting for total value added at current prices. As a result, the weights applied to extrapolate the base-year estimates of gross value added at basic prices and at constant prices in 2010 differed somewhat from the weights that were used when the base year was fixed at 2005 prices.

Table 3 Contribution of gross value added by kind of economic activity to total value added at basic prices

Per cent

Sectors	2005 base year	2010 base year
Primary sector	10,2	11,9
Agriculture	2,7	2,6
Mining	7,6	9,2
Secondary sector	23,6	20,9
Manufacturing	18,5	14,4
Electricity, gas and water	2,4	2,7
Construction	2,8	3,8
Tertiary sector	66,2	67,2
Trade, catering and accommodation	13,9	14,9
Transport, storage and communication	10,0	9,2
Financial and business services	21,1	21,0
Government	14,9	16,2
Other services	6,3	6,0
Total	100,0	100,0

* Totals may not add up due to rounding

A comparison of the contribution of the various sectors of economic activity to total gross value added at basic prices in 2005 and in 2010 shows some noteworthy differences in the relative weights of particular sectors in the two base-year periods:

- The primary sector's contribution to gross value added at current prices increased from just more than 10 per cent in 2005 to about 12 per cent in 2010, mainly due to an increase in the contribution of the mining sector which was, in turn, partly affected by a change in the weights of the different mining products when rebased to 2010.

- By contrast, the contribution of the secondary sector to total value added shrank from 23,6 per cent in 2005 to 20,9 per cent in 2010. Increases in the relative contributions of both the electricity, gas and water and the construction sectors were more than offset by a decline in the contribution of the manufacturing sector from 18,5 per cent in 2005 to just more than 14 per cent in 2010.
- The contribution of the services sector to total value added increased from 66,2 per cent in 2005 to 67,2 per cent in 2010. This was the net result of increases in the contributions of both the commerce and general government sectors which more than neutralised decreases in the contributions of the transport, storage and communications sector; the finance, insurance, real-estate and business services sector; and the other services sector. The revised increased size of the value added by the general government sector was brought about by a sharp rise in consumption of fixed capital charges on weapon systems which were capitalised according to the recommendations of the 2008 SNA.
- Table 4 presents the changes in the average annual real growth rates between 2006 and 2013 measured at 2010 prices compared with the average growth over the same period at 2005 prices. Growth in real gross domestic product was revised slightly downwards. The average annual rate of increase between 2006 and 2013 was estimated at 2,5 per cent at 2010 prices compared with a rate of 2,7 per cent estimated at 2005 prices. The real value added by the primary sector estimated at 2010 prices showed no growth compared with a rate of 0,2 per cent at 2005 prices. The real output of the agricultural sector increased, while the negative growth in mining output was maintained at a rate of 0,9 per cent measured at both 2005 and 2010 prices. Real value added by the secondary sector increased slightly faster on the new basis with its average growth rate rising from 1,6 per cent measured at 2005 prices to 1,7 per cent at 2010 prices. This essentially reflected higher growth in the real value added by the construction sector measured at 2010 prices. Growth in the real value added by the manufacturing sector registered a slower pace on the new basis, while that of electricity, gas and water remained unchanged. The pace of increase in the real value added by the tertiary sector was maintained at an annualised rate of 3,3 per cent measured at both 2005 and 2010 prices. Higher growth in the commerce and general government services sectors offset somewhat slower growth in the real value added by the transport, storage and communications, and the finance and other services sectors when measured at 2010 prices.

Table 4 Growth in real gross domestic product by kind of economic activity between 2006 and 2013

Per cent		
Sectors	Compound annual rates at 2005 prices	Compound annual rates at 2010 prices
Primary sector	0,2	0,0
Agriculture.....	3,0	3,2
Mining	-0,9	-0,9
Secondary sector	1,6	1,7
Manufacturing	1,2	1,1
Electricity, gas and water.....	0,1	0,1
Construction.....	5,2	5,6
Tertiary sector	3,3	3,3
Trade, catering and accommodation	2,7	2,8
Transport, storage and communication	3,0	2,8
Financial and business services	4,1	3,6
Government	3,4	3,9
Other services	2,2	2,1
Total	2,7	2,5



Revisions to the components of gross domestic expenditure

Revisions to the components of gross domestic expenditure were informed by the outcome of the previously mentioned sources, a thorough analysis of certain components of households' consumption expenditure, and of the income and expenditure of general government at all levels, including audited information that became available, and the incorporation of additional information pertaining to gross fixed capital formation and the book value of inventories as outlined below.

Table 5 Contribution of expenditure components to total gross domestic product

Per cent

Components	2005 base year	2010 base year
Final consumption expenditure		
Households	63,1	59,0
General government	19,5	20,2
Gross fixed capital formation	16,8	19,3
Change in inventories	1,2	0,2
Gross domestic expenditure		
Exports of goods and services.....	27,4	28,6
Imports of goods and services.....	27,8	27,5
Residual	0,0	0,0
Gross domestic product.....	100,0	100,0

The revised estimates of final consumption expenditure by households were based on data obtained from, among others, the 2010/11 *Income and Expenditure Survey of Households*, the 2011 *Population Census* results; financial reports of companies; information from the National Gambling Board, Bureau of Market Research, the Federation of governing bodies of South African Schools (FEDSAS), the National Association of Automobile Manufacturers of South Africa (NAAMSA); and results of special research projects undertaken by the Bank in respect of medical aid schemes.

All subcategories of household expenditure were revised. The extent of the revisions varied from relatively insignificant to fairly substantial in the case of certain categories. Marginal changes were made to estimates in the new benchmark period by factoring in additional information regarding gambling, social protection, veterinary and other services for pets, and small tools and accessories for the house and garden, in line with the classification of individual consumption by Purpose (COICOP) reference classification.

As indicated in Table 6, the average annual rate of growth in real outlays on final consumption expenditure by households moderated from 3,1 per cent calculated at 2005 prices to 2,9 per cent measured at 2010 prices in the period between 2006 and 2013. The slower pace of increase was more pronounced in 2008 and 2009 when growth rates of 2,2 per cent and -1,6 per cent were re-estimated as 1,0 per cent and -1,8 per cent respectively. As a share of gross domestic product, final consumption expenditure by households declined from 63,1 per cent in the 2005 base year to 59,0 per cent in 2010.

Table 6 Growth in real expenditure on gross domestic product by main expenditure component, 2006 to 2013

Per cent

Components	Annualised growth rates at 2005 prices	Annualised growth rates at 2010 prices
Final consumption expenditure		
Households	3,1	2,9
General government	4,1	3,7
Gross fixed capital formation	4,7	4,5
Change in inventories (R billions)*	3,44	10,31
Gross domestic expenditure	3,2	3,1
Exports of goods and services	0,9	1,0
Imports of goods and services	3,1	2,9
Gross domestic product	2,7	2,5

* Average annual change in R billions at constant prices

Consumption expenditure by general government was revised in accordance with the latest available information on current expenditure by general government at national, provincial and local government level. A notable methodological change was incorporated in the estimation process of the compensation of general government employees on both nominal and constant price basis. Building block data in this area, such as cash payments, are quite volatile from quarter to quarter. Recognising the continuity in most government services and relative stability in government employment and underlying spending on salaries and wages, an estimation process to adjust for accrual accounting through smoothing the data was accepted. Quarterly data on nominal salaries and wages were smoothed by using a five-term Henderson filter. The deflation process to obtain a measure of the volume of services rendered by government employees was enhanced by distinguishing between the various categories of government employees and their respective average salary levels, rather than using the overall headcount only. Data were also smoothed by using a five-term Henderson filter. Special adjustments were made to factor in events such as strikes and short-term employment in the government sector related to elections and the population census.

In addition to the methodologically enhanced estimation of salaries and wages in calculating final consumption expenditure by general government, other changes affecting this component include the following:

- General government consumption expenditure on non-wage goods and services was balanced with disaggregated data as published by Stats SA for full fiscal years.
- Data for business enterprises were removed from the statistics of local government with effect from 2007 to improve the measurement of the general government services rendered by local government.
- Spending on weapon systems, previously included in non-wage goods and services, was excluded together with expenditure on R&D.
- Increases in the consumption of fixed capital followed the capitalisation of expenditure on weapon systems and R&D.
- Provision for FISIM and a portion of the output of the central bank was added to the expenditure on non-wage goods and services.

Consequently, final consumption expenditure by general government increased from 19,5 per cent of gross domestic product in the 2005 base period to 20,2 per cent in 2010, even



though average growth in real aggregate final consumption expenditure by general government was revised downwards for the period between 2006 and 2013 from 4,1 per cent per annum calculated at 2005 prices to 3,7 per cent measured at 2010 prices.

The revised estimates of gross fixed capital formation originated mainly from the partial implementation of the 2008 SNA.

- R&D was added as a new asset type to each sector of economic activity. Information was compiled by using source data from the South African *Survey of Research and Development* produced by CeSTII on behalf of the DST. The distribution between the sectors was based on data obtained from the QFS and AFS published by Stats SA.
- The category animal resources yielding repeat products was added to capital expenses. Data were obtained from the Department of Agriculture, Forestry and Fishing.
- The level of capital expenditure by the finance and real-estate sector increased as the capitalisation of low-cost housing was revisited from the early 1990s.
- Capital expenditure on mineral exploration was reclassified and shown separately as gross fixed capital formation. Tree, crop and plant resources currently form part of cultivated biological resources. These outlays were previously classified as construction works.
- Capital outlays on ICT equipment and on computer software are now shown separately as individually classified capital assets.
- Spending on weapon systems, previously treated as consumption expenditure by general government, was classified as fixed assets.

Real outlays on gross fixed capital formation were revised slightly downwards. In the period 2006 to 2013, the average annual rate of increase was estimated at 4,5 per cent at 2010 prices compared with a rate of 4,7 per cent estimated at 2005 prices. Growth rates of -4,3 per cent in 2009 and -2,1 per cent in 2010 were revised to -6,7 per cent and -3,9 per cent respectively. Gross fixed capital formation as a percentage of gross domestic product increased from 16,8 per cent in 2005 to 19,3 per cent in 2010.

The incorporation of improved statistics on the book value of inventories as sourced from the AFS and QFS published by Stats SA, as well as information from financial statements of companies, resulted in somewhat higher estimates of inventory investment at current prices over the period 2006 to 2013. At constant prices, the average annual level of change in inventories at 2005 prices amounted to R3,4 billion over the period and to R10,3 billion measured at 2010 prices.

Conclusion

The main thrust of the SNA has stood the test of time, with gradual enhancement to cater for a changing world. It is trusted that the incorporation of key changes proposed in the 2008 SNA and the results of the general benchmarking, revision and rebasing of the national accounts in South Africa, as released on 25 November 2014 by Stats SA and in this issue of the *Quarterly Bulletin*, will serve the users of macroeconomic data on South Africa well.

References

Prinsloo, J W. 1999. Revisions of South Africa's national accounts. *Quarterly Bulletin*, June. Pretoria: South African Reserve Bank.

South African Reserve Bank. 1999. South Africa's national accounts, 1946-1998: An overview of sources and methods. *Supplement to the Quarterly Bulletin*, June. Pretoria: South African Reserve Bank.