



The Philippine Experience on Household Energy Consumption Survey Design and Implementation

18 September 2025 | 9:30 AM to 10:00 AM

23rd APEC Workshop on Energy Statistics: Capacity Building in Conducting Household Energy Consumption Survey (Phase 1)





Outline

- I. Background
- II. Specific Objectives of the 2023 HECS
- III. Scope and Coverage
- IV. Sampling Design
- V. Questionnaire Design
- VI. Key Takeaways

I. Background

Comprehensive Regional Energy Study of the Philippines (CRESP)

- CRESP is a regional study which aim to assess the end-use energy consumption patterns and various energy issues and concerns of Filipinos for better energy planning and policy formulation covering both the household and establishment sectors.



Component 1
Household Energy
Consumption Survey (HECS)



Component 2
Survey of Energy Consumption
of Establishments (SECE)



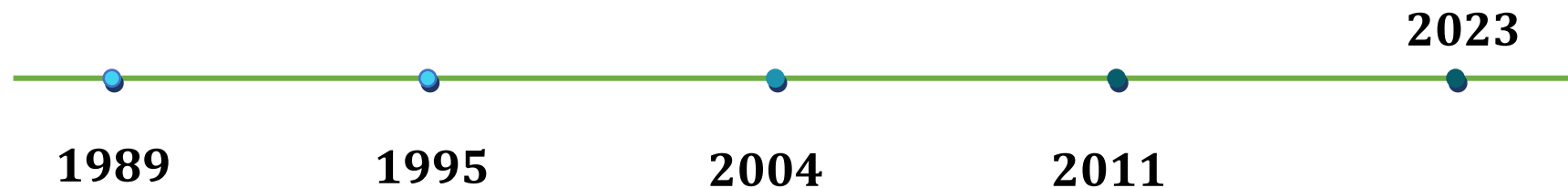
Component 3
Final reports and studies of CRESP with
State Universities and Colleges (SUCs)



I. Background

Household Energy Consumption Survey (HECS)

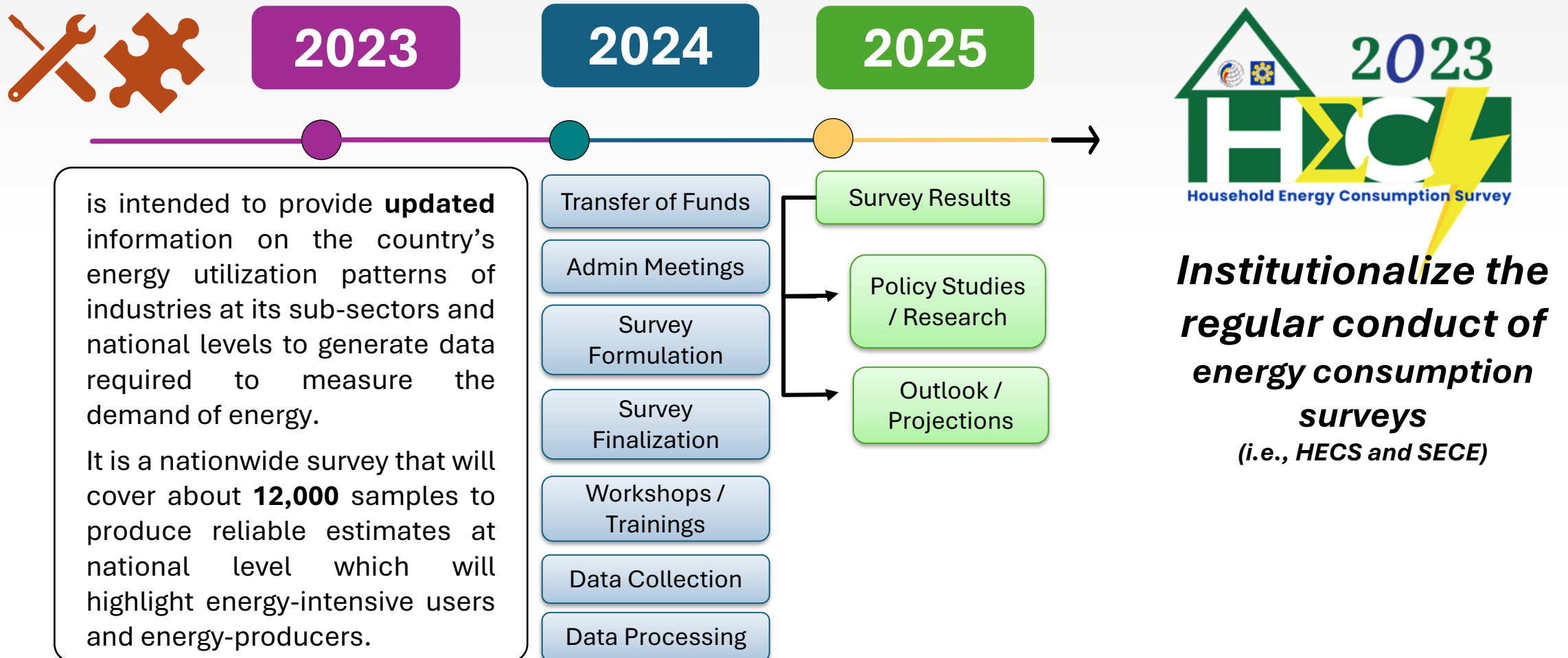
- The 2023 HECS is a nationwide survey jointly executed by the Department of Energy (DOE) and the Philippine Statistics Authority (PSA).
- This is the fifth in the HECS series which started in 1989.



- The primary goal of the HECS is to generate **comprehensive and reliable data/information and analyze end-use energy consumption and preferences** in the residential sector.

I. Background

Activities on the Conduct of HECS





II. Specific Objectives of the 2023 HECS

The 2023 HECS has these specific objectives:

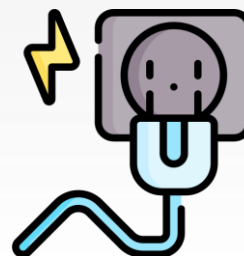
1. Provide detailed information on the sources of energy consumption and their details;
2. Gather information on the fuel/energy mix of the household sector based on its energy consumption;
3. Determine the most energy-consuming and energy-efficient appliances and equipment used;
4. Obtain information on cooking fuel switching;
5. Collect information on the current energy efficiency and conservation techniques;
6. Determine awareness and attitude on major energy issues and programs in the energy sector; and
7. Collect information on the energy use of vehicle for transportation.

III. Scope and Coverage of the Survey

The 2023 HECS involves the collection of data on:



Energy consumption in the residential sector



Attitudes and practices on energy-related issues



Detailed listings of **household appliances and equipment**

The unit of enumeration for the 2023 HECS is **HOUSEHOLDS**

- with a national sample of approximately **45,000 households/housing units** deemed sufficient to provide **reliable estimates at the national and regional levels**



IV. Sampling Design

The design for the 2023 HECS is a **two-stage cluster sampling design**.

TWO-STAGE CLUSTER SAMPLING DESIGN

Primary Sampling Unit (PSU):

Barangays or Enumeration Area (EA) or groups of nearby barangays or Eas

Secondary Sampling Unit (SSU):

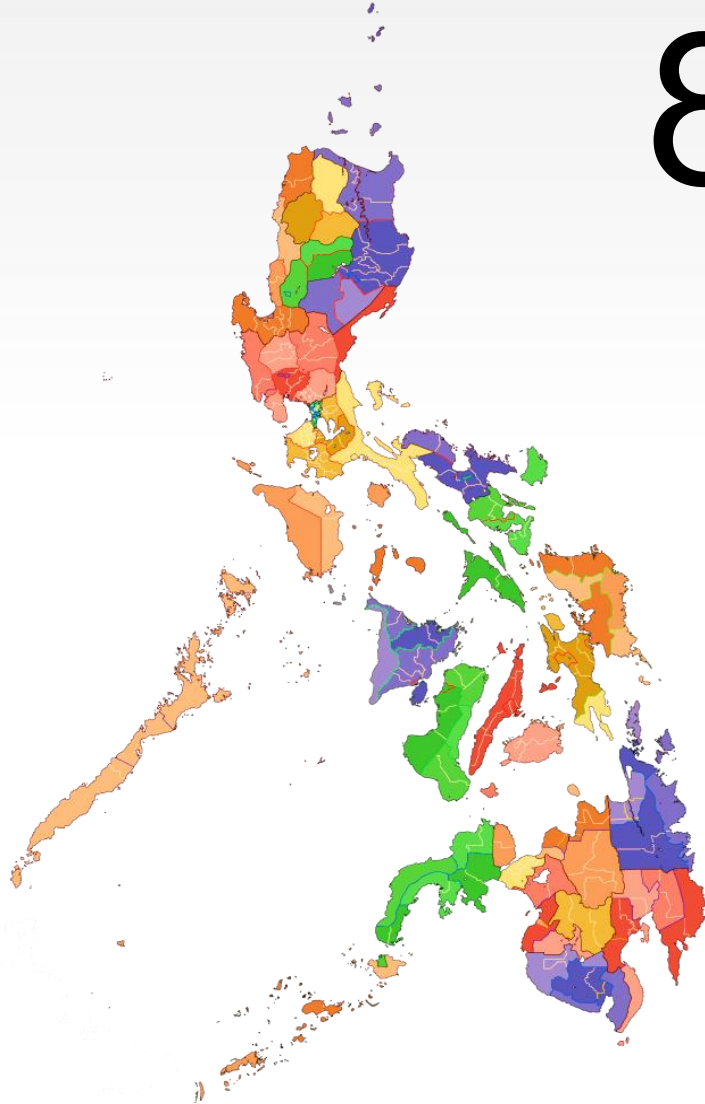
Housing Units within the PSUs

Sampling Frame:

The 2023 GeoMS sampling frame is constructed based on the results of the 2020 Census of Population and Housing (CPH). The EA Reference File of the 2020 Census of Population is used as the PSU frame while the 2020 list of households for each of the PSUs is used as the SSU frame.



IV. Sampling Design Domains



82 PROVINCES
including Maguindanao del Norte
and Maguindanao del Sur

33 HIGHLY URBANIZED CITIES
including 16 Cities in NCR

3 OTHER AREAS
Pateros, Isabela City, and Cotabato City



118 SAMPLING
DOMAINS

IV. Sampling Design

Primary Sampling Unit

For the 2023 GeoMS, PSUs are defined as exhaustive and non-overlapping area segments composed of 100 to 300 households.

- ❖ A single Enumeration Area (EA) Barangay
- ❖ Two or more adjacent small EAs/*Barangays* within the same Barangay/*Municipality*
- ❖ Portion or an EA of a multi-EA Barangay



Out of the 42,046 barangays in the Philippines, 127,028 PSUs were formed. This excludes areas identified as Least Accessible during the development stages of the 2023 GeoMS.

IV. Sampling Design

2 x 2 x 2 Implicit Stratification of PSUs

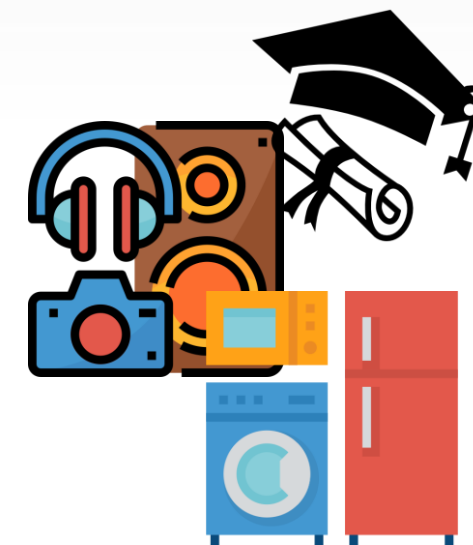
1 Geographic Location



2 Decreasing Proportion of HHs with Overseas Worker



3 Decreasing Wealth Index





IV. Sampling Design

Sampling Frame and Sample Selection

PSU FRAME



Equal-Probability
Systematic Selection
of PSUs

2020 CPH EARF

SSU FRAME



Equal-Probability Systematic
Selection of SSUs

2020 CPH FORM 1



IV. Sampling Design

Sample Size

Many target parameters are, or can be expressed as, proportions (P) or percentages, or ratios.

$$\begin{aligned} 1.96 \text{ se}(\hat{p}) &\approx 2 \text{ se}(\hat{p}) = 2 \left(\frac{PQ}{n} \right)^{\frac{1}{2}} \\ &= 2 \left(\frac{1}{4n} \right)^{\frac{1}{2}} = \left(\frac{1}{n} \right)^{\frac{1}{2}} \end{aligned}$$

i.e., CV = 95% Confidence Interval = $\left(\frac{1}{n} \right)^{\frac{1}{2}}$

under Simple Random Sampling (SRS) and
 $P=1/2$



IV. Sampling Design

Sample Size

In general, with $V(\hat{p})$ the variance for any probabilistic design

$$deff = \frac{V(\hat{p})}{V(\hat{p})|SRS}$$

or

$$CV(\hat{p}) = \left(deff \frac{Q}{Pn} \right)^{\frac{1}{2}}$$



IV. Sampling Design

Sample Size

$$\begin{aligned} CV(\hat{p}) &= \left(deff \frac{Q}{Pn} \right)^{\frac{1}{2}} \\ &= \left(\frac{deff}{n} \right)^{\frac{1}{2}} \\ &= 2 \left(\frac{deff}{n} \right)^{\frac{1}{2}} \\ &= 3 \left(\frac{deff}{n} \right)^{\frac{1}{2}} \\ &= 4.36 \left(\frac{deff}{n} \right)^{\frac{1}{2}} \end{aligned}$$

when $P = \frac{1}{2}$, (e.g., contraceptive use prevalence rate);

when $P = 0.20$ (poverty incidence, underemployment);

when $P = 0.10$ (unemployment rate);

when $P = 0.05$ (unemployment rate in some provinces, poverty incidence in NCR, mortality rates, prop of households with disabled member).



IV. Sampling Design

Sample Size

CV(\hat{p} | n=1400)

Deff	p			
	0.05	0.10	0.20	0.50
1.0	0.116	0.08	0.054	0.027
1.5	0.143	0.098	0.065	0.033
2.0	0.165	0.113	0.076	0.038
2.5	0.184	0.127	0.084	0.042
3.0	0.202	0.139	0.092	0.046

- The quarterly samples are independent and different (except for repeat draws). The annual sample size = Σ quarter sizes \approx 1536 HHs. This would mean $CV \leq 10\%$ for majority of annual domain estimates, quarterly regional estimates will be based on > 1536 HHs, hence $CV < 10\%$.
- Annual sample = 1536 x 118 domains = 181,248.
Quarterly sample = 181,248 / 4 \approx 45,312.



IV. Sampling Design

Replicates

- Six (6) PSUs form a replicate for most of the province domain;
- Eight (8) PSUs form a replicate for most of the HUCs;
- Three (3) PSUs form a replicate for small provinces.

Sampling Allocation

- At least one (1) sample replicate per sampling domain is required to generate a reliable national-level estimate;
- Four (4) sample replicates to generate a reliable regional level estimate; and
- Sixteen (16) sample replicates to generate reliable province/HUC level estimate.

V. Questionnaire Design

Contents of the Questionnaire



Section I Geographic Identification and Other Information



Section II Household Membership, Head, and Respondent's Characteristics



Section III Checklist of Energy Sources

- Section IV**
- A Electricity
 - B Petroleum Products
 - C Transport
 - D Renewable Energy Sources and Technologies
 - E Cooking Fuel Switching



Section V Household Practices and Attitudes towards Use of Energy Sources



Section VI Awareness on Energy Issues



Section VII Household Income and Housing Characteristics



Thank you

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