

# Disaggregating the electricity sector in Egypt social accounting matrix

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**Keywords:** Social accounting matrix, Electricity, renewable energy, economic structure

## Overview

A SAM represents income concerning the different sectors and institutions (Alikaj & Alexopoulos, 2014). It is a comprehensive system that enables to expand of the narrow structure of national accounts within a matrix by highlighting, in one framework, the flow of production of various activities, the dues of the factors of production, income flows and the expenses of economic agents (Davies, Kwaramba, & Seventer, 2018). The type of disaggregation used in the construction of SAM depends on the study's objectives and data availability (Thorbecke, 2000).

Different studies have disaggregated the electricity sector represented in the social accounting matrix. For example, Şenerdem & Akkemik (2017) disaggregated the electricity sector of Turkey's social accounting matrix based on the public and private segments of the electricity sector and implemented four satellite accounts: public wholesale, private wholesale, distribution, and organised electricity market. In order to study Spain's electricity system and the effects of multiple transition scenarios on the entire economy, Duarte, Langarita, & Sánchez-Chóliz (2016) disaggregated the electricity sector into its activities within the social accounting matrix for 2010: generation, transmission, distribution, and commercialisation. They divided generation activities into their different production technologies.

Our disaggregated SAM needs to include a high disaggregation of the electricity sector and renewable energies. To the best of our knowledge, this study is the first study dealing with the disaggregation of the electricity sector in the social accounting matrix for the Egyptian economy.

## Methods

The electricity sector in Egypt SAM for the year 2014/2015 was disaggregated into different subsectors based on the sources of electricity generation (electricity- oil, electricity - natural gas, electricity- hydropower, electricity- wind, and electricity- solar). The main challenge we faced when we disaggregated the electricity sector was that there is no specific classification related to renewable energy offered by supply and use tables which is usually the major source for SAM. To solve this problem, we used the shares of renewables in electricity generation obtained from the annual bulletin for electricity and energy statistics published by (CAPMAS 2016) and the IEA database. The shares of electricity generation by sources were divided between oil 21.21%, natural gas 69.13%, hydropower 8.6%, wind 0.90%, and 0.15% for solar.

To estimate the intermediate demand for electricity generation, we calculated the input shares from natural gas, petroleum products, and chemicals products for all electricity generating technologies (table 5). These calculations are based on the value of the fuel used in electricity generation derived from the annual bulletin for electricity and energy statistics published by (CAPMAS 2016).

Using our disaggregated SAM for Egypt for 2014/2015, this paper presents the structure of the Egyptian economy. We calculated various economic indicators such as Value-added shares, GDP production shares, activity production shares, demand shares, trade shares, household income and expenditure shares.

## Results

This paper modifies the standard SAM for Egypt in 2014/2015 by aggregating and disaggregating some of its accounts. The resulting SAM consists of a total of 109 accounts, including 41 activity sector, 42 commodity sector, 5 factors of production, 1 enterprises account, 10 household account, 1 government account, 2 accounts for enterprises, 4 tax

accounts, 1 investment and 1 stock changes account, and 1 account for the rest of the world. In addition, that social accounting matrix provides the core database for the CGE model; it has also been used to analyse the economic structure of Egypt. Our calculations from the SAM show the main characteristics of the Egyptian economy.

## Conclusions

Compared to the standard SAM, the existing SAM disaggregate the electricity sector into different subsectors based on its different production technologies (electricity - oil, electricity- natural gas, electricity- hydropower, electricity - wind, and electricity – solar). Agriculture, forestry and fishery products and Food processing sectors were aggregated into two aggregated sectors. Also, the household sector was disaggregated into ten representative household groups according to per capita expenditure quintiles, while labour was disaggregated into three types based on skill levels: unskilled, semi-skilled, and skilled labour.

In addition, that social accounting matrix provides the core database for the CGE model; it has also been used to analyse the economic structure of Egypt. Our calculations from the SAM shows the main characteristics of the Egyptian economy. For example, services, trade, and manufacturing sectors are significant contributors to the total domestic value-added. The service sector represents the highest share of GDP with 18.6%, while the water represents the lowest share of 0.6%. The electricity sector depends heavily on fossil fuel inputs with 43% input from natural gas, 21% from crude oil, 27% from electricity itself, while labour and capital provide only 9.2% and 7.2%, respectively. Urban households spent more on natural gas, other manufacturing, electricity, construction, and trade than rural households. The Egyptian government relies on taxes to finance its expenditures, as total tax revenues accounted for 76.5% of total government revenues

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