Measuring Sustainable Service Quality of Malaysian Water and Sewerage Companies: A Pilot Study

¹Abrari Salleh, ²Sha'riMohdYusof, ³Norazli Othman

¹PhD Scholar, UTM Razak School of Engineering and Advanced Technology, UniversitiTeknologi Malaysia,
irarba69@yahoo.com

²Professor, UTM Razak School of Engineering and Advanced Technology, UniversitiTeknologi Malaysia,
shari@utm.my

³Senior Lecturer, UTM Razak School of Engineering and Advanced Technology, UniversitiTeknologi Malaysia,
norazli.kl@utm.my

ARTICLEDETAILS

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ABSTRACT

Purpose:The aim of this paper is to evaluate the reliability and validity of the sustainable service quality or SUSSERV instrument prior its implementation to measure service quality and sustainability among the water and sewerage companies.

Design/Methodology/Approach: The random survey data from thirty questionnaires were analyzed representing customers of water and sewerage service companies in Selangor, Kuala Lumpur, and Putrajaya.

Findings:The findings showed that SUSSERV model with six independent variables namely tangibles, reliability, responsiveness, assurance, empathy, and sustainability is a valid and reliable instrument. We recommend the sampling method be used during the final research is the quota sampling and will be based on geographical factors (districts) and category of services (water and sewerage).

Implications/Originality/Value: This paper is an attempt to fill the gap between service, product and process quality. The SUSSERV model has achieved the research objective where it can be used to measure service quality and sustainability among the Malaysian water service companies. SUSSERV will be suitable to overcome the lack of research in sustainability service quality.

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Corresponding author's email address: irarba69@yahoo.com

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1. Introduction

The issue on public water services is being discussed especially in developing countries in the area of water management (Mutikangaet. al., 2011) such as water delivery quality (Abubakar, 2016). This research will explore and explain the impact of Malaysian water and sewerage companies' service quality towards sustainability. Therefore, the main objectives of this pilot research are to determine the perceived service quality and sustainability of the water and sewerage companiesand to evaluate the reliability and validity of the instrument for sustainable service quality or SUSSERV to measure Malaysia's water and sewerage services quality.

2. Literature Review

2.1 Perspectives on Quality

Services can be viewed as a process, product and services in term of customer's value creation and provider's activities (Gronroos, 2008). It is difficult to determine customers' expectation and whether they are satisfied with the company, its products, and its service. Numerous definitions of quality have been given by researchers, practitioners, and gurus from many perspectives. Product based and user-based approaches are normally viewed by marketing people. Conversely, most engineers viewed quality as manufacturing-based. With multiple perspectives in viewing quality, companies can take advantage of shifting perspectives on quality as a product move from design to market (Garvin, 1984). In other words, quality is when a product is cheap and easy to produce and market and at the same time makes the consumer trust and feel satisfied with the product or service. The "perceived service quality model" replaces the product features of a physical product in the consumption of services. The customers perceived what they received as the outcome of the process in which the resources are used, i.e. the technical or outcome quality of the process. The differentiation between technical quality and functional quality can be seen in the hospital and healthcare services (Abuosi and Atinga, 2013) and also in higher learning institution (Kong and Muthusamy, 2011). This is because their services involve high technology tools, equipment, and peripherals which are related to functional quality. For manufacturing with total quality management (TQM) practices, other than service quality, process and product quality are being considered as well as technical quality because there is a positive relationship between TQM practices and market orientation (Lam *et. al.*, 2012). Process and product quality are interrelated in manufacturing whereby process quality has a direct relationship toward product quality performance and business performance (Agus and Hajinoor, 2012). Quality can also be seen from a different perspective: product quality (technical quality), process quality (functional quality) and service quality (perceived quality).

2.2 Sustainability

The Triple Bottom Line is a sustainability model developed by Elkington (1998) comprised of three important elements, environment (planet), social (people) and economy (profit). Sustainability that has been discussed by social science scholars basically consists of *three* components (Sloan, 2010; Fernando, 2012; Tajbakhsh, A. and Hassini, E., 2015; Afful-Dadzie *et. al.* 2016) namely (1) *Economy*, (2) *Environment* and (3) *Society*. However, Lehtinen (2012) suggested four criteria insustainability which is Environmental, Social, Economic, and Relationship (transparency, risk management, partnerships) factors. Sustainability was also viewed by the researcher from the aspect of the economy. There is an element of cost and benefit or profit and loss for the purpose of measuring sustainability such as cost-efficient model (Benedetti *et. al.*, 2012). It can be concluded that sustainability has a positive relationship towards profitability, cost reduction, economic performance (growth) and competitive advantage thus will definitely impact the economy (Amran *et. al.*, 2010). Sustainable development is a major challenge and proves to be a daunting task to understand the inter-related complex issues. To date, sustainable development is an important concern, probably the most important, for business and society, and even for those who for years argued in favor of the importance of change towards sustainable development, this issue is now perceived as being more apparent and urgent. Therefore, sustainability is a key issue for the business community in the twenty-first century. The current crisis resulting from rapid industrialization has caused significant social and environmental side effects (Amran *et. al.* 2010). The policymaker, especially in water and sewerage industry, will always want its industry to be sustainable and relevant to the consumers' needs. The change will definitely involve many parties and strong political will (Moe and Rheingans, 2006) and support should be present to achieve its objectives.

Companies wishing to achieve business excellence are intense marketing products and have resulted in shorter life cycles of new products. Business excellence will be achieved by companies which can react quickly to new market conditions and customer needs. They will also constantly look for creative solutions and continuous improvements or sustainability in products and processes. Gaining product

sustainability is important but a difficult practice in business organizations (Ali *et. al.*, 2013). Therefore, meeting functional requirements and sustainability is critical for product success in the current market. Products compete on the basis of not only price, functions and diversity, but also sustainability. Sustainable product or system is its ability to work continuously during its life cycle with less impact on the environment (Hosseinpouret. *al.*, 2015). Sustainability does have an impact on the implementation of services and indirectly attributes to the quality of services. Social and economic factors are among the many attributes that are correlated with service quality.

2.3 Modified Service Quality

From Service Quality Model (Gronroos, 1984), then a SERVQUAL model (Parasuraman *et. al.*, 1988) with five dimensions factors has been developed. This model employs a survey in the form of a questionnaire that can be used to measure customers' expectations of service quality in terms of these five dimensions and their perceptions of the service they received. Although SERVQUAL model is proven to be a reliable and valid tool to measure service quality, it has not stopped the researchers from enhancing or extending its capability through some modifications to suit their objectives. Some modified SERVQUAL models that have been developed include SERVPERF (Cronin and Taylor, 1992), BSQ Index (Abdullah *et. al.*, 2011) and SSQ (Voonet. *al.*, 2014). Other researchers used the modified SERVQUAL model to suit their research in the areas of study such as hospital and healthcare (Abuosi and Atinga, 2013); banking (Amin and Isa, 2008; AmatTaapet. *al.*, 2011); manufacturing with TQM practices (Lam *et.al.* 2012). Researchers in previous studies have modified the original SERVQUAL model in order to accommodate their areas of research while this research emphasized on another area that has a major impact on service quality, sustainability factors (Economy, Environment, and Society).

3. Methodology

The research process on SUSSERV is sequentially carried out begins with discovering issues, research proposal, research design and strategy, pilot testing, data collection, data analysis and finally, thesis reporting as simplified in Figure 1. Pilot testing will allow improvement of the instrument that needs to be made prior to the actual data collection.

3.1 Instrument, Data Collection, and Sample

For the purpose of this research, the authors have developed a SUSSERV model with thirty-one attributes comprises twenty-two attributes from the original SERVQUAL model (Parasuraman *et. al.*, 1988 and Zeithamlet. *al.*, 1990). In addition, three attributes each from the sustainability dimension namely economy, environment and society were referred to the latest scholars are presented in Table 1 to assess the instrument's validity and reliability. Data acquired for this research is from primary data using a questionnaire that consists of three sections: Section A – General Information; Section B – Expectation (E) and Perception (P) of service quality; Section C – The important features of service quality. All the questions came in the formats of Multiple Choice, Likert Scale and Fixed Sum Scale using rating scales or response strategy to generate interval and interval data (Cooper and Schindler, 2001) that are easy to compare, tabulate and analyze. The consistency in the response categories allows trends to be tracked over time if the same questions are used. The questionnaire used 7-point Likert-scale where the respondents were asked to select the most appropriate number that corresponds to the extent they agree with a statement where 1 represent “Strongly Disagree” to 7 represent “Strongly Agree”. The exploratory or pilot sample size of 30 respondents were randomly selected and the answered questionnaires were collected from the sample population representing customers of water and sewerage service providers in Selangor, Wilayah Persekutuan Kuala Lumpur and Putrajaya (Billingham, *et. al.*, 2013).

Figure 1: The Research Process on SUSSERV **Table 1: The Additional Nine Attributes of Sustainable Service Quality Sustainable Dimension (S)**

Additional Attributes - Sustainable Dimension	References for the attributes
<i>SUSTAINABLE – ECONOMIC</i>	
S1 - Providing worth value in water/sewerage service price. S2 - Making profit without compromising its services. S3 - Having a good business relationship with its suppliers.	(Aksorn and Charoenngam, 2015); (Tajbakhsh and Hassini, 2015); (Simonis, 1990)
<i>SUSTAINABLE – ENVIRONMENT</i>	
S4 - Reducing the ecological footprint – Air (pollution)	(Aksorn and Charoenngam, 2015); (Tajbakhsh and Hassini, 2015); (Simonis, 1990); (Delai and Takahashi, 2011); (Bo et. al., 2007); (Frederiksen et. al., 2008)
S5 - Reducing the ecological footprint - Water (pollution)	(Aksorn and Charoenngam, 2015); (Tajbakhsh and Hassini, 2015); (Delai and Takahashi, 2011); (Frederiksen et. al., 2008); (Simonis, 1990);
S6 - Reducing the ecological footprint – Land (destruction)	(Aksorn and Charoenngam, 2015); (Delai and Takahashi, 2011); (Frederiksen et. al., 2008); (Simonis, 1990);
<i>SUSTAINABLE – SOCIAL</i>	
S7 - Having a good working place.	(Aksorn and Charoenngam, 2015); (Tajbakhsh and Hassini, 2015); (Delai and Takahashi, 2011); (Enquist et. al., 2007); (Simonis, 1990);
S8 - Having a good community.	(Aksorn and Charoenngam, 2015); (Tajbakhsh and Hassini, 2015); (Delai and Takahashi, 2011); (Simonis, 1990);
S9 - Having knowledge workers/ organization	(Aksorn and Charoenngam, 2015); (Delai and Takahashi, 2011); (Simonis, 1990);

Source: Authors

4.Data Analysis

In order to fulfill the pilot's objectives, reliability, descriptive and factor analyses were performed. This is to ensure the SUSSERV instrument used can precisely measure service quality in Malaysia's water and sewerage services.

4.1 Reliability and Validity Test

Validity test will provide some assurance and confidence in our findings (Davis and Cosenza, 2000). There are three important characteristics used to value the measurement instrument in research namely validity, reliability and practicality (Cooper and Schindler, 2001). The reliability of data from N=30 questionnaires was tested using SPSS version 22 to measure questionnaire consistency. The overall results of reliability test indicated that the questionnaire used in this research is reliable with a Cronbach Alpha value of > 0.60 (Hair *et. al.*, 2010) as shown in Table 2. The *content validity* was carried out by asking the feedback and opinions from the expert (researchers and government officers) due to their direct involvement with water and sewerage services and understood the meaning of the sustainable concept (Joseph, 2013) on the variables and format used in the instrument, whilst *construct validity* of the instrument was identified using factor analysis (Cooper and Schindler, 2001).

Table 2: The Cronbach Alpha Value for Reliability Test

6 SUSSERV Dimensions	Variables For Expectation	Cronbach's Alpha For Expectation	Variables For Perception	Cronbach's Alpha For Perception
<i>Tangibles</i>	<i>E1-E4</i>	0.632	<i>P1-P4</i>	0.709
<i>Reliability</i>	<i>E5-E9</i>	0.951	<i>P5-P9</i>	0.906
<i>Responsiveness</i>	<i>E10-E13</i>	0.778	<i>P10-P13</i>	0.915
<i>Assurance</i>	<i>E14-E17</i>	0.959	<i>P14-P17</i>	0.878
<i>Empathy</i>	<i>E18-E22</i>	0.787	<i>P18-P22</i>	0.808
<i>Sustainability</i>	<i>E23-E31</i>	0.951	<i>P23-P31</i>	0.844
Overall		0.957		0.961

4.2 Descriptive Analysis and Analysis of Variance (ANOVA)

The demographic information of the respondents indicated that the sample comprised water supply services (53%) and sewerage services (47%). The locations or area which services were delivered to respondents represented 77% in Selangor while only 23% in Wilayah Persekutuan Putrajaya and Kuala Lumpur areas. The type of customers' household ranges from Bungalow (7%); Semi-Detached (10%); Terrace (66%); Condominium (7%); Apartment (7%) and Low-Medium Cost houses (3%). The results of the descriptive statistical analysis of customers' perceptions of water and sewerage services are shown in Table 3.

The gaps between Perception and Expectation on each of the Water and Sewerage Services indicates the mean scores of customers' perceptions of water services ranged from 3.44 to 5.19 whereby the mean scores for customers' expectation on water services ranged from 4.06 to 6.38 thus the gap scores ranged from -0.62 to -2.00. The lowest perceived quality item (water services) with highest negative gap score of -2.00 was '*give customers personal service*', which indicates that the water company has less empathy or lost their personal touch on giving customers personal service. The mean scores of customers' perceptions of sewerage services ranged from 4.20 to 5.27 whereby the mean scores of customers' expectation on sewerage services ranged from 5.53 to 6.13 thus the gap scores ranged from -0.67 to -1.73. The lowest perceived quality item (sewerage services) with highest negative gap score of -1.73 was '*provide the service at the time it promised to do so*', which indicates that sewerage company needs to provide services as promised or stated in the clients' charter as perceived by their customers.

The overall mean score for *service quality perception* items for water and sewerage services were 4.51

and 4.84 respectively as compared to the overall mean score for *service quality expectation* items for water and sewerage services which were 6.00 and 5.86 respectively. These scores indicate a customer *expectation* on water and sewerage companies regarding service quality because the standard of living is rising and Malaysian customers expecting more quality of services, especially in water and sewerage.

Table 3: The Gaps between Perception and Expectation on Water and Sewerage Services

Dimensions	Variable No.	WATER SERVICES			SEWERAGE SERVICES		
		Mean Perception	Mean Expectation	Gap Score	Mean Perception	Mean Expectation	Gap Score
Tangible	1	4.19	6.13	-1.94	5.00	5.67	-0.67
	2	4.38	5.63	-1.25	4.64	5.67	-1.03
	3	4.50	6.00	-1.50	5.14	5.87	-0.73
	4	4.44	5.88	-1.44	5.00	5.87	-0.87
Reliability	5	4.44	5.94	-1.50	4.60	5.53	-0.93
	6	4.63	5.81	-1.18	4.60	5.60	-1.00
	7	4.38	5.88	-1.50	4.33	5.80	-1.47
	8	4.44	6.00	-1.56	4.27	6.00	-1.73
	9	4.44	5.75	-1.31	4.53	5.93	-1.40
Responsiveness	10	4.63	6.25	-1.62	4.80	5.93	-1.13
	11	4.56	6.19	-1.63	4.47	5.93	-1.46
	12	4.69	6.38	-1.69	5.07	6.07	-1.00
	13	4.13	5.50	-1.37	4.80	5.53	-0.73
Assurance	14	4.56	6.25	-1.69	5.20	6.00	-0.80
	15	5.00	6.19	-1.19	5.07	6.00	-0.93
	16	4.81	6.19	-1.38	5.27	6.07	-0.80
	17	4.75	6.38	-1.63	5.20	6.13	-0.93
Empathy	18	4.31	6.31	-2.00	4.93	6.07	-1.14
	19	4.81	6.31	-1.50	4.67	5.73	-1.06
	20	3.44	4.06	-0.62	4.20	5.53	-1.33
	21	4.06	5.88	-1.82	4.80	5.73	-0.93
	22	4.38	5.94	-1.56	5.00	6.00	-1.00
Sustainability	23	4.31	6.19	-1.88	4.67	5.73	-1.06
	24	4.19	5.94	-1.75	5.00	6.07	-1.07
	25	4.44	5.69	-1.25	5.00	5.67	-0.67
	26	4.63	6.19	-1.56	4.87	5.93	-1.06
	27	4.81	6.25	-1.44	4.87	5.93	-1.06
	28	4.56	6.19	-1.63	5.00	5.80	-0.80
	29	4.75	6.06	-1.31	5.00	6.00	-1.00
	30	4.94	6.19	-1.25	5.00	5.87	-0.87
	31	5.19	6.31	-1.12	5.13	6.00	-0.87
Overall		4.51	6.00	-1.49	4.84	5.86	-1.02

The Analysis of Variance (one-way ANOVA) has been performed to determine whether any of differences between means perception of the Category of Services (Water and Sewerage) and Living Status (Type of houses) are significantly different from each other. Most of the perception attributes showed no significant differences except for three of F values for Category of Services (P1, P18, P24) and one F value for Living Status (P20) were significant that measured the size of the effects or the differences between the means are shown in Table 4. These were due to the water supply and sewerage is the same water industry and having the same perceptions. Furthermore, living status has no significant impact to differentiate for the assessment of basic needs of services especially, utility (water & sewerage).

Table 4: Analysis of Variance of Services (Water and Sewerage) and Living Status (Type of Houses)

One Way ANOVA (Water and Sewerage)						
		Sum of Squares	Df	Mean Square	F	Sig.
P1	Between Groups	4.929	1	4.929	4.853	.036
	Within Groups	28.438	28	1.016		
	Total	33.367	29			
P18	Between Groups	2.834	1	2.834	4.320	.047
	Within Groups	18.366	28	.656		

	Total	21.200	29			
P24	Between Groups	5.834	1	5.834	5.563	.026
	Within Groups	29.366	28	1.049		
	Total	35.200	29			
<i>One Way ANOVA (Living Status - Bungalow, Semi-Detached, Terrace, Condominium, Apartment, and Low-Medium Cost houses)</i>						
		Sum of Squares	df	Mean Square	F	Sig.
P20	Between Groups	34.340	5	6.868	6.638	.001
	Within Groups	23.798	23	1.035		
	Total	58.138	28			

4.3 Factor Analysis

This study uses Exploratory Factor Analysis (EFA) to uncover the underlying structure of a relatively large set of variables are shown in Table 5. Factor Analysis has been used for providing insight and information into what constitutes for each dimension especially *sustainability* for the purpose of data summarization and data reduction (Hair *et. al.*, 2010). EFA was conducted using Principal Component Analysis (PCA) as the factor extraction method and used Varimax with Kaiser Normalization as the rotation method (Lai *et. al.*, 2007). PCA required some correlations to be greater than 0.30 and all variables were correlated by more than 0.30 using Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) which rotated factor value must exceed 0.50 for the overall and individual variable. Variables less than 0.50 should be removed from the factor analysis one at a time, started with the smallest ones (Hair *et. al.*, 2010). The exploratory factor analysis extracted six factors due to a small number of cases or 30 valid cases only, which the ratio of cases to variables should be more than 5:1 (or 30 cases for 6 factors or less).

For validation, all variables have the communalities values of more than 0.50 except one variable (E13, < 0.50) and all factors have been accounted for more than 60 percent of the total variance in the data based on eigenvalues greater than 1.0. Variable *E13* – “*never be too busy to respond to customers' requests*” has been removed as the loading factor of Factor 3 due to low communalities value of only 0.254. The findings showed that almost all or 98% communalities are high therefore the sample size will not influence or have little impact on the quality of factor analysis (MacCallum *et.al.*, 1999; Pearson and Mundfrom, 2010). The EFA results also suggested that *sustainability* factor has been explained by 84.6% as compared to other five existing SERVQUAL factors (*Assurance*, 83.1%; *Empathy*, 80.4%; *Reliability*, 79.5%; *Responsiveness*, 77.6%; *Tangibles*, 75.4%) and the average KMO value for all factors are above 0.50. Based on these findings, it can be concluded that all the six dimensions of SUSSERV are a valid and reliable instrument.

Table 5: Factor Analysis and Reliability Analysis on Sustainability Service Quality of Malaysian Water and Sewerage Companies

Variables / Dimensions	Communalities	ROTATED FACTORS					
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
		<i>Tangible</i>	<i>Reliability</i>	<i>Responsiveness</i>	<i>Assurance</i>	<i>Empathy</i>	<i>Sustainability</i>
1. E1	0.779	0.608					
2. P1	0.880	0.929					
3. E2	0.628	0.616					
4. P2	0.795	0.726					
5. E3	0.836	0.912					
6. P3	0.704	0.793					
7. E4	0.673	0.808					
8. P4	0.736	0.810					
9. E5	0.802		0.823				
10. E5	0.742		0.707				
11. E6	0.860		0.838				
12. P6	0.688		0.628				
13. E7	0.883		0.822				
14. P7	0.736		0.623				

15. E8	0.874		0.762				
16. P8	0.902		0.761				
17. E9	0.813		0.743				
18. P9	0.659		0.682				
19. E10	0.903			0.944			
20. P10	0.779			0.880			
21. E11	0.924			0.957			
22. P11	0.846			0.910			
23. E12	0.913			0.940			
24. P12	0.829			0.904			
25. E13 (to be removed)	0.254 (<0.50)			0.448			
26. P13	0.765			0.870			
27. E14	0.919				0.958		
28. P14	0.790				0.887		
29. E15	0.900				0.941		
30. P15	0.755				0.867		
31. E16	0.897				0.936		
32. P16	0.834				0.884		
33. E17	0.937				0.965		
34. P17	0.619				0.781		
35. E18	0.839					0.900	
36. P18	0.803					0.864	
37. E19	0.897					0.944	
38. P19	0.921					0.950	
39. E20	0.620					0.744	
40. P20	0.774					0.818	
41. E21	0.780					0.696	
42. P21	0.808					0.776	
43. E22	0.822					0.727	
44. P22	0.777					0.663	
45. E23	0.828						0.766
46. P23	0.719						0.544
47. E24	0.863						0.791
48. P24	0.842						0.762
49. E25	0.707						0.688
50. P25	0.759						0.537
51. E26	0.948						0.957
52. P26	0.897						0.926
53. E27	0.971						0.979
54. P27	0.741						0.840
55. E28	0.960						0.974
56. P28	0.836						0.887
57. E29	0.957						0.887
58. P29	0.766						0.716
59. E30	0.887						0.935
60. P30	0.850						0.886
61. E31	0.892						0.931
62. P31	0.804						0.675
Kaiser-Meyer-Olkin (KMO)		0.502	0.523	0.745	0.756	0.636	0.725
Measure of Sampling Adequacy (MSA)							
Bartlett's Test of Sphericity (p-value)		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Eigenvalue/ Extraction Method: Principal Component Analysis		6.03	7.96	6.21	6.65	8.06	15.29
% Cumulative Variance Explained Principal Component Analysis (PCA)		75.4%	79.5%	77.6%	83.1%	80.41%	84.6
Cronbach's Alpha (by Factor)		0.64	0.886	0.770	0.82	0.788	0.877
Number of items		8	10	8	8	10	18

4.4 Discussions and Recommendations

Based on the above results and analysis indicated that all dimensions were negatively perceived meaning dissatisfaction among the respondents towards services rendered by both water and sewerage companies. The EFA results proposed that sustainability factor have been satisfactorily explained and the data for all factors (KMO) are suitable for factor analysis especially *reliability* and *sustainability* factors of the SUSSERV instrument. The overall goal of this research, therefore, will be to implement the SUSSERV model to existing Malaysian water services industry.

There is a lack of research in service quality particularly in the context of Malaysian water services industry. This paper is an attempt to fill the gap between services, product and process quality by

including sustainability. The water and sewerage companies should provide information to customers about how it is meeting its responsibilities in relation to sustainable water usage, resources and how customers may conserve water, more research is required to widen the applicable and perspective of sustainable development, especially on water and wastewater management. Future research can also be extended to other states by using SUSSERV especially when sustainable service quality is an imperative element.

However, this pilot study has a limitation on the small sample size and quota sampling method is suggested to be used during the final research (Voon and Murray, 2014; Amin and Isa, 2008) based on geographical factors (districts) and category of services due to the total population is too large. The quota will be based on the number and percentage of account holders or customers of each water and sewerage companies in a district as compared to the total population in Selangor, Putrajaya and Kuala Lumpur, to improve representativeness (Cooper and Schindler, 2001).

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