

CONSTRUCTING A NEW BENCHMARK FOR CAMBODIAN NATIONAL ACCOUNTS

Documentation of process
and results



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This study documents the context and process of constructing the supply and use table of Cambodia to develop a new benchmark for producing national accounts statistics.

The study is one of a series of five on successful statistics development initiatives implemented as part of the Regional Programme on Economic Statistics in Asia and Pacific. The studies are intended to inspire and support other countries that may wish to replicate the initiatives in their own national context.

The study has been prepared by the National Institute of Statistics (NIS) of Cambodia and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) with funding support by the United Kingdom Foreign, Commonwealth and Development Office (previously Department for International Development).

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Acronyms

BOP	Balance of Payments
CEC	Cambodia Economic Census
CIES	Cambodia Intercensal Economic Survey
CSES	Cambodia Socio-Economic Survey
DFID	Department for International Development of the United Kingdom
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
GFS	Government Finance Statistics
GVA	Gross Value Added
ISIC	International Standard Industrial Classification of All Economic Activities
MAFF	Ministry of Agriculture, Forestry, and Fisheries
MEF	Ministry of Economics and Finance
NAD	National Accounts Department
NCPA	National Classification of Products by Activity
NIS	National Institute of Statistics
RPES	Regional Programme for Economic Statistics
SNA	System of National Accounts
SUT	Supply and Use Tables
TA	Technical Assistance

I. EXECUTIVE SUMMARY

Until recently, Cambodia's Gross Domestic Product (GDP) has been estimated using a benchmark from the year 2000 – a time when the structure and size of the national economy was vastly different from today. Recognizing the limited experience, capacity and resources, the National Institute of Statistics (NIS) of Cambodia requested the assistance of United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) to compile their new benchmark national accounts. Under the Regional Programme on Economic Statistics (RPES), ESCAP engaged an international expert to support Cambodia in revising the GDP. Drawing from a range of available survey and administrative data sources from 2014, and following the expert's advice, NIS produced the 2014 Supply and Use Tables (SUTs) that enabled the estimation of the new benchmark GDP for Cambodia.

The new benchmark GDP and sectoral estimates showed increased value of production across sectors in 2014. Early findings suggest the results represent a more reflective picture of the economic production in Cambodia than were previously available and captured in the 2000-based GDP estimates. It should be noted, however, that the final tables have not been released and are still undergoing review and validation.

Cambodia's national accounts are now aligned with the latest international standards and recommendations: the 2008 System of National Accounts (SNA) and the International Standard Industrial Classification of All Economic Activities (ISIC, Revision 4). The initiative has provided not

only a more reflective economic statistics for Cambodia but has considerably strengthened the capacity of NIS. Staff are now trained and experienced in producing SUTs, and once reliable and accessible data sources become available and are confirmed, they will be able to regularly compile and review this approach to ensure the GDP estimates remain as accurate as possible.

Countries who plan to develop new benchmarks using supply and use tables framework can hopefully benefit and be inspired by the approach taken in Cambodia. The skills and lessons learned include application of international best practices at the national level, and the use of advanced features of MS Excel for efficient data management, including preparation, estimation, compilation and production. Recommendations from NIS emphasise the importance of conducting regular household and economic surveys and securing easy access to administrative data sources.

II. BACKGROUND AND CONTEXT

Gross Domestic Product (GDP) is a measure of the value of the economic activity in a country. According to international standards, estimates of GDP should be made where the transactions involved are accurately recorded in censuses, surveys or administrative systems. These sources of data should include informal and even illegal activities (such as smuggling goods, and the production output of unregistered businesses) as well as the imputed value of rent of owner-occupied dwellings. Only services produced by households for their own use (such as childcare or meal preparation) are not included as economic production.

Prior to the implementation of the project, estimates of Cambodia's GDP were compiled with 2000 as benchmark. To the extent possible, the previous benchmark used data from census, surveys and/or administrative systems for the year 2000. In some cases, data for other years were used as proxy indicators. Cambodia has undergone considerable development since then and estimates from the 2000 benchmark no longer reflect the current structure of the economy.

Since 2000, much change has taken place. Buildings, bridges and roads have been constructed. Commodity prices have increased over time, especially the price of land, housing units, and other real estate-related structures. Many rural villages have been reclassified as urban villages because of their rapid economic

development. Paddy farms and ponds have become factories, supermarkets, markets, or commercial and residential buildings. Due to this substantial development, the year 2000 data could no longer accurately capture the reality of the national economy and updating of the 2000 benchmark to a more recent year was necessary.

Updating the benchmark for Cambodia was also an opportunity to implement the most recent international standards set out in the 2008 SNA and the latest industrial classification (ISIC, Revision 4), which had been used in the 2011 Cambodia Economic Census (CEC), 2014 Cambodia Intercensal Economic Survey (CIES), and 2014 Cambodia Socio-Economic Survey (CSES): all key sources for estimating the new GDP benchmark.

III. SUPPLY AND USE TABLE: THE BASIC FRAMEWORK

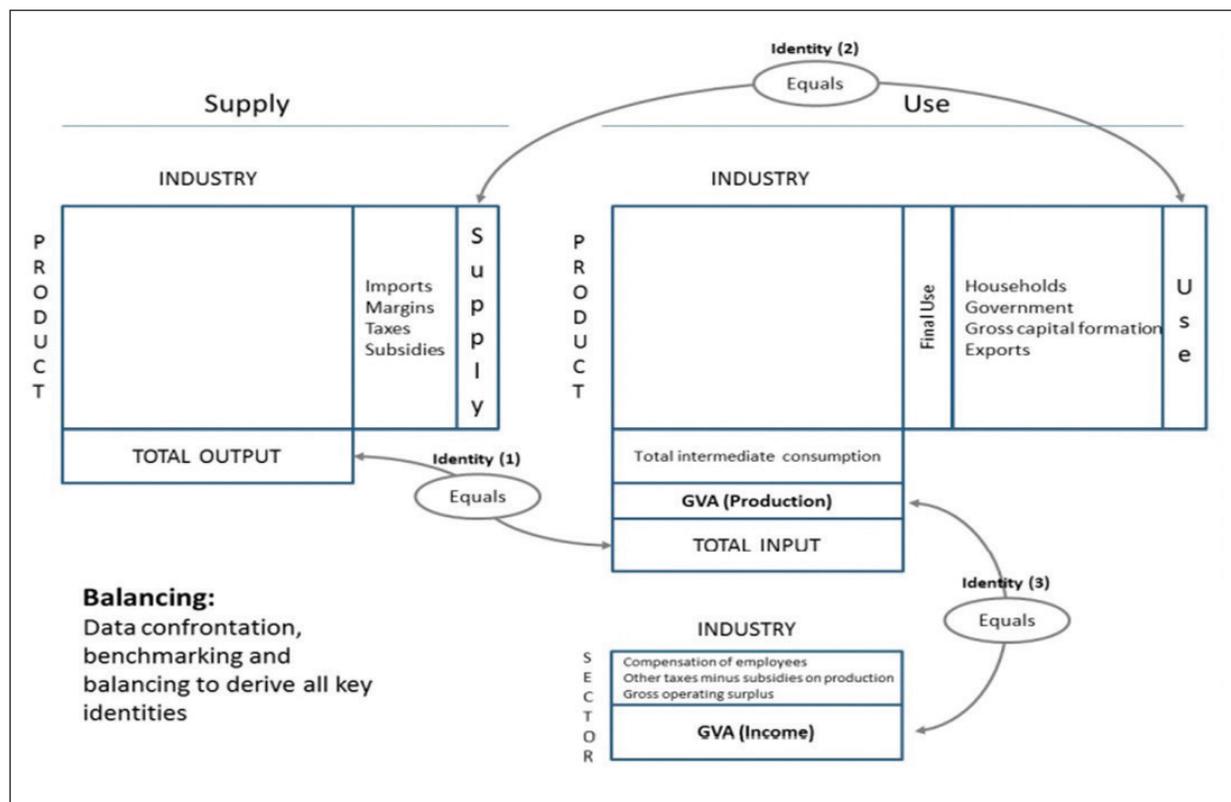
The SUT framework is an integrated framework that allowed national accounts compilers at the NIS to assemble data on the Cambodian economy from all available sources. These data were classified into resources (supply) and demand (uses), which facilitated the assessment of data consistency (from input to output). The framework allowed NIS data compilers to identify imbalances in some products or industries and find ways to balance them. When values of all products or industries were balanced in the 2014 SUT, a new benchmark GDP for Cambodia became available for the same year.

Why use SUT?

SUTs are an integral part of the 2008 SNA: the international standard for producing national accounts.³ They are the central framework for the compilation of a single and coherent estimate of GDP by integrating all the components of production, income and expenditure approaches, as well as providing key links to other parts of the SNA framework. SUTs simply describe how products (goods and services) are brought into an economy (either as a result of domestic production, or imports from other countries), and how those same products are used, which includes intermediate consumption, household final consumption, non-profit institutions serving households, general government final consumption, gross capital formation and exports. They link to the components of Gross Value Added (GVA), industry inputs and industry outputs. These inter-linkages or inter-dependence among industries facilitate data confrontation and harmonization. They integrate data on goods and services obtained from different statistical sources such as business surveys, household surveys and administrative data, within a single detailed framework (Figure 1).

3 Handbook on Supply Use and Input-Output Tables with Extensions and Applications, United Nations, New York, 2018, p3.

Figure 1. Overview of Supply and Use Tables



Operationalizing the SUT framework for Cambodia

A full SUT framework consists of a complex set of three tables, the Supply Table, the Use Table, and the Gross Value Added (GVA) Table. These tables can be split into five major parts (Figure 2). The key feature of an SUT is the balance between the supply and use of individual products. In each row, total supply must equal total demand. At the same time, the total output of each activity must equal the sum of the inputs (intermediate consumption) of goods and services (IC) and the gross value added (GVA).

Figure 2. The Supply and Use Tables and its parts

PRODUCTS	DOMESTIC OUTPUT								Total output	Imports of gds & servs	Margins	Taxes on products	Total supply
	ACTIVITIES												
	A	B	C	D	E	F	G	H	etc				
TOTAL	PART A												
A1	PART D								PART B				
A2													
A3													
A4													
A5													
B0													
C1													
C2													
C3													
C4													
C5													
C6													
C7													
C8													
etc													

Total demand	INTERMEDIATE CONSUMPTION								Total IC	Final consumption House-holds	Government	Capital forma-tion & servs	Exports of gds
	ACTIVITIES												
	A	B	C	D	E	F	G	H	etc				
	PART A												
	PART C								PART B				
GROSS VALUE ADDED													
TOTAL	PART A												
Compens of employees	PART E												
Other productn taxes													
Gross operating surplus													
Mixed income													

	PART A: Production accounts
	PART B: Commodity flow balances
	PART C: Intermediate consumption matrix
	PART D: Make matrix
	PART E: Generation of income

In preparing the benchmark SUT of Cambodia, the SUT was divided into five main parts as shown in Figure 2. Part A corresponds to production accounts and for each activity consists of the totals for domestic output, the intermediate consumption, and the gross value added. Part B on the other hand, is the commodity flow balances and comprises of a set of summary supply-use balances for each product with no details of activity. Part C is the intermediate consumption matrix, in which all the enterprises in each activity are split up into all the different raw materials and other goods and services that they consume in the production process.

Part D is called the make matrix, showing the products produced by the enterprises classified to each activity. This matrix is predominantly a diagonal one and can be assumed to be so, without much loss of accuracy. In other words,

this means for example that (within the rows) the great majority of agricultural products are produced by businesses whose main activity is agriculture. Also, (within the columns) almost all products produced by businesses whose main activity is agriculture are agricultural products. Part E refers to the generation of income account shows the types of primary incomes and the sectors, sub-sectors or industries in which the primary incomes originate, as distinct from the sectors or sub-sectors destined to receive such incomes⁴. For the new benchmark SUT of Cambodia, Parts D and E were not compiled as the detailed information needed to do so was not available. Nevertheless, the exclusion of these parts was considered not too critical for Cambodian SUTs as most off-diagonal matrices would be empty.

4 OECD Glossary of Statistical Terms - Generation of income account Definition, <https://stats.oecd.org/glossary/detail.asp?ID=1103>

IV. COMPILING THE NEW BENCHMARK NATIONAL ACCOUNTS FOR CAMBODIA: STAGES AND PROCESSES

In November 2016, NIS requested ESCAP to support the construction of new benchmark. The collaborative project between NIS, ESCAP and Statistics Sweden comprised eight major stages as described in Figure 3.

Stage 1. Preparatory work.

Establishing partnership with stakeholders and experts. The staff in the National Accounts Department (NAD) of the National Institute of Statistics (NIS) Cambodia has limited knowledge and experience in constructing the new benchmark for GDP compilation. Hence, in November 2016 they requested technical assistance (TA) from the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). In response, ESCAP established a TA project under the RPES funded by the United Kingdom Foreign, Commonwealth and Development Office (previously Department for International Development).

Setting-up the team and preparing of workplan with milestones. A project team was established in 2017 comprising the “experts’ team” from Statistics Sweden, ESCAP consultant and the national team from the NAD of the Cambodian NIS. The experts’ team in collaboration with NAD, set-up the project programs, assigned tasks to NAD and guided them while implementing the tasks. The experts’ team also monitored, evaluated, and provided expert judgement in the final stages of compilation.

The national team is led by the Director of the NAD, with nine officers of the department as members.⁵ The team was responsible for working on the tasks assigned and instructed by the expert team such as preparing, summarizing and aggregating survey and administrative data into the framework, balancing the SUT framework, and conducting backward and forward casting to revise the series of GDP estimates from the final estimated SUT framework.

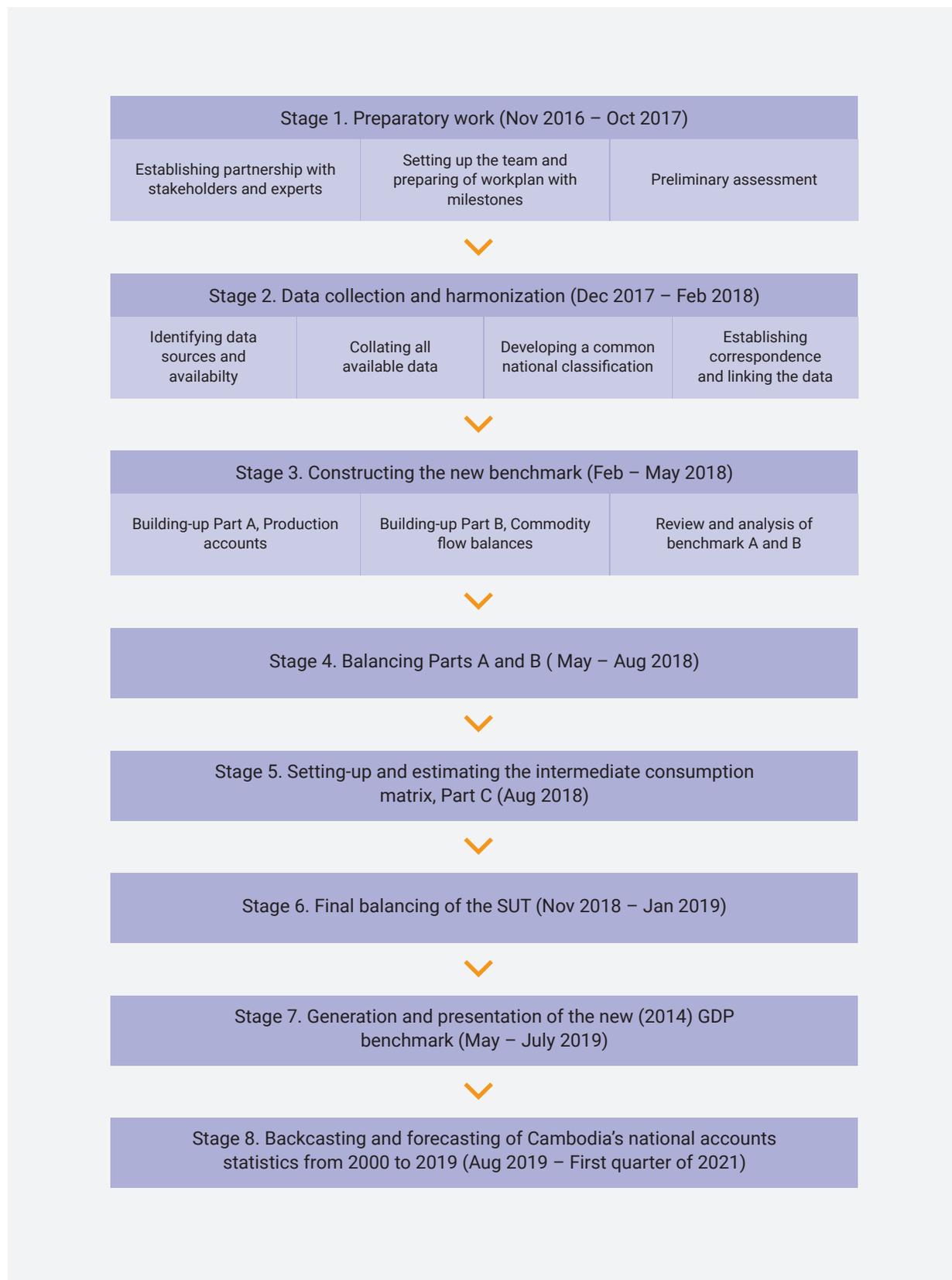
5 The NAD team who worked on the new benchmark for Cambodia was led by Mr. Keo Chettra and consisted of: Mr. Oeur Sophal, Mr. Kong Seng, Mr. Yim Saonit, Mr. Veun Thy, Mr. Vy Sovil, Mr. Meng Huykheang, Mrs. So Sovannchakriya, Mr. Un Savin, and Mr. Try Meng Heang from the Cambodia NIS.

Preliminary assessment. Under the TA, experts assessed the available data sources in October 2017 and identified Supply and Use Tables (SUTs) as the best tool to produce the new benchmark for Cambodia's national accounts. According to the ESCAP expert, there are several ways to estimate the GDP and none are perfect. In a country like Cambodia, the best practice is to first establish a 'benchmark' level of GDP by assembling data from several different sources in the Supply and Use Tables (SUTs) framework. Then, using various indicators and assumptions, extrapolate the benchmark GDP in terms of nominal or current prices, and at real or constant prices (volume estimates). It was also deemed necessary to review and re-establish the benchmark every five years or so to accurately reflect the changing structure of the country's economy.

In December 2017, the first training workshop was conducted where experts provided the background on SUT and trained NAD staff on what are the data requirements and tables would be required as inputs for the SUT framework, and plan for the first workshop.

The experts and the national team worked together through several workshops. Two workshops of one to two weeks duration were conducted at Kampong Cham Province and others in Phnom Penh at the NIS offices. Throughout the duration of the project, the experts conducted 10 country missions to Cambodia, which ran from October 2017 to January 2019.

Figure 3. Project stages to compile the new (2014) benchmark national accounts statistics, Cambodia



Stage 2. Data collection and harmonization

Identifying data sources and availability. The main sources of available data for the compilation of the SUTs along with brief descriptions and rationale on why they were used are as follow:

1. *2014 Cambodia Socio Economic Survey (CSES)*. The CSES is one of the annual household surveys conducted in Cambodia, with a large sample size (12,096 households across the country and the 12 months of the year). There are many modules of information collected in this survey, with only some being relevant in the compilation of SUTs frameworks: household activities in agricultural and non-agricultural businesses; household consumption; household construction; household and economic activities. The CSES uses two methods for estimating household consumption: the recall and diary methods.
2. *2011 Economic Census of Cambodia (ECC)*. This was the first economic census of Cambodia conducted to collect data on the number of persons employed, the size, type, main and secondary activities, revenues, and expenses of all establishments in Cambodia. For establishments required to keep financial statements, the information on assets and liabilities was also collected. Establishments classified as being in the following industry groups (based on ISIC, Revision 4) were excluded from this census coverage:
 - Section A, Agriculture, forestry, and fishing
 - Section O, Public administration and defence; compulsory social security
3. *2014 Cambodia Intercensal Economic Survey (CIES)*. This survey was the first ever economic intercensal survey conducted in Cambodia following the 2011 ECC. It had the same coverage as the 2011 ECC and collected the same information, with a sample of 12,178 establishments. Among these, all large and medium enterprises with fifty or more persons engaged were surveyed. These 1,619 enterprises accounted for 0.32% of all establishments in the 2011 ECC and, with 508,000 persons employed, 30.3% of all persons covered in the 2011 ECC.
4. *Estimates of agricultural production* produced by the Ministry of Agriculture, Forestry, and Fisheries (MAFF). These are generally available annually and are produced on seasonal basis (dry and wet seasons), and by provinces. The MAFF report contained data on area cultivated (in hectares), yield of production per hectare, and total seasonal and annual production of crops, livestock, forestry, and fisheries. Data are available by type of typical crops, livestock, forestry and fisheries activities and products.
5. *External trade in goods and services*. There were many sources of data on external trade of goods and services, such as, the data from Customs, the Ministry of Commerce, the Balance of Payments (BOP), and the mirror trade statistics from the United Nations Comtrade Database.
 - Section T, Activities of households as employers; undifferentiated goods and services-producing activities of households for own use
 - Section U, Activities of extraterritorial organizations and bodies.

6. *Government Accounts.* These data are produced by Ministry of Economics and Finance (MEF) for the Government Finance Statistics (GFS) of Cambodia. Data on government revenue and expenditure are available on a quarterly basis.
7. *Other data sources.* Aside from the main data sources mentioned above, others used in the compilation of the SUT frameworks were the financial statement of some large and medium companies (retrieved from company websites); annual report of the Electricity of Cambodia and Phnom Penh Water Supply Authority; and income statements of commercial banks and micro-finance institutions.

Collating all available data: Data from the identified sources were collected, retrieved, and prepared in formats ready for processing.

Developing a common national classification. Prior to compiling the SUT, it is necessary to develop the National Classification of Products by Activity (NCPA) to suit the Cambodian context especially for activities that are unique to the country. Some examples are shown in (Figure 4). In developing the NCAP, however, efforts were made to ensure that the NCPA is aligned with the ISIC Revision 4. The NCPA served as the main classification from which data from various sources will be linked.

Figure 4. Sample Worksheet. National classification of products by activity for supply and use table, Cambodia

NCPA	Label
A1	AGRICULTURAL CROPPING
A1-1	Paddy
A1-10	Paddy
A1-2	Cereals except rice
A1-21	Maize
B0	MINING & QUARRYING
B0-1	Mining of coal, crude oil & gas, and metal ores
B0-10	Mining of coal, crude oil & gas, and metal ores
B0-9	Other mining & quarrying
B0-91	Stone, sand & clay
B0-92	Salt
B0-99	Other mining n.e.c.
C1	MANUFACTURE OF FOOD PRODUCTS
C1-1	Processing of meat
C1-1X	Processing of meat, unallocated
C1-11	Meat of buffalo & cattle

Establishing correspondence and linking the data. To establish correspondence and link the data from various sources, concordance or correspondence tables were developed by mapping the tables prepared from each data source to the NCPA. The NCPA is very critical since the first set of tables (prepared during collation) are based on their own classifications. For example, trade data were classified by harmonized system (HS) codes and household consumption was classified by classification of individual consumption according to purpose (COICOP). All the original classifications were mapped to unique NCPA codes. About 304 NCPA codes were created to match and consolidate the varying activities, products or items of goods and services resulting from the use of varying classification systems.

Experts and NAD staff worked together in different teams in a workshop to develop NCPA code for Cambodia; prepare necessary input tables from the available data sources; and to construct the new SUTs framework for part A and B (as in in step 1 of the process) and inputting into the framework. This workshop was held from 2-8 February 2018 in Kampong Cham Province.

Stage 3. Constructing the new benchmark

After stage 2, the next step is to set-up and construct the main SUT framework first by building Parts A and B and then reviewing and analysing the preliminary estimates and tables. The output worksheet for SUT providing the aggregates for Part A and details for Part B are in Figure 5.

Figure 5. SUTs framework, Output worksheet, Cambodia

TOTAL OUTPUT														
Length		NCPA	Output	Adjust	Output data	IES Formal	CSE S	Agri	Finance & Govt	Other	Agriculture Adjusted prices	Agri from CSES	Construction from CSES	Label
		Total	0	0	0	0	0	0	0	0	0	0	0	
5	A1-1	A1-10	0		0									Paddy
5	A1-2	A1-21	0		0									Maize
5	A1-2	A1-29	0		0									Other cereals
5	A1-3	A1-31	0		0									Cabbage & other leaf & stem vegetables
5	A1-3	A1-32	0		0									Gourds, chillies and other fruit vegetables
5	A1-3	A1-33	0		0									Onions, garlic & other root vegetables,
5	A1-3	A1-34	0		0									Cassava
5	A1-3	A1-35	0		0									Potatoes & other tubers
5	A1-3	A1-36	0		0									Mung beans
5	A1-3	A1-37	0		0									Other beans & legumes
5	A1-4	A1-41	0		0									Soya bean
5	A1-4	A1-42	0		0									Groundnuts
5	A1-4	A1-43	0		0									Sesame seeds
5	A1-4	A1-44	0		0									Other oil seeds
5	A1-5	A1-51	0		0									Bananas
5	A1-5	A1-52	0		0									Mangoes
5	A1-5	A1-53	0		0									Orange, limes, pomello & other citrus fruit
5	A1-5	A1-54	0		0									Pineapples
5	A1-5	A1-55	0		0									Longan

Building-up Part A, the production accounts.

As mentioned in the earlier section, Part A corresponds to production accounts where each activity consists of the total domestic output, the total intermediate consumption, and the total gross value added. The most updated information from the established harmonized data were initially used and mapped into corresponding cells in Part A of the SUT worksheet. They served as “control totals” for domestic output, intermediate consumption and gross value added for each activity.

Building-up Part B, the commodity flow balances.

For the Cambodian SUT, commodity flow balances were developed where each set summary supply-use balances for each product were filled up using the available data from various sources that were mapped in the NCPA. One main Excel file was created and named for “version control”. It contained 11 worksheets: Import, Output, MarginRates (trade margins), Margins (gross margins for

production activity other than trade), Taxes, BAL (balance), IntD (intermediate demand or intermediate consumption), HFCE (household final consumption expenditure), OtherFD (other final demand or final consumption), Exports, and NCPA. These worksheets were linked to the correspondence tables established in Stage 2. The main worksheets are described in Table 1.

Data in the columns were summed and adjusted as needed to compute final figures for import, output, margins, taxes, intermediate consumption, HFCE, other final demand, and exports. All were linked to BAL sheet to be used for the balancing procedure.

Review and analysis of benchmark. In the May 2018 workshop, experts and NAD staff worked together in separate teams at NIS to review and analyse the inputted data in the framework. More data were collected to add to the SUTs, and some parts of data were revised as required in the balancing process.

Table 1. Overview of Excel Workbook used to collate data and produce SUTs

EXCEL WORKSHEETS	DESCRIPTION
Import sheet	Columns were created and named to input data from different sources such as, Customs, BOP, Other Sources, and from Mirror Trade.
Output sheet	Contained different columns for the data from sources such as, CIES-formal, CSES-informal, Agriculture, Finance & Government, and Others.
MarginRates	Margin rates for each type of wholesale and retail trades calculated from ECC, CIES, and CSES were input in this sheet to be applied to the sheet 'Margins'.
IntD	This intermediate demand sheet contained columns for the data from different sources of intermediate consumption such as, Manufacturing raw material, Construction, Food services, and Others.
HFCE	This sheet was for the household final consumption expenditure. The main data source was the 2014 CSES. The consumption data details by diary method with adjustments for recall under-coverage of top spenders were used together with other necessary adjustment for the HFCE.

Figure 6. Worksheets of the SUTs framework-Balancing Worksheet

NATIONAL CLASSIFICATION OF PRODUCTS BY ACTIVITY for SUT purposes													
GDP= 0													
Length	NCPA	Imports	Output	Margins	Taxes	Total supply	Difference	Total demand	Intern demand	HFC E	Other exp	Exports	Label
	Total	0	0	0	0	0	0	0	0	0	0	0	0
4	A1	A1-1											Paddy
4	A1	A1-2											Cereals except rice
4	A1	A1-3											Vegetables
4	A1	A1-4											Oil seeds
4	A1	A1-5											Fruit & nuts
4	A1	A1-6											Industrial crops
4	A1	A1-8											Agricultural services
4	A2	A2-1											Livestock
4	A2	A2-2											Livestock products
4	A3	A3-1											Plantations & logging
4	A3	A3-2											Other forestry products
4	A4	A4-0											Fishing
4	B0	B0-1											Mining of coal, crude oil & gas, and metal ores
4	B0	B0-9											Other mining & quarrying
4	C1	C1-1											Processing of meat
4	C1	C1-2											Processing of fish
4	C1	C1-3											Processing of fruit & vegetables
4	C1	C1-4											Animal & vegetable oil & fat
4	C1	C1-5											Dairy products
4	C1	C1-6											Grain milling & milling services
4	C1	C1-7											Other food manufacturing
4	C1	C1-9											Animal feed manufacturing
4	C2	C2-1											Manufacture of wines & spirits
4	C2	C2-2											Manufacture of beer & malt
4	C2	C2-3											Manufacture of soft drinks, drinking water & ice
4	C2	C2-5											Manufacture of tobacco products

Stage 4. Balancing the SUT framework

Balancing reveals deficiencies in the source data that are not otherwise apparent. Initially, the general policy was that if demand exceeded supply, supply was adjusted to match the demand. If supply exceeded demand, demand was adjusted to match supply.

Balancing was done row by row. When an imbalance was found, the earlier correspondence tables and source data were checked to identify potential causes of error and fill the gaps. For example, balancing one row revealed an imbalance of five trillion riel (around US\$1.2 trillion) in the CIES results. Going back to the data source it was found that this error stemmed from one record in which all the financial data had two extra zeros.

When balancing the SUT framework, certain assumptions and decisions were made on which data sources were used:

- CSES recall data was preferred because it was found to be more accurate to the diary (but the diary was essential for the detail). An allowance was made for under-coverage of the top spenders.
- Mirror trade was preferred to Customs data on external trade; in a lot of cases imported textile materials were treated as 'goods for processing' instead of having it as value added.
- 2014 CIES was used for initial estimates of output; but data from the CSES was preferred for 'informal' activities.
- Economic Census (2011 ECC) was used to estimate initial trade margins and input-output ratios.

Stage 5. Setting-up and estimating the intermediate consumption matrix (Part C)

After achieving the balance of parts A and B, the next stage involved compilation of the intermediate consumption (IC) matrix (Part C) of the SUTs. Insufficient information from Cambodian enterprises about their costs of production led the team to use Vietnamese coefficients as a starting point. The process followed was:

- a. A correspondence table was created to map the 225 categories of output of Cambodian producers to the 165 Vietnamese activities.

- b. Initial adjustments were made to the Vietnamese coefficients, including a split of the clothing manufacturers' coefficients into two: one with and one without inputs of textile material.
- c. Using the Vietnamese input-output ratios and coefficients and Cambodian output, an initial IC matrix was formed.
- d. The rows and columns of this matrix were aggregated to 72 Cambodian products and activities. The Vietnamese input-output ratios were then adjusted to match initial estimates of the Cambodian input-output ratios for the major headings.
- e. Total intermediate demand was determined for each product and compared with the estimate in Part B.
- f. Specific adjustments were made to some product rows. In some cases, the output was revisited. Finally, any imbalances were removed by spreading the difference pro-rata across the activities in the IC matrix.
- g. The adjustments had the effect of changing the initial Cambodian input-output ratios. Where appropriate, further adjustments were made to minimize these changes. In view of their uncertainty, the final ratios were not constrained to the initial ratios.

Figure 7. Worksheet of the SUTs framework_ Intermediate Consumption Matrix Worksheet

Cambodian total output, Viet Nam ratios			Paddy	Cereals except rice	Vegetables	Oil seeds	Fruit & nuts	Industrial crops	Agricultural services	Livestock	Livestock products	Plantations & logging	Other forestry products	Fishing	Mining of coal, crude oil & gas, and metal ores
NCPA-3	Comodities	Total	A1-1	A1-2	A1-3	A1-4	A1-5	A1-6	A1-8	A2-1	A2-2	A3-1	A3-2	A4-0	B0-1
P1	Output	CVV													
	Viet Nam ratio	Ratio (not used)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
P2	Viet Nam IC	CVV													
	Adjusted ratio	Ratio (not used)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Based on Cambodian aggregates	CVV2													
	Intermediate input		0	0	0	0	0	0	0	0	0	0	0	0	0
7	A1-8 Agricultural services														
8	A2-1 Livestock														
9	A2-2 Livestock products														
10	A3-1 Plantations & logging														
11	A3-2 Other forestry products														
12	A4-0 Fishing														
13	B0-1 Mining of coal, crude oil & gas, and metal ores														
14	B0-9 Other mining & quarrying														
15	C1-1 Processing of meat														
16	C1-2 Processing of fish														
17	C1-3 Processing of fruit & vegetables														
18	C1-4 Animal & vegetable oil & fat														

Stage 6. Final balancing of the SUT

With both stages of compilation complete, the SUTs framework was ready to provide the benchmark estimates of GDP levels and its components for the whole year of 2014. This framework provided the estimates of GDP not just at the aggregate levels, but in more detail as needed. Input-output ratios for each main activity were also available for the future extrapolation in the national accounting of Cambodia.

The results of the benchmarking exercise were obtained only after making many assumptions and adjustments to the available data within

the SUTs framework. When statistics from different sources were put together in the framework, there were many inconsistencies and gaps. Some assumptions were made to fill the gaps, and adjustments were introduced to eliminate inconsistencies.

The SUT is, therefore, like an impressionist painting. Up close, it is not correct, but overall, the result is realistic. None of the figures in the SUT are completely accurate. There were many gaps and some large imbalances, but, overall, the GDP should be within about ten percent of reality.

Stage 7. Generation and presentation of the new (2014) GDP benchmark

Between May and July 2019, experts and NAD staff worked together at the NIS to generate the new benchmark of GDP basing on the 2014 SUTs. The preliminary results were presented to the management of NIS, the Ministry of Planning, and other data users in July 2019.

Stage 8. Finalizing and back-casting, forecasting of Cambodia's national accounts statistics from 2000 to 2019

While the SUT framework and the preliminary results were presented, the NAD is currently firming up the 2014 benchmark to reflect the new data. Consultations from relevant stakeholders have been ongoing since July 2019. Likewise, the NAD staff conducted back-casting and forecasting of the series of Cambodia's national accounts statistics from the year 2000 to 2019 having benefited from experts' guidance. Given the constraints presented by the pandemic, the process has taken longer but the final results are expected to be released in the early part of 2021.

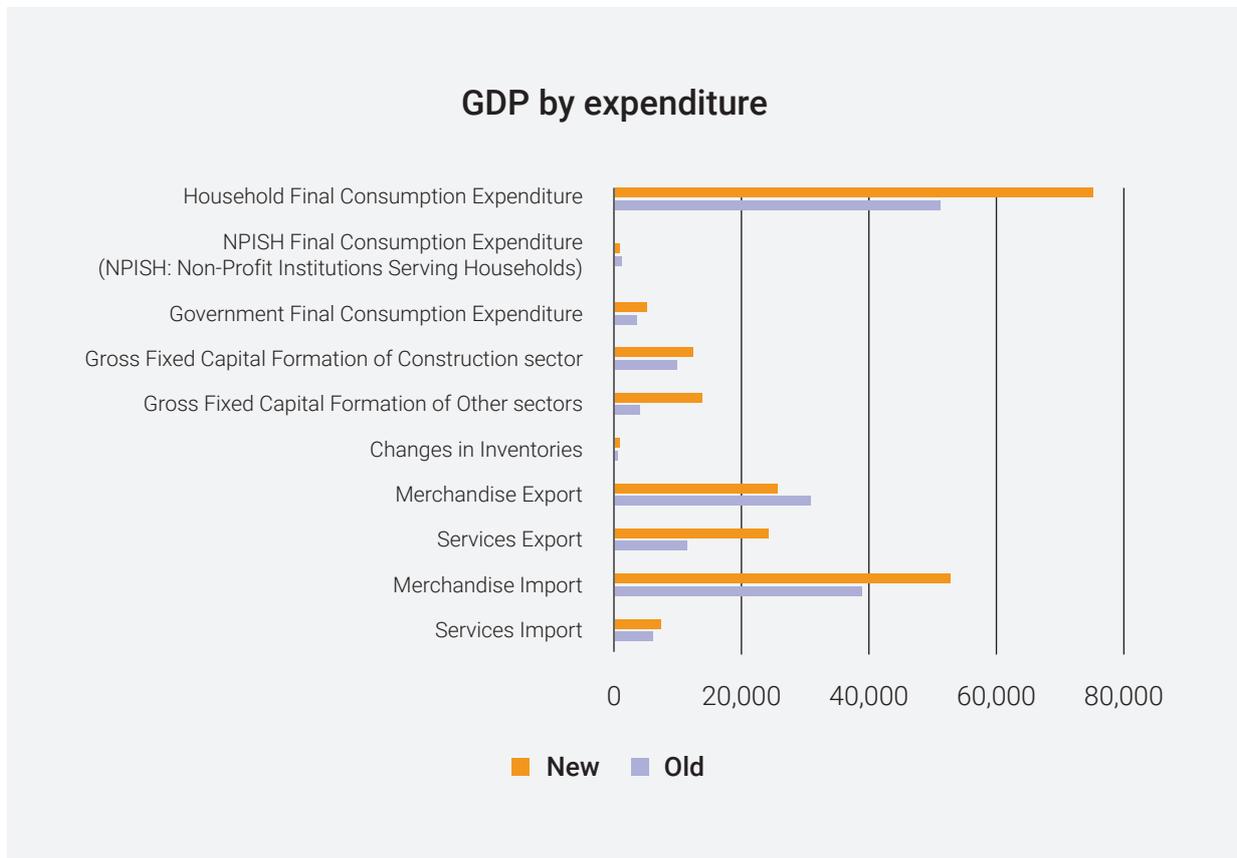
V. PROJECT RESULTS AND OUTCOMES

A new and more appropriate benchmark for GDP and its components has been produced. It provides significantly different estimates of GDP than the benchmark from 2000, which were based on outdated information.

The 2014 benchmark estimates the GDP to be around 46% higher than when based on the benchmark from 2000. The increase is largely from the industry and services sectors, up by about 51.6% and 85.2% respectively. GDP in agriculture was lower than before, approximately 4.6%.

DISCLAIMER: This section provides preliminary estimates of SUT based on available data as of June 2019. Data are subject to change and **MUST NOT** be used for any other purpose beyond the replication study. The NIS is currently reviewing and validating the estimates based on more updated data and information.

Figure 8. Components of GDP by expenditure approach basing on the old and new benchmark

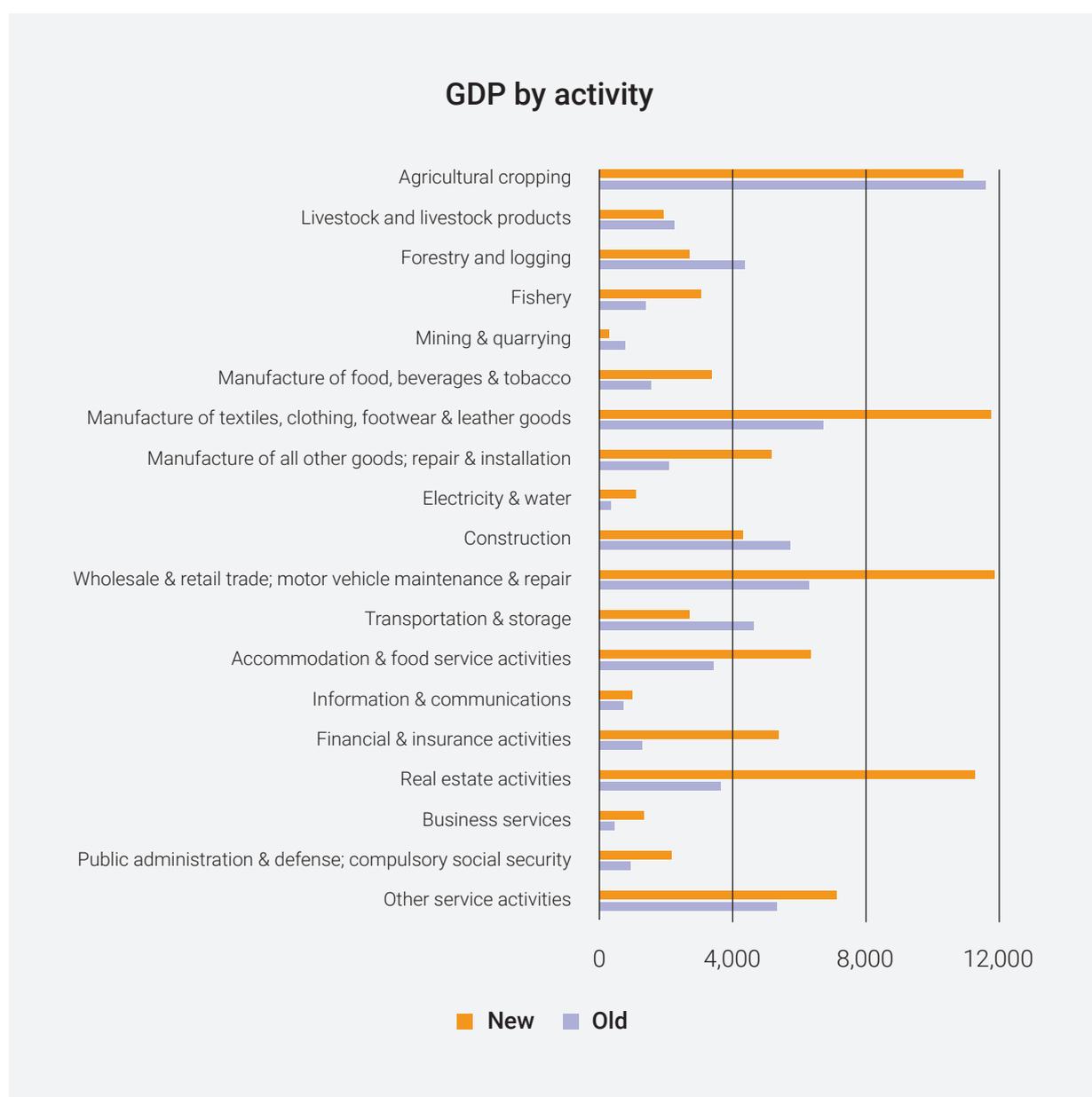


By expenditure, the new estimates were higher by about 46% for final consumption expenditure, 85% for gross capital formation, 19% for exports, and 34% for imports.

The approach of using supply and use tables were extremely beneficial for NIS and other users. They provided updated estimates and more detail than the existing system, enabling more

analysis. The SUTs gave the input-output ratios for national accountants to extrapolate the levels of GDP and its components for the future. For other users, the new benchmark had more detail allowing deeper insight into the country's economic situation. They provide granular information for more informed economic development policies.

Figure 9. Components of GDP by production approach basing on the old and new benchmark



This project has enabled Cambodia to align with the 2008 SNA. The SUT framework follows the most recent international standards set out in the 2008 SNA, together with the latest version of the industrial classification (ISIC, Revision 4). This supports international users to compare Cambodia's GDP to other countries.

Another advantage of this project is that the staff of the NAD have gained considerable new knowledge and experience in how to prepare, clean and analyse data, how to set up the tables, how to integrate all relevant data into the framework, and how to balance the supply and use tables. Other skills were gained, especially in the advanced Excel functions introduced in the compilation process.

Although the SUTs framework provided the most recent benchmark available for estimating GDP, there are some limitations. It gave the estimates only for one year: 2014. For other years forward, quality data sources that have strong correlation with each component of GDP still need to be found. These sources should be produced regularly and be accessible for national accountants in a timely manner. Quality data and information will enable the national accounts team to use them as movement indicators to extrapolate for the future estimates.

Other limitations of this SUT framework are:

1. Parts D and E of the framework shown section III-C1 above were not yet completed; and
2. CPA codes⁶ were used while most countries in the world use CPC (Central Product Classification) codes.

6 CPA (Classification of Products by Activity) is the classification of products (goods and services) at the level of the European Union (EU). Product classifications are designed to classify products having common characteristics. They provide the basis for collecting and compiling production, consumption, wholesale, retail and international trade, and transportation statistics.

VI. RECOMMENDATIONS AND LESSONS LEARNED

Learning

The National Accounts Department of NIS (NAD) gained a great deal of knowledge and skills with this project. They are now experienced in:

- **Data preparation and cleaning:** staff learnt about analysing data from different sources; data checking; editing; cleaning; and data confrontation. In addition, staff gained knowledge in advanced Excel functions which were used substantially throughout the compilation process.
- **Linking the data:** staff gained insight into how to link one input table to another, and to the main table.
- **Setting up the supply and use tables:** staff learnt how to set up the SUTs framework. The framework is complicated, and it is necessary to know what data or tables are needed. Staff now know how to set up this framework, and how to link each input table to each specific matrix and cell to complete the otherwise very complicated system.
- **Data source diagnosis and gap-filling:** staff acquired experience on how to diagnose data from different sources, and how to reconcile differences and fill gaps.
- **Balancing the SUTs:** the balancing process is difficult requiring a lot of knowledge and experience with all sources of data, and it consumes a lot of time.

Recommendations for the future and for others planning similar work

1. SUTs framework is effective for making the most of available data.
2. Working with experts is a valuable way to progress the work and build national capacity.
3. The exercise should include ways to find data to complete the parts D and E which were missed out in this initial project. Part D is also important for data analysts and policy makers, and Part E represents the estimates of GDP by income approach.
4. The framework should use CPC code instead of CPA to align with international best practices.
5. National accountants should have access to relevant administrative data especially financial statements from tax returns, in a timely manner.
6. Survey data of households, agriculture, business and industries, and other related activities should be more frequently available and with acceptable quality.

For anyone who wants further detailed information regarding the New Benchmark for Cambodian National Accounts, please contact the Cambodia National Institute of Statistics. Their contact details are below:

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