THE WILLINGNESS TO PAY FOR CHANGES IN WATER, WASTEWATER AND ELECTRICITY SERVICES IN TRINIDAD AND TOBAGO

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Introduction

Trinidad and Tobago is a twin island nation in the southern Caribbean Sea. The total population of the islands is 1.25 million in 340 000 households, with 1.2 million residing in Trinidad and the balance in Tobago. The country's residents are supplied water by the Water and Sewerage Authority (WASA) who is mandated to provide universal access to water supply in the country. Electricity is distributed by the Trinidad and Tobago Electricity Commission (T&TEC). The Regulated Industries Commission (RIC) is responsible for the regulation of these two utilities in terms of tariff schedules as well as quality of service standards.

Historically, the performance of WASA has been inadequate. Water coverage has not been universal, and where customers have network access, the availability of water has been less than ubiquitous, and this is despite the relatively high availability of water on the islands. WASA estimates suggest that 92% of the population is served with a water supply through 240 000 connections, at either an in house level of service or through standpipe service. Sewerage coverage is lower with only 20% of the population having access to sewerage mains operated by the utility. A further 10% of the population is serviced by private treatment plants and plants owned by the National Housing Authority (NHA) (RIC, 2003a).

T&TEC is the utility responsible for transmission and distribution of electricity in Trinidad and Tobago. The utility supplies about 330 000 customers in the two islands and this coverage amounts to over 97% of the population (RIC, 2003c). Reliability of supply has frequently been highlighted as a problem in the utility, though there has been an increasing trend in the utility over the past seven years. The proportion of outages not restored within four hours dropped from 54% in 1996 to 9% in 2001 (RIC, 2003b).

This paper discusses the results of a national survey aimed at assessing customer satisfaction with WASA and T&TEC. As well the survey sought to quantify consumers' willingness to pay (WTP) for changes in the level of service offered by the two utilities. The following section discusses the design of the survey research. First, theoretical issues pertaining to willingness to pay measurement are discussed. The practical issues, including sample design issues and field procedures, are then presented. The paper then discusses the results arising from the survey and policy applications of those results.

Methodology

As noted above the survey conducted had two main objectives:

- Understand the level of utility service experienced by utility customers
- Ascertain the social benefits which would accrue given a change in the level of service experienced by customers

In attempting to measure current levels of service, some general understanding of the levels of service existent is required. The incorporation of such information into the survey design is the subject of section XXX. The following section considers the theoretical issues pertaining to benefit estimation for service level changes.

As tariffs are set by the government or regulator in Trinidad and Tobago, customers pay one rate or a discrete number of rates for differing levels of service. For instance, customers of WASA classified as

having an in-house connection will pay a flat fee, irregardless of whether there is any service available, or what level the service is at. Further, the utilities under consideration (WASA and T&TEC) have monopolistic concessions on their core business areas. As such, observed customer behaviour is not reflective of internal preference structures associated with the utility customers. The effect of a change in the level of service on social benefits cannot be estimated, therefore, from observed customer behaviour.

Given that customer preference structures are not directly observable in a real market, numerous hypothetical methods are available for the assessment of these preference structures. Such hypothetical methods can be further classed into direct methods and indirect methods. Direct methods seek to evaluate the preference, or equivalently the willingness to pay (WTP), of the consumer by asking the respondent to value a particular change. Indirect methods observe the choice behaviour in artificial markets and infer the preference structure of the respondents. This report uses the contingent valuation method (CV), a hypothetical direct valuation method to value changes in the service levels of water, wastewater and electricity. As well, choice models (CM) are used to estimate the welfare functions of respondents with regard to changes in water services.

Contingent Valuation

The contingent valuation method seeks to ascertain the value placed on a discrete policy change by an individual. A change in policy is described, often using visual aids, and the value for the change is elicited. This method has been widely applied in studies, internationally, attempting to investigate the WTP for changes in water supply and sanitation service (see for example: Whittington et al, 1993, Briscoe et al, 1990, Altaf et al, 1992, Griffin et al., 1995).

Due the hypothetical nature of the inquiry, numerous biases may arise if the scenario is improperly constructed. For example, biases may arise as a result of a misspecification of the scenario. That is, if the scenario is insufficiently anchored in possibility, responses to WTP questions may not be sufficiently representative of internal preference relations.

Numerous methods are available in the literature, to elicit respondents WTP, given the presentation of scenario. The study opted for an iterative bidding game. In such a situation respondents are offered a series of bids, with the value of each bid determined by the series of preceding bids, and asked to answer the dichotomous question of whether they would participate in the described scenario at a given price. The result is an interval estimate of their maximum WTP. The bidding game elicitation method was engaged due to the relatively large amount of information obtained given a sufficient level of control of bias. This method is analogous to the dichotomous choice method suggested in Arrow et al. (1993).

The time taken to develop and present the scenario to survey respondents restricts the process to, normally, one scenario. As such, the analyst is able to develop an estimate of the welfare effects of one discrete change in the level of service or policy. The effects on welfare given fractional changes of those assumed in the scenario are not estimable and as such the method is subject to some variability where the scenario is mis-specified.

The development of the scenarios for use in the present study was iterative and aimed at reflecting the ideal situation with regard to water, wastewater and electricity supply. Initial scenarios were drafted and revised by the survey design team. The scenario was then presented to sector experts, in order to assess its applicability to the Trinidad and Tobago case. Finally a pilot test led to further modifications of the wording of the scenarios. Two scenarios for water were developed; one for those already with in house connections and another for those lacking such facilities. For the wastewater and electricity CV questions one scenario was used for all the respondents.

The values used in the bidding game for water were derived from information about current water tariffs and the tariffs required for cost recovery at the utility (London Economics, 1998). A starting point for the bidding games was set to 200 TT$ per quarter as this was considered a median level at present for in house customers. The maximum and minimum values offered in the bidding game were 500 TT$ and 50TT$ per quarter respectively. The billing frequency was set to quarterly as this is the current billing regime. The

bidding game method fixed the number of dichotomous questions which needed to be answered by each respondent in order to control for respondent fatigue.

Discrete choice experiments (CE)/ choice modelling (CM)

CM is a stated preference technique offering hypothetical changes to respondents and using indirect choice behaviour to estimate the WTP and welfare of policy changes. The method has developed out of conjoint analysis (e.g. Louviere, 1988) and has been applied in environmental valuation exercises (e.g. Blamey et al., 1999) and, in one case, water supply valuation (Anand, 2001).

In CM sets of choice situations are presented to the survey respondent. The sets are composed of different alternatives, and the attributes which define them. A multitude of choice scenarios are presented to the respondent and in each case the respondent is required to indicate the alternative that is most preferred within the set. The choices made, therefore, are independent between sets. One alternative, normally, is set to the status quo to provide measures of utility relative to the present situation. Should this status quo alternative not be included, valuations would only be relative to one another. The inclusion of a cost allows for the modelling of household willingness to pay, and by including the household cost as an attribute, the method does not overstress the importance of cost and so minimizes the tendency to yea-saying. CM requires the presentation of multiple choice sets and so available substitutes must necessarily be considered. This results in a richer understanding of household willingness to pay in that it gives the analyst the ability to evaluate WTP for multiple policy alternatives.

The structuring of choice sets as composed of alternatives, defined by attributes, presents further theoretical benefits. If alternatives are considered to be composed of attributes which can be manipulated by the researcher, then an understanding into the WTP for the inclusion of different levels of those attributes in a policy or project can be estimated. In the case of water supply, for instance, it is possible to define alternatives, in part, by the reliability of the supply. By varying the level of the attribute, reliability, across choice sets, and modelling the data using discrete choice models, the WTP for improvements to reliability can be assessed. The inclusion of other attributes of water supply improvements would allow for a prioritization of imp rovements by attribute, and so would facilitate the design of demand responsive interventions.

Table 1 shows, and briefly describes, the attributes used in this survey.

Table 1: Attributes used in alternative definition in choice experiments

Attribute	Number of levels	Justification
Reliability: days per week	3	The availability of water was considered to be the most significant factor impacting on the WTP of respondents. If water was available for some time every day lifestyle may change to cope with available water. This attribute was an integer value between 0 and 7.
Reliability: hours per day	3	The number of hours per day water is available impacts upon the ability to do water intensive activities such as car washing and laundry. This attribute was an interval categorical variable
Pressure	3	The pressure, if insufficient, requires that coping mechanisms, with financial implications, be effected. If pressure is low many activities take longer and so such an attribute would have an economic impact on the respondent. This attribute was a subjective categorical variable
Quality	3	The quality of water has impacts on the standard of living. Coping costs, such as for treating water to potable quality have economic impact and as such this attribute was included for all choice sets as a subjective categorical value.
Level of Service	2	This factor impacted only choice sets designed for non piped users. The binary variable described two states; the first with a continued standpipe level of service and the second with a higher in house level of service.
Connection Cost	3	This attribute applied to non piped users, and took three values from

		TT$ 0 to 600. The connection cost may impact as a deterrent in the choice to upgrade supply to a higher level of service.
Price	5	Price would necessarily impact the utility gained from a particular policy change. Also, marginal rates of substitution between different attributes and price are calculated to assess the WTP for the policy change.

The design of specific choice sets, and the attribute levels used to define specific alternatives, was developed using a statistical experimental design using the SAS statistical package (Kuhfeld, 2002). Twelve sets including four alternatives each were administered to each respondent. One alternative was constant across all sets (a status quo alternative) to allow for the measurement of the elasticities of the various attributes and the eventual computation of the utility of specific alternatives. Two versions of the choice sets were administered. The first was applied where the respondent used a WASA private connection as their primary water source. The second was for situations where other water supplies constituted the main water source for the responding household. In the second situation, two additional attributes were included as shown in table 1.

Sampling methodology

The sample was drawn using the Continuous Sample Survey of Population (CSSP) methodology of the Central Statistical Office of Trinidad and Tobago (CSO, 1987). The sample frame included the total national population and a two stage stratification process is used in defining the sample. The total sample size of the study was 1420 households, and a non response rate of 12.5% was obtained.

Questionnaire Implementation

The survey was implemented, in Trinidad, over the May-June period of 2003, and used 30 trained enumerators for its administration. In Tobago, the survey was implemented in the first week of June 2003, using 6 enumerators, and three supervisors. The survey included questions about current water, wastewater, and electricity service, hypothetical WTP questions and socioeconomic characteristics of the households.

Survey Results

This paper discusses, briefly, the preliminary results of the survey and a fuller treatment can be found in Virjee (2003).

Sample Characteristics

The sample included more females (60%) than males (40%) as questionnaires were mostly administered during the day. Most of the respondents had either a primary or secondary level of education (80%) and 60% of the sample were owners of their property. This point is of relevance given the tendency in the country for renters to have water rates included implicitly in their rental rates.

Awareness of the RIC

Awareness, amongst the surveyed households, of the Regulated Industries Commission was rather low with only 8% of respondents having heard of the Commission. Of those who had heard of the Commission less than half knew of its functions.

Water Supply

The survey found that 83% of the sample relied upon either an in-house connection or a standpipe supplied by WASA for their primary water source. WASA claims the figure is higher and that they serve 92% of the population at one of theses two levels. As well, the survey found that 27% of respondents depend on at least two sources to meet their total water needs. Rainwater was collected and used by 16% of the

respondents for use as either a primary or secondary source. Of those who depended upon standpipes for their primary water source (11%), 30% utilized standpipes further than 200m from their house, the maximum distance allowed for in the Water Act. Figures 1 and 2 show the proportion of respondents with WASA supplied water as primary sources in Trinidad and Tobago respectively.

Table 2 shows the average bill reported in the survey by customer class, as well as the official water tariffs as provided by WASA (RIC, 2003a). All water tariffs in table 2 are given per quarter.

Table 2: Averaging billing by customer class

Customer class	Number of Respondents	Average Billing (Survey)	Water tariffs (WASA)
A1 – Standpipe	27	$53	$33.75
A2 – Externally Serviced	67	$100	$67.50
A3 – Internally Serviced (no metering)	465	$169	Varies[a]
A4 – Internally serviced (metered)	6	$272	Varies[b]

Notes:

a. – A3 rate depends on the Annual Taxable Value of the building (ATV) and varies between $108 and $270 per quarter

b. – A4 rate is a two block volumetric rate: $1.75/$m^3$ for the first 150 m^3, $3.50/$m^3$ after.

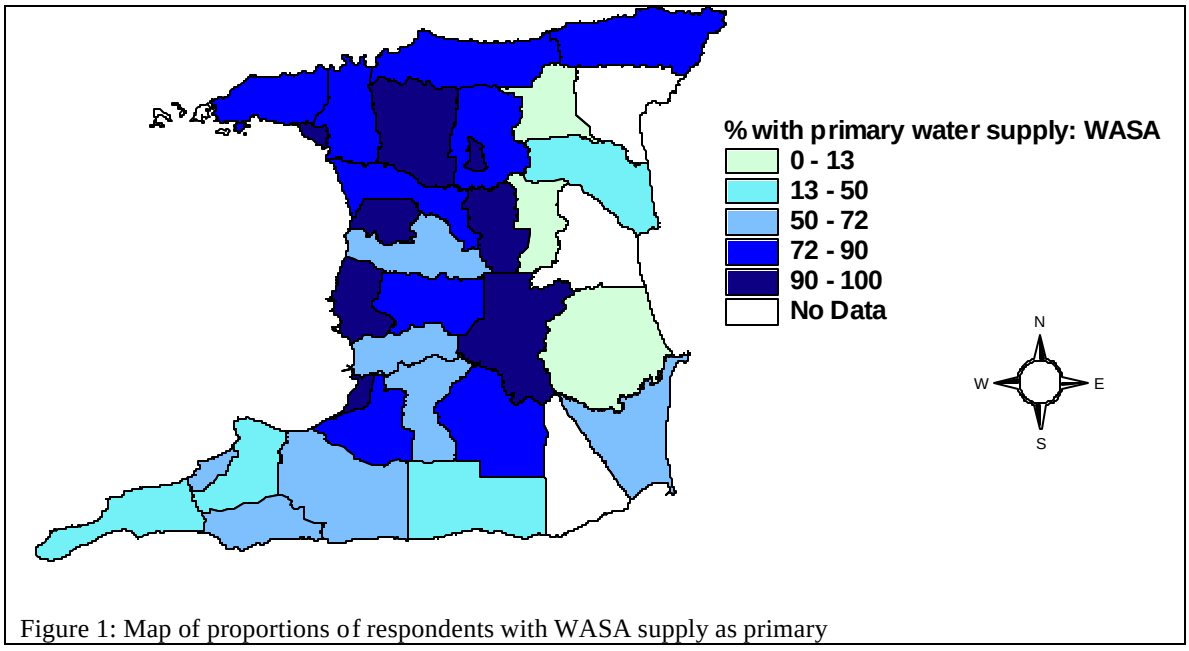

Figure 1: Map of proportions of respondents with WASA supply as primary

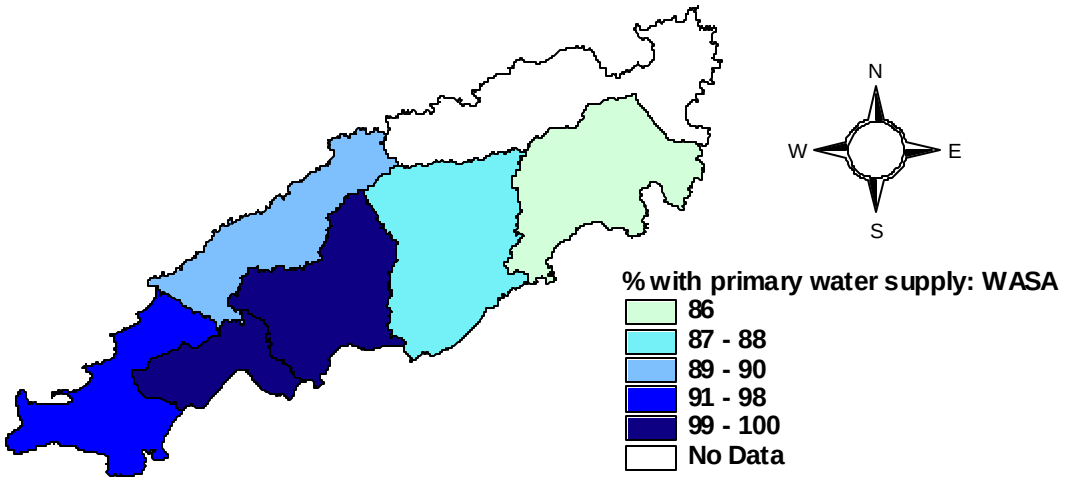

Figure 2: Map of proportions of respondents with WASA supply as primary

The mean rates for customers in this survey are different from the water tariffs utilized by WASA. For fixed rate classes, A1 and A2, the variance between the rate found in the survey and the tariff is, most likely, attributable to errors in reading bills. As bill payments can often be late, arrears may be included in the bills and would serve to inflate the rates reported. The average bill for A3 class customers seems more reasonable. The average billing for A4 customers as given by WASA is $931 per quarter as of 2001 (RIC, 2003a). The considerable difference between this figure and the one reported in table 2 is attributable to two factors; two years have elapsed giving time for customers to change behaviour in response to volumetric prices and, more significantly, the sample of such customers is very small (n=6) making the reliability of such an estimate questionable.

Beside the formal water tariff levied by the utility some households incur other water charges, to cope with inadequate service levels by the utility. 8 % of the survey respondents pay in addition to their water rates for a coping source. The majority of these pay for private water tankers to fill private local storage tanks at an average cost of $160 per month. There were also cases in the survey where respondents indicated that they had paid for truck delivered water by WASA, despite the requirement that WASA deliver such water as part of the larger tariff, water supplied from neighbours, and to other private vendors.

27% of the respondents to the survey indicated that water was available 24 hours a day, seven days a week. This value is somewhat further debatable, due to the effect of local storage, which is widespread in the country. The effect of storage facilities located on private property is discussed below. 44% of the respondents, however, indicated that they had service for between 0 and 48 hours per week and 29 % of the total sample indicated that they received no water at all.

Due to the unreliability of water supply in Trinidad and Tobago, many residents install local storage tanks. The survey attempted to assess the prevalence of such installations.
68% of those surveyed has storage tanks either connected to the water mains or filled manually from hosepipes running from standpipes, neighbours, or mains supplies. On average the installed storage capacity per household was found to be 610 gallons. 82% of the respondents were able to enjoy a continuous supply as a result of the installed storage. This result implies that the proportion of those who have class 1 service may be smaller than reported in the survey given that many respondents would be unaware of service cuts as installed tanks allow for a continuous supply. On average local storage allows for 5.5 days of storage.

Water pressure was also surveyed. Almost half (47%) of the respondents felt that the water pressure was good to excellent, which implied that they saw no difficulties in washing dishes, showering or other similar activities. 14 % felt the water pressure was poor or very poor.

Water quality, largely, was reported as acceptable. A small percentage (8.4%) found the quality on the whole to be poor. Almost 20% of the respondents, however, reported the colour of the water as being poor to very poor, and almost 15% of the respondents took issue with the taste of the water supplied by WASA. 45% of the respondents, though, do treat their water, with the most popular form of treatment being boiling.

Non piped water users spend considerable time in collecting water. Of the surveyed non piped water users, over 75% spend more than 30 minutes per day collecting water and 30% spend more than 60 minutes.

Wastewater services

17% of the survey respondents had access to a central sewerage system and WASA supplies approximately 20% of the population with wastewater services (RIC, 2003a). Almost 60% of the respondents rely on septic tanks for waste disposal. In such cases, open drains would be used to dispose of greywater. As well, almost 25% of the survey uses pit latrines for waste disposal.

Though a large proportion of the sample was satisfied with their current wastewater disposal system, almost 40% indicated that an improved system was preferred. Again the aggregate disguises the variation in preference for service level change. Latrine users were considerably more interested in an improved wastewater disposal system than those already with a central sewerage system. And though septic tank users were the most satisfied group, they, more than central sewer users, preferred a service change.

Most surveyed households preferred a central sewerage system be accessible at their household but almost half of current latrine users preferred septic tanks to central sewerage as their waste disposal mechanism.

Electricity

92% of survey respondents had electricity. Given sample error, this number is not statistically different from the 97% coverage reported by T&TEC. The average bill in the survey was $216 bi-monthly. Respondents, mostly (70%), pay their electricity bills within 2 weeks and 97% pay their bills within a month.

Electricity supply was considered to be good to excellent by 83% of the survey respondents. This proportion is the same on both islands in the country. As well, customer service satisfaction is high with over 85% of respondents reporting that they were satisfied to very satisfied with the level of service offered by T&TEC.

Outages were infrequently experienced by 75% of the respondents and about 6% of the respondents reported outages with at least a weekly frequency. When outages did occur, they were, most often, within 2 to 4 hours duration.

20% of the respondents have, in the past, made a trouble report and in the majority of cases the reports have been resolved within 4 hours.

Voltage fluctuations are experienced only rarely by 70% of the respondents, though 17% of the respondents do experience voltage fluctuations frequently. The voltage fluctuations have led to damaged appliances for 8% of the respondents, but less than 2% of the respondents reported making a compensation claim for damaged appliances. Of those who have made compensation claims, 79% have found the level of compensation to be unfair or very unfair.

Willingness to Pay for Service Changes

Water

As has been mentioned, two methods were used to evaluate the WTP of respondents for service level changes in their water supply. The contingent valuation method (CV) was applied using a fixed scenario with a bidding game for the valuation elicitation. The average WTP for the entire sample, for a service

upgrade to a 24 hour supply with adequate pressure and quality, and an in house connection where it currently does not exist (with standpipe customers for instance) was TT$ 150 per quarter as compared to TT$ 156 per quarter, which is the average bill currently paid by respondents. This would indicate that there is little net willingness to pay for increased service levels amongst the sample as a whole. When sub samples are examined, however, some difference is observed. Standpipe customers are willing to pay, on average, TT$ 185 per quarter, for the service upgrade, which is somewhat more than the current tariff of TT$ 34 per quarter.

In general, the WTP values obtained from the CV bidding games seem to show some bias in that respondents appear to have used current billing levels as indicators for their WTP rather than an explicit consideration of scenario offered. This is most likely due to inadequate confidence in the potential for changes, as described in the CV scenario, to be implemented by the current water utility. As well, as many users have invested in coping mechanisms, such as local storage facilities, the demand for service changes which make such investments redundant would be reduced. Again, this is indicative of a lack of consumer confidence in the utility in that the consumer would rather take onus of provision upon themselves than rely upon the utility.

It is relevant to understand the influences on the WTP of other independent factors. As such a regression model has been developed to examine the factors influencing the WTP of respondents of the survey. Table 3 shows the parameters which significantly affect respondent WTP. An ordinary least squares regression was performed with the dependent variable as the mid point of the interval in which the true WTP lies. As the bidding game establishes an interval in which the respondent's WTP lies (through a series of discrete choice questions), the mid point can be used to represent the true WTP for such analysis (Altaf et al, 1992).

Table 3: Parameters in OLS model of WTP for water supply changes

Parameter	**estimate**	**t-statistic**
Intercept	173.33	5.16
Income (1000 TT$)	5.10	2.71
Current bill amount (TT$/quarter)	0.25	5.36
Squatter (1= squatting; 0 = not squatting)	75.64	2.35
Piped (1 = currently have piped connection; 0 = currently do not have piped connection	-49.99	-2.25
Tanks not connected to WASA mains (1 = have non connected tanks; 0 = do not have tanks not connected to WASA mains	-15.46	-1.65

All the parameters in table 3 are significant at the 10 percent level and the model F-statistic is 12.69.

As can be seen the signs of the parameters in the model are all as expected. Increased income and current bills increase the WTP of respondents. As well the model shows that in cases where respondents were squatting, or land tenure was insecure, respondents were, on average, willing to pay an additional TT$ 75 per quarter for the service increase. Users currently relying on a piped in house connection for their primary supply had a lower WTP, by TT$ 50 per quarter, than those relying on other sources of water. As well the presence of tanks not connected to the mains had a negative effect on the WTP for service increases. This also is reasonable. If users invest in local storage, effectively coping with reliability variations, they would be unwilling to pay for service level increases which make their investments redundant.

As well as the CV method, discrete choice experiments were used. Table 4 shows the parameter estimates for a conditional logit model (McFadden, 1974) resulting from data from users whose primary water source is an in house piped connection supplied by WASA. Alternatives in the choice set were contrasted with a status quo option to provide for the ability to analyse choice behaviour rather than an un-anchored preference structure that would result should such an alternative not be included. For this preliminary analysis, the status quo option was coded as the average for all respondents.

Table 4: Conditional logit parameter estimates: piped users

Parameter	Units	Estimate
Reliability (days per week)	1 = 4 days per week	3.28
Reliability (days per week)	1 = 7 days per week	3.81
Reliability (hours per day)	1 = 12 hours per day	2.06
Reliability (hours per day)	1 = 24 hours per day	1.66
Pressure	1 = medium	1.51
Pressure	1 = high	0.91
Quality	1 = medium	2.15
Quality	1 = high	2.16
Price	Scaled price (continuous)	-0.87

The parameters in table 4 were all significant at the 5% level. As well, a visual inspection shows that the parameters are of the correct sign. For instance the price parameter being negative implies that an increase in the price of water supply decreases the utility of the supply to the consumer. An increase in the reliability of supply, as suggested by the positive coefficient, would increase the utility. The amount of price increase that would have to occur to reduce the utility to the level before the reliability increased is called the compensating variation and is equivalent to the willingness to pay for the service. Thus the results imply that in moving from a supply of water which comes four days a week for 2 hours a day to a supply offering 168 hours per week, a respondent currently paying TT$ 150 would be willing to pay TT$ 386 per quarter. The model estimated in table 4, however, should be taken as a preliminary one, given the lack of comprehensive investigation into the assumptions associated with the conditional logit model.

Wastewater

The willingness to pay for changes to wastewater service was also examined in this survey. In this case, only the contingent valuation method was employed. The mean WTP for access to piped sewerage facilities, meeting environmental standards, was TT$80 per quarter.

Table 5 shows estimates of the linear model parameters estimated using an ordinary least squares linear regression.

Table 5: OLS parameter estimates for WTP for water sewerage systems

Parameter		Estimate	t-statistic
Intercept		114.46	4.52
Income (1000 TT$)		5.03	3.69
Current water bill amount (TT$/quarter)		0.05	1.86
Squatter (1= squatting; 0 = not squatting)		59.86	2.47
Tanks not connected to WASA mains (1 = have non connected tanks; 0 = do not have tanks not connected to WASA mains		-13.94	-1.99
Class of service (1 to 5 depending upon hours of service per week)	Class = 1 (168 hrs/week)	23.73	2.87
	Class = 2 (120-168 hrs/week)	18.32	1.39
	Class = 3 (84-120 hrs/week)	13.58	1.35
	Class = 4 (48-84 hrs/week)	6.07	0.53
	Class = 5 (<48 hrs/week)	0[a]	

Notes:
[a] – Due to dummy coding parameter is set to zero

Again, the model shows parameters of the expected sign and the model F-statistic is highly significant at 6.47. Of particular note is the relationship between the reliability of current water sources and the willingness to pay for sewerage connection. This is most likely due to the supposition on the part of the respondent that the two are linked. In reality the sewerage infrastructure would require a relatively reliable water supply to facilitate its operation. The negative effect of non connected local storage on the WTP of the respondent can be attributed to the likelihood that in cases were tanks are not connected to the mains

water supply is sourced from other sources alongside the mains supply. In such cases, the respondent is required to suppose that along with the improved sewerage service a reliable water service would be offered. This perhaps is beyond the imaginable reality of the respondent and so where tanks are in place local sewage disposal mechanisms, such as latrines and septic systems, may be sought.

Electricity

The WTP for a fully functioning electricity supply, with no brownouts or blackouts, and prompt rectification of problems on average was TT$ 184 bi-monthly. This is not significantly less than the average bills reported by the respondents of the survey.

Table 6 shows parameters of a linear model estimated using a regression analysis on the dependent variable; willingness to pay for service improvements.

Table 6: OLS parameter estimates for WTP for electricity improvements

Parameter		**Estimate**	**t-statistic**
Intercept		115.99	9.41
Income (1000 TT$)		7.63	7.91
Frequency of outages	Weekly	-17.78	-1.25
	Monthly	-17.76	-1.49
	Infrequently	-27.48	-2.54
	Never	0[a]	
Household owns:	Water heater	20.34	3.72
	Washer	10.93	4.92
	Television	21.77	2.19

Notes:
[a] – Due to dummy coding parameter is set to zero

Table 6 shows that the monthly willingness to pay for electricity changes is dependent upon the frequency of outages as well as the income of the respondent. Also, the ownership of electricity consuming appliances is of relevance. The model F statistic is 19.57 and all the parameters bar the weekly outage dummy variable are significant at the 10% level.

Conclusions

This brief treatment of the results of a willingness to pay survey for water and electricity services in Trinidad and Tobago measures quality of service levels and develops estimates of the potential benefits which would accrue given increase service standards in the two industries. First, though, the preliminary nature of the results should be stressed, especially with regard to the econometric models built to explain the variation in willingness to pay.

The service levels currently in place in the water sector are generally lacking by international standards, as well as falling behind the levels reported by the water utility, WASA. Particularly, measured coverage is lower than reported and when reliability of supply is considered this measured coverage is further eroded. There are significant aesthetic water quality issues, notably discolouration of the water.

The econometric models indicate that there is a willingness to pay for increased service levels with the main priority amongst users being increased service reliability. More detailed tests are required, however, in order to ascertain the exact effects of various influences on the willingness to pay for water.

Wastewater services are currently confined to a small proportion of the population, as this survey found. A significant number of households in the two islands continue to rely upon very low service levels of human waste disposal (i.e. pit latrines). The willingness to pay for changes to this system seems to be independent of current service levels which further indicates that surveyed households do not consider expanded sewerage facilities as feasible in the foreseeable future.

Electricity is widely accessible and delivered at a high standard, with relatively few outages and high levels of customer satisfaction. The willingness to pay for changes is somewhat small due to this.

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