Chapter 3

Methodology: Survey Design

February 2022

This chapter should be cited as
ERIA (2022), 'Methodology: Survey Design', in Hisashi Yoshikawa (ed.), *Public Attitudes Towards Energy Policy and Sustainable Development in ASEAN Countries.* ERIA Research Project Report FY2021 No. 22, Jakarta: ERIA, pp.30-36.

Chapter 3

Methodology: Survey Design

1. Survey Overview

A series of household surveys were conducted in three cities in three countries to explore the willingness to pay (WTP) for renewables in the Association of Southeast Asian Nations (ASEAN) countries. A discrete choice experiment (DCE) was conducted in Bangkok (Thailand), Kuala Terengganu and Kuala Nerus (Malaysia), and Manila (the Philippines), and a contingent valuation method (CVM) was employed in Manila to investigate methodological influences.

Local researchers, in collaboration with the author, conducted each survey. Table 3.1 describes the survey period for each city. The survey instrument for the Philippines is presented in the Appendix as an illustration. The survey was influenced by the COVID-19 pandemic.

Table 3.1: Survey Period

City	Period
Bangkok	December 2020 to March 2021
Manila	December 2020 to April 2021
Kuala Terengganu and Kuala Nerus	February to March 2021

Source: Authors.

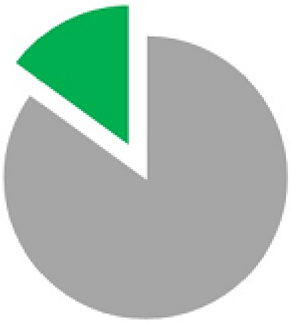
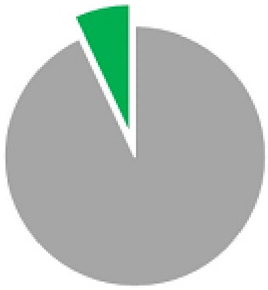
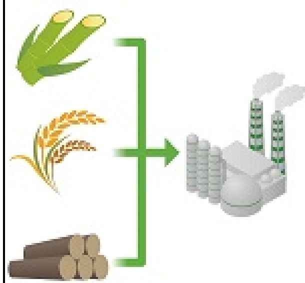
2. Discrete Choice Experiment

2.1. Theoretical Background

DCE and CVM are stated preference methodologies to measure the WTP of respondents. The stated preference method is appropriate for a hypothetical choice scenario with a smaller number of samples. Please see more details of theoretical backgrounds in Yoshikawa (2020).

The DCE asks respondents to choose from choice sets to elicit preferences. There are three alternatives (scenarios) in each choice set, and each set has a collection of attributes with defined levels (Table 3.1) Respondents are required to select the most preferred alternatives amongst the choice set.

Table 0.1: Sample Questions from the DCE Survey

Choice Set 1	**Alternative A**	**Alternative B**	**Alternative C (Status Quo)**
Renewable Energy (%)	25 % Renewable Energy 	15 % Renewable Energy 	7 % Renewable Energy 
Main Type of Renewable Energy	 Solar	 Biomass	 Solar
% Increase in Monthly Electricity Bill	Your monthly electricity bill will **increase** by **5%**	Your monthly electricity bill will **increase** by **5%**	No change

DCE = discrete choice experiment.

Source: Authors.

2.2. Attributes and Levels

Two common characteristics regarding the renewable energy (RE) policy were selected for the experiment—the RE share in future total generation capacity and the RE type with a higher share. For an easier understanding of the respondent, only one of these renewable sources will increase RE, even if the current share is collective. These attributes were designed at three to four levels depending on the circumstances of each country.

The price attribute was defined as the percentage increase in residents' monthly electricity bills. The increase in the monthly electricity tariff levels was determined per the results from the last phase (Yoshikawa, 2020). Table 3.3 displays the three attributes along with their corresponding levels.

Table 3.3: Attributes and Their Levels by Country

	Future Share of RE*	Type of RE	Increase in Monthly Electricity Tariff	Status
Thailand	15%/25%/35% in 2036 (current 9%)	Solar/Wind Biomass and waste/Small-scale hydropower	2%/5%/10%/15%/25%	9% by solar power
Philippines	35%/40%/45%/50% in 2030	Solar/Wind Biomass/ Small-scale hydropower	5%/10%/15%/20%/30%	30% by Large-scale hydropower and geothermal power
Malaysia	10%/15%/25%/35% in 2030	Solar/ Biomass/ Small-scale hydropower	2%/5%/10%/15%/25%	current 6% by solar power

RE = renewable energy.

* The target year of each country was set according to each government's plan, as explained below.

Source: Authors.

Thailand

The renewable share levels in Thailand were set at 15%, 25%, and 35%, unlike other countries. Given that the share of RE in 2014 was calculated as 9% of the total of solar, wind, small hydropower, geothermal, biomass, biogas, municipal solid waste, and energy crops, it seemed challenging for respondents to imagine only a percentage point increase. Based on the Thailand Power Development Plan 2015–2036 (PDP2015) (Ministry of Energy, 2015), the target share of the government in 2036 is projected as 33%. Further, RE definitions in PDP2015 vary from those used in this report and include large-scale and imported hydropower. Therefore, the RE share was fixed between the status quo and marginally above the government target. For simplicity, the survey combined various types of renewables such as biomass, biogas, municipal solid waste, and energy crops as 'biomass/waste.'

Philippines

The RE share in installed capacity is 29%, which is 4%, 2%, 1%, 8%, and 15% solar, wind, biomass, geothermal, and large-scale hydropower, respectively (DOE, 2019). We excluded large-scale hydropower when counting the RE share; however, for the Philippines, we include large-scale hydropower to calculate the current RE share for easier understanding. In the questionnaire, the current RE share is estimated as 30% rather than 29% for ease of comprehension. The target RE share is calculated based on RE-based capacity installation targets by 2030 (15,304.3 MW) DOE, 2011) and the total capacity of all sources in 2030 (31,215 MW) as a sum of capacity addition of all sources (17,338 MW) and existing capacity (13,877 MW) (Table 3.4) because there is no target RE share available. In the survey, the calculated target RE share (49%) was rounded to 50% for ease of comprehension. It includes large-scale hydropower in total RE share; however, in the questionnaire, respondents are asked to assume that the increase in RE share will be achieved via solar, wind, biomass, or small-scale hydropower.

Table 3.4: Capacity Installation Targets of the Philippines

	Total Installed Capacity by 2030		-	Source
Geothermal	3,461.0 MW	28.2%[4]		Department of Energy (2011)
Hydro	8,724.1 MW	11.1%		
Biomass	315.7 MW	0.9%		
wind	2,378.0 MW	7.6%		
solar	285.0 MW	1.0%		
Ocean	70.5 MW	0.2%		
Capacity addition of RE by 2030	15,304.3 MW	49.0%		
Capacity addition of all sources by 2030			17,338[1] MW	Department of Energy (2016)
Existing capacity of all sources			13,877[2] MW	
Total capacity in 2030			31,215[3] MW	

MW = megawatt, RE = renewable energy.

[1] Total of baseload capacity addition (1,150 MW), mid-merit addition (7,800 MW), and peaking (8,388 MW)

[2] Total of existing peaking and baseload power source

[3] Total of capacity addition of all sources (17,338 MW) and existing capacity (13,877 MW)

[4] 3,461 MW of geothermal capacity in 2030 divided by 31,215 MW of total capacity in 2030

Source: Collected by authors.

Malaysia

Currently, the installed RE capacity is 985 MW, which is 6% of the share in Malaysia, and the government targets to increase it by 4,000 MW (17%) in 2030 and 21.4 GW (73%) in 2050 (Chen, 2012). However, considering the recent surge in momentum to climate change, the target seems slow. Thus, we set the maximum level of share of RE in 2030 to 35%.

Blocks and Choice Sets

We produced the necessary combinations of choice sets using the numerical analysis software, MATLAB. We set seven to eight choice sets per respondent, as the response quality degrades when eight to 16 comparisons are made (Pearmain and Kroes, 1990). Choice sets assigned to each respondent comprise a block. A block is configured such that the number of occurrences of alternatives is equal. Table 0.2 shows the number of alternatives, choice sets, and blocks.

Table 0.2: Number of Choice Sets and Blocks for Each Country

	Blocks	Choice Sets
Malaysia	11	86
Thailand	12	91
Philippines	11	87

Source: Authors.

Sample size

A certain number of sample sizes are needed to evaluate the WTP in DCEs. Kuriyama, Tsuge, and Shoko (2013) reported that 200 samples are sufficient for statistical analysis in DCEs. We followed the formula (3–1) provided by de Bekker-Grob et al. (2015).

$$\frac{nta}{c} > 500, \ (3-1)$$

where n is the number of respondents, t is the number of tasks, a is the number of alternatives, and c is the largest number of attribute levels.

For our design, c = 5, t = 7 (minimum), and a = 2 because the status quo alternative should not be counted. Therefore, we determined that the number of respondents should be n > 178.6, and we collected 250 to 300 samples for each country.

2.3. Contingent Valuation Method

In addition to DCE, a survey based on contingent valuation method was conducted in the Philippines to check the robustness of the results to the survey method. We employed a double-bounded dichotomous choice approach as in the previous year. The sample size was taken to be 250.

In the survey, a scenario of renewable expansion from the current level of 30% to 50% was presented to respondents, and respondents were invited to answer two bidding questions. The bid levels were chosen as follows:

- For the first WTP question: 5, 10, 15, 20, 30 (% increase in monthly electricity bill); and
- For the second WTP question: 2, 5, 10, 15, 20, 30, 40 (% increase in monthly electricity bill).

See the Appendix for the details of the survey.