Zambia - Multi-Tier Framework Survey for Measuring Energy Access 2017-2018

Energy Sector Management Assistance (ESMAP)

Report generated on: November 7, 2019

Overview

Identification

ID NUMBER
ZMB_2017_MTF_v02_M

Version

VERSION DESCRIPTION
- v01: Anonymous raw dataset for public distribution

Overview

ABSTRACT
The World Bank, with support from the Energy Sector Management Assistance Program (ESMAP), has launched the Global Survey on Energy Access, using the Multi-Tier Framework (MTF) approach. The survey's objective is to provide more nuanced data on energy access, including access to electricity and cooking solutions. The MTF approach goes beyond the traditional binary measurement of energy access to capture the multidimensional nature of energy access and the vast range of technologies and sources that can provide energy access, while accounting for the wide differences in user experience.

The resulting dataset contains responses from households to questions on experiences concerning their electricity services and cooking practices, as well as questions on other basic socioeconomic factors, such as age, gender, education, expenditure, and health.

KIND OF DATA
Sample survey data [ssd]

UNITS OF ANALYSIS
Households

Scope

NOTES
The scope of the MTF Survey includes:

A. Household roster

B. Household characteristics

C. Supply of and demand for electricity

D. Willingness to pay for a grid connection

E. Willingness to pay for solar device

F. Kerosene/fuel-based /candle lighting

G. Dry-cell batteries

H. Household fuel consumption

I. Use of cooking solutions

J. Space and water heating

K. Willingness to pay for an improved cookstove

L. Consumption / expenditure

M. Selected assets: farm equipment and animals

N. Household assets: electrical appliances

O. Household land ownership and other assets

P. Household economic shocks

Q. Street lighting

R. Time use

S. Health impacts

U. Women’s empowerment

Coverage

GEOGRAPHIC COVERAGE
The sample size proposed for Zambia is designed to get sufficiently precise estimates of each tier at national as well as urban and rural level.

Producers and Sponsors

PRIMARY INVESTIGATOR(S)

Name	Affiliation
Energy Sector Management Assistance (ESMAP)	World Bank

FUNDING

Name	Abbreviation	Role
Energy Sector Management Assistance	ESMAP	

Metadata Production

METADATA PRODUCED BY

Name	Abbreviation	Affiliation	Role
Development Data Group	DECDG	The World Bank Group	Documentation of the Study

DATE OF METADATA PRODUCTION
2019-11-01

DDI DOCUMENT VERSION
Version 01 (September 2019)

Version 02 (November 2019). This version is identical to version 01, except for the file "sample_weight" which was added.

DDI DOCUMENT ID
DDI_ZMB_2017_MTF_v02_M_WB

Sampling

Sampling Procedure

A. SAMPLE SIZE CALCULATION PARAMETERS

The sample size proposed for Zambia is designed to get sufficiently precise estimates of each tier at national as well as urban and rural level. A much smaller sample size would have been adequate to produce precise estimates at the national level within those domains. This section discusses the factors that should be taken into consideration in the determination of sample size calculation and provides a justification for the proposed sample size for each country. The major issues considered in determining the appropriate sample size for a survey are:

1. The precision of the survey estimates

The concept of the precision of a sample survey estimate is crucial in determining the sample size. By definition, a sample from a population is not a complete picture of the population. However, an appropriately drawn random sample of reasonable size can provide a clear picture of the characteristics of that population, certainly sufficient for policy implication or decision-making purposes. From a sample of households, one can collect data and generate a sample (or survey) estimate of a population parameter. The population parameter value of a characteristics of interest is generally unknown.

2. The quality of the data (Non-sampling error)

Besides sampling errors, data from a household survey are vulnerable to other inaccuracies from causes as diverse as refusals, respondent fatigue, measurement errors, interviewer errors, or the lack of an adequate sample frame. These are collectively known as non-sampling errors. Non-sampling errors are harder to predict and quantify than sampling errors, but it is well accepted that good planning, management, and supervision of field operations are the most effective ways to keep them under control. Moreover, it is likely that management and supervision will be more difficult for larger samples than for smaller ones (Grosh and Muñoz 1996, p. 56). Thus, one would expect non-sampling error to increase with sample size and we would like to limit the sample size to less than 5,000.

3. The cost of data collection, processing, and dissemination.

The sample size can affect the cost of the survey implementation dramatically. It will also affect the time in which the data can be collected, processed and made available for analysis. The availability of survey firm and cost for each country would affect the total cost of survey implementation, too. Thus, the cost of data collection, processing, and dissemination should be considered in determining the sample size for each country.

B. SAMPLING APPROACH

In this study, a stratified random sampling technique is used. The first stratification involves stratifying into urban and rural strata. The second stratification is based on the electrification status of the enumeration areas (EAs) in the study population.

- Urban and Rural stratification

The primary sampling units (PSUs) in this study are EAs, selected randomly from the list of EAs in Zambia obtained from CSO Zambia. The EAs were stratified into rural and urban strata. For each stratum, random numbers were allocated to each EA and these EAs were arranged in ascending order. The first EAs to satisfy the sample quota of each province were picked. The number of EAs picked in each province for either rural or urban stratum were dependent on the sample size of each province. A total of 14 households were sampled in each EA, so the sample size of each of the province was divided by 14 to get the total number of EAs to be sampled. An equal split of the sample between rural and urban stratum was done at the national level.

- Electrified or non-electrified stratification

Listing was conducted only in the sampled EAs to determine whether to classify an EA into either electrified or non-electrified stratum. EAs with at least 3% of households that were connected to the national grid were classified as electrified while those with less than 3% of households connected to the national grid were classified as non-electrified. A 50-50 ratio of distribution of sample between grid and non-grid users was achieved.

- Household selection

During the listing process, information on electricity connection (the number of households with or without electricity in a sampled EA) was collected. Random numbers were allocated to each household and arranged in ascending order for each stratum.

Of the original sample size of 3,668 targeted households in 262 EAs (130 EAs in urban and 132 EAs in rural areas), 3,612 households in 260 EAs were contacted, and 3,537 in 260 EAs were effectively interviewed. The response rate is thus 96%, which is the difference between the sample of households originally targeted and those finally interviewed. As explained in paragraph 4, the non-response was mainly due to movement out of the dwelling of respondents (43 households) and unwillingness to participate in the survey.

Response Rate

The response rate is 96%

Weighting

Sample weights are important in analyzing household survey data. Due to this fact sample weighting was executed to reduce bias due to imperfections in the sample. Since we used two-stage stratification, the sample design weight was calculated as wi= 1/p, where p is the probability of a unit to be included in the sample. The focus is on design weight, weight attributable to the compensation for non-coverage, and weight attributable to compensation for non-response. Calculation of the design weight was done as follows.

(i) First, the probability of selecting a certain EA in rural and urban strata was established, which was the first stage calculated as the number of EAs selected in a stratum multiplied by the measure of the size of the EA. The total number of households in that stratum were then divided into the result. An 88-12% electrification ratio between urban and rural areas respectively was used to calculate the probability of electrification status of an EA. The 88-12% electrification status split was obtained from the CSO of Zambia.

(ii) The probability of selecting the household within the EA, which is stage 2, was then established. This was simply the number of households selected in the EA in a certain stratum divided by the total number of households listed in the EA in that stratum considering the electrification status.

(iii) We then calculated the overall selection probability of each household in an EA of a certain stratum as a product of values found in (i) and (ii) above.

(iv) We computed the design weight for each household in an EA of a certain stratum as the inverse of the overall selection probability.

Correction for non-response was done at EA and household levels. EA response rate was calculated as the number of EAs interviewed divided by the number of EAs selected in each stratum. Household level response rate was calculated as the design weight multiplied by the sum of households interviewed in a stratum divided by the design weight multiplied to the sum of households listed in a stratum.

Questionnaires

Overview

The questionnaire is in English and it is provided as related material.

Data Collection

Data Collection Dates

Start	End	Cycle
2017-09	2018-03	N/A

Data Collection Mode

Computer Assisted Personal Interview [capi]

Data Collection Notes

The study was carried out successfully, although some challenges were met during the course of the fieldwork. Fieldwork challenges included:

- Inaccessible EAs: A total of 8 sampled EAs were in the wetlands and, thus, difficult to reach because of the rainy season. This delayed fieldwork, as enumerators used a primitive mode of transport. A total of 2 out of 8 EAs were totally inaccessible by any form of transport.

- Overall, about 4% of the sampled households were not interviewed because they were unwilling to participate; furthermore, 43 households moved out of the dwelling after listing.

- Electrification status discrepancies between listing and fieldwork: About 1% of the sampled households recorded as connected during listing were then identified as not connected to electricity during the fieldwork, and this problem was solved by recording the connection status during the fieldwork.

- Permission to interview facilities: The authorization letter from Ministry of Energy was received on time, while the letters from Ministries of Health and Education delayed to the end of the survey.

- Challenges in locating some households in the compound residential areas.

Questionnaires

The questionnaire is in English and it is provided as related material.

Data Processing

No content available

Data Appraisal

No content available

Documentation

Questionnaires

Multi-Tier Framework Survey for Measuring Energy Access 2017-2018: Household Questionnaire

Title	Multi-Tier Framework Survey for Measuring Energy Access 2017-2018: Household Questionnaire
Country	Zambia
Language	English
Filename	mtf_hh_quest_ver_56_14_09_17_public.pdf

Reports

Multi-Tier Framework Survey for Measuring Energy Access 2017-2018: Energy Access Diagnostic Report

Title	Multi-Tier Framework Survey for Measuring Energy Access 2017-2018: Energy Access Diagnostic Report
Author(s)	ESMAP
Country	Zambia
Language	English
Filename	mtf_energy_access_country_diagnostic_report_zambia_9.2019.pdf

Technical documents

Multi-Tier Framework Survey for Measuring Energy Access 2017-2018: Sampling Strategy

Title	Multi-Tier Framework Survey for Measuring Energy Access 2017-2018: Sampling Strategy
Country	Zambia
Language	English
Filename	sampling_strategy_mtf_zambia_micro_data_library.pdf