

## Research Paper

# Estimating the Willingness to Pay for Existing Domestic Drinking Water Service: Residential Customer Satisfaction Index Model

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## Abstract

The global is not on track to achieve sustainable development goal (SDG) 6 while access to safely managed /improved drinking water services are a basic human right for wellbeing and public health of people. Customer satisfaction is one of the basic measures of the quality of drinking water service. Hence, this study was analyzed the perception of residential customers' satisfaction of National water supply and drainage board (NWSDB) with domestic drinking water service in Karachchi divisional secretariat division of Kilinochchi district. The analyse was based on customers' perception of ten selected satisfaction drivers, a set of structured questionnaire was administered for 150 residential customers of NWSDB using google form, however only 131 of them responded . The data was analyzed using descriptive analysis and a customer satisfaction index (CSI) model. The calculated CSI was 3.68 points on a 5 point scale, which meant that drinking water service in the study area was perceived as satisfactory by the residential customers. In addition, two-third of the customers were willing to pay for water, while one-third of them were not willing to pay based on their overall perception of the services of the NWSDB. This illustrates that the service of the NWSDB to its customers was adequate despite an improvement . To recommend, there is a positive correlation between safely managed/improved drinking water services and customers' willingness to pay for water service. The NWSDB should undertake to improve drinking water services. Resultant, NWSDB should recover cost, provide water service to the whole district/national population to achieve the SDGS which are directly and indirectly depend on SDG6.

**Key words:** customer satisfaction index, drinking water, Sri Lanka

## **Introduction**

The world is not on track to achieve Sustainable development goal (SDG) 6. Billions of people globally still live without safely managed drinking water and sanitation, significantly in rural areas and least developed countries. [1]. In 2010, the UN General Assembly explicitly recognized the human right to water and sanitation and Access to safe drinking water is a basic human right for well-being and public health of people [1]. According to many low- and middle-income countries data, it proves that, there are lack of existing water quality data from water service providers particularly in rural area. Where majority of people access non piped supplies for drinking and cooking. [2, 3]. Therefore, it is a big considerable challenge to obtain reliable information on the safety of drinking water supplies for national and global monitoring [2, 4].

According to UN 2021 [1], drinking water services can be classified as safely managed drinking water services which means, they use improved water sources, water sources are located on premises, available when required , and free from physical, chemical and biological contamination. Basic services also an improved water source located within a round trip of 30 minutes. Limited services mean, to access an improved water source it takes more than 30 minutes to collect water and No drinking water services mean people access drinking water from groundwater and surface water, especially unprotected wells, springs, lakes, ponds, rivers and streams [2].

Sri Lanka also does not have required data in terms of water sanitation and hygiene (WASH) services [4,5]. However, one of the prevalent issues identified across several areas such as Kilinochchi, Mannar, Mullaithevu, Vavuniya, Jaffna, Batticaloa and Trincomalee in Sri Lanka have lack/no of access to basic human right which is access to safe drinking water [6]. People from the districts are considerably being diagnosed due to CKD/ CKDu. And the exact cause/s of which still unclear while there are some

findings revealed that drinking water quality have positive correlation with the occurrence of CKDu [7].

Further, existing customers of national water supply and drainage board (NWSDB) also do not aware of the quality of water. It is evident that the challenges remain to be maintenance of the services to the current users and extension of services to the un-served population [6].

### **Methodology**

The objective of this study is to estimate the performance rating of the national water supply and drainage board (NWSDB) in terms of how well it satisfies its residential customers and assess willingness of residential customers of water board to pay for its existing drinking water services. This method involved using a structured questionnaire (google form) which was administered to residential customers of water supply and drainage board (NWSDB), using the stratified random sampling techniques. The sample size was 131 residential customers of Karachchi divisional secretariat division of Kilinochchi district Sri Lanka was selected.

Three sections were consisted in the questionnaire such as (a) socio economic characteristics of the participants, (b) customer satisfaction rating of the drinking water services of NWSDB (c) willingness to pay for existing water services of NWSDB. Five - point Likert scale was used to analyze customer satisfaction rating. The likert scales and points are following, very satisfied (5), satisfied (4), fairly satisfied (3), poorly satisfied (2) and not satisfied (1).

**Table 1.** Five satisfaction drivers with respect to public services across the public sector

Satisfaction drivers	Description
<b>(Public services)</b>	
Delivery	The service providers manage to deal with any issues that may arise
Timeliness	The service providers respond immediately to the initial customer contact and deal with the issue quickly
Professionalism	Staff are competent and treat customers fairly
Information	Accurate and comprehensive information are provided
Staff attitude	Staff are friendly and sympathetic to customers' needs
water quality	Physical, chemical and biological parameters are within acceptable SLS and WHO standards
water supply duration	Availability of water at least 20 hours a day
water pressure and quantity	pressure is high enough to deliver at least 15 litres within 5 minutes
integrity of pipe network	pipes are high quality, well laid, maintained, no leaking or burst pipes,
cost of water	adequate billing and payment methods

These ten selected drivers of satisfaction were rated by respondents using the 5-point Likert scale [8].

The customer satisfaction index (CSI) model designed by Ohwo [8].

$$CSI = \sum_{i=1}^n rwi \quad n; i = 1, 2, 3 \dots 10$$

$$\text{Where } rwi = \sum_{j=1}^n \frac{(s_j \times n_j)}{t_i} \quad ; j = 1, 2, 3, 4, 5.$$

CSI: customer satisfaction index

rwi: rating weight index for each satisfaction driver, a number between 1-5

sj: satisfaction unit weight, a number between 1-5

nj: number of respondents to jth weight

ti: total respondents to ith satisfaction driver

n: number of satisfaction drivers

$\Sigma$  : summation

To interpret, the customer satisfaction index (CSI), the points between 4.50–5.00, 3.50–4.49, 2.50–3.49, 1.50–2.49, 1.00–1.49 were considered as very satisfied, satisfied, satisfied, fairly satisfied, poorly satisfied, not satisfied respectively [8], [9].

## Results and discussion

### *Demographic Characteristics of Respondents*

Initially, 150 households were selected for the study while 131 (87.3%) households only responded. The demographic characteristics of the respondents revealed that 52 (39.7%) respondents were males while 79 (60.3%) were females. The age of 21-30 years had the highest respondents (112) representing 85.5%; while above 61 years had the lowest 2 (1.5 %). The educational status of respondents showed that those with national diploma level in agriculture had the highest figure of 115 (87.8%), while those with ordinary level was 1 (0.8%) and 10 (7.6 %) participants were educated up to bachelor level, 5 (3.8 %) of them were master degree holders. And none of the respondents was no schooling. This clearly evident that the respondents could understand the questionnaire to provide adequate responses. The income status showed that the income LKR 21,000- 30,000 had the highest responses (46) representing 27.5 %; while LKR 51,000 – 60,000 had the lowest responses (13) representing 7.8 % and above LKR 61,000 had 28 (16.8 %) respondents.

Additionally, respondents were requested to answer for the question how many of their family members work at water or environmental related sectors, in accordance, 130 (99.2%) of the households had nobody who work in the sectors while only one (0.8%) household had a member who works in the sectors. One of the questions was how many of your family members who completed / studies water related courses, results evident that in 120 (91.6 %) households, only one family member had studied water related components in one of the modules which were learnt during their diploma or degree program but which was not learnt as majoring module. And in 10 (8.4 %) of the households, nobody had studied even up to certificate level. The finding proved that; majority of households did not have opportunity to learn water education reason was Sri Lanka school education / school curriculum was not mainly focused on water education or water related sustainable development goals [10],[11].

**Residential Customers of NWSDB's Perception**

**Table 2 : NWSDB's Customer Perception on water services during Yala season**

<b>Satisfaction Drivers</b>	<b>Very Satisfied</b>	<b>Satisfied</b>	<b>Fairly Satisfied</b>	<b>Poorly Satisfied</b>	<b>Not Satisfied</b>
	Responses	Responses	Responses	Responses	Responses
	(Percentage)	(Percentage)	(Percentage)	(Percentage)	(Percentage)
Water quality	29 (22%)	49 (37%)	36(27%)	9 (6.87%)	8 (6%)
Water supply duration	34(26%)	59(45%)	20(15%)	10(7.63%)	8(6%)
Water pressure and quantity	28 (21%)	51(39%)	33(25%)	15(11.45%)	4(3%)
Integrity of pipe network	32(24%)	57(44%)	28(21%)	9(6.87%)	5(4%)

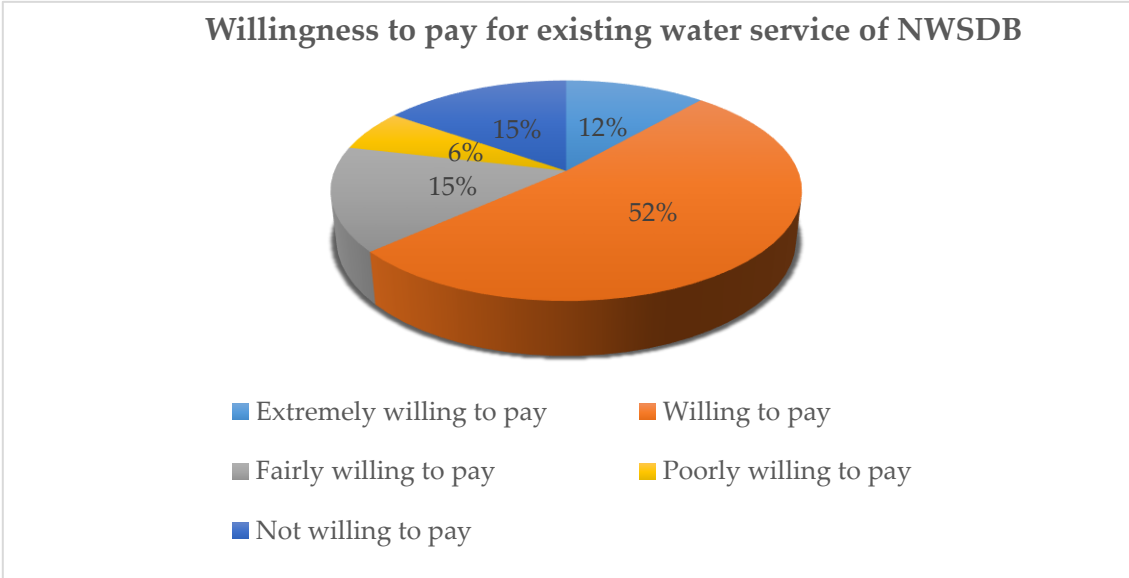
Cost of water	25(19%)	58(44%)	29(22%)	11(8.4%)	8(6%)
Delivery	30(23%)	60(46%)	26(20%)	9(6.87%)	6(5%)
Timeliness	21(16%)	61(46%)	33(25%)	15(11.45%)	2(2%)
Professionalism	24(18%)	60(46%)	31(24%)	11(8.40%)	5(4%)
Information	20(15%)	62(47%)	32(24%)	9(6.87%)	8(6%)
Staff attitude	26(20%)	59(45%)	30(23%)	11(8.40%)	5(4%)

The first satisfaction driver (water quality) indicates that 78 (59.54%) respondents were both very satisfied and satisfied with the quality of water from NWSDB (Table 2). Responses to water supply duration 93 (71%) were either very satisfied or satisfied. Some interviewed respondents stated that “water supply had not been regular especially during Yala. 79 (60.3%) respondents considered the water pressure and quantity to be very satisfactory or satisfactory; while 52 (39.7%) considered it to be either fairly, poorly or not satisfactory.

The integrity of the pipe network was not favourably perceived 42 (32.1%). However, 32 (24%) and 57 (44%) respondents were very satisfied and satisfied respectively. Especially this satisfaction driver had highest perception level. According to the satisfaction driver cost of water, 83 (63.4%) respondents were either very satisfied (19%) or satisfied (44%) with the cost of water. However, the perception of the ten satisfaction drivers (Water quality, Water supply duration, Water pressure and quantity, Integrity of pipe network, cost of water, delivery, timeliness, professionalism, information and staff attitude) were

around 60% of the respondents perceived these drivers as either very satisfactory or satisfactory.

**Customers' Willingness to Pay Water Rates**



**Figure 1:** Customer’s Willingness to Pay Water Rates Based on Overall Perception of Satisfaction

Customers’ willingness to pay for existing water service was determined based on their overall perception of satisfaction of the services offered by NWSDB. Figure 1 revealed that two third of the households were willing or extremely willing to pay. These responses proved that improvement of water services will certainly encourage customers for cost recovery of the service provider.



**Table3:** Calculated Customers’ Satisfaction Rating of domestic drinking water service

<b>Satisfaction Drivers</b>	<b>Very Satisfied</b>	<b>Satisfied</b>	<b>Fairly Satisfied</b>	<b>Poorly Satisfied</b>	<b>Not Satisfied</b>	<b>Rating weight index (rwi)</b>
	Unit weight (5)	Unit weight (4)	Unit weight (3)	Unit weight (2)	Unit weight (1)	
Water quality	1.1	1.496	0.824	0.137	0.06	3.62
Water supply duration	1.298	1.80	0.46	0.153	0.06	3.77
Water pressure and quantity	1.07	1.56	0.76	0.23	0.03	3.65
Integrity of pipe network	1.22	1.74	0.64	0.14	0.04	3.78
Cost of water	0.95	1.77	0.66	0.17	0.06	3.61
Delivery	1.15	1.83	0.6	0.14	0.05	3.77
Timeliness	0.80	1.87	0.76	0.23	0.02	3.68
Professionalism	0.916	1.83	0.71	0.168	0.04	3.66
Information	0.76	1.89	0.73	0.14	0.06	3.58
Staff attitude	0.99	1.8	0.68	0.17	0.04	3.68
						<b>Σrwi = 36.80</b>

Calculated CSI= (36.80/10) = **3.68**

The RWI is derived from the total of the calculated satisfaction unit weight (SJ) of the responses to each of the satisfaction drivers. The lowest value (3.58) was recorded the satisfaction driver which is information and the highest value (3.78) was recorded for integrity of pipe network. The calculated customer satisfaction index (CSI) is 3.68 . This value means that residential customers of NWSDB perceived domestic drinking water service in the district as satisfactory.

## Conclusion

Drinking water services by the NWSDB is perceived as satisfactory by residential customers' in Karachchi division of Kilinochchi district. Information service by the NWSDB was the least rated (3.58 points) while the integrity of pipe network was the best rated (3.78 points) on a 5-point scale. According to the willingness to pay for water cost, around two-third of the customers responded very willing and willing for cost of water, however, one-third of the customers were fairly willing, poorly willing and not willing to pay for water based on their overall perception of the quality of NWSDB services. The calculated customers' satisfaction index (CSI) is 3.68 points, which evidences that performance rate of NWSDB in Karachchi DS division of Kilinochchi district is satisfactory (3.50-4.49) by the residential customers. It explicitly shows that quality services should encourage customers for cost recovery.

## Conflicts of Interest

There is no conflict exist.

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