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The Understanding of Willingness to Pay for Clean Drinking Water Through Extended Version of The Theory of Planned Behaviour

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ABSTRACT

This study examines how extended version of Theory of Planned Behavior (TPB) affects households Willingness to pay (WTP) for getting access to clean drinking water. In order to validate how extended version of TPB and WTP are related, it also considers people's Environmental concerns (EC) as antecedent variables to core TPB factors. The Structural Equation Modeling (SEM) is employed to validate the hypotheses of the research after recruiting 401 participants. The result of current study showed that TPB factors play a significant role in effecting households' intention to pay (IP), which subsequently influences their WTP. Additionally, the households' environmental concerns, as antecedent variable play a significant effect on core TPB factors i.e. attitude (ATT), subjective norm (SN) and perceived behavior control (PBC). In turn, these core factors of TPB shape households' intention to pay, which subsequently influences their WTP for getting access to clean drinking water. It gives stakeholders a chance to observe how extended version of TPB and WTP interact with one another. To increase WTP for getting access to clean drinking water, raise awareness about environmental risks. Promoting the concern for environmental can improve attitudinal and behavioural aspect of an individual. These changes then result in enhancing intention to pay (IP). Aligning messages with people's environmental values helps build support for sustainable water access. The recent study also contributes to the literature in behavioural and attitudinal contexts by examining extended TPB constructs, and community responsibility in relation to getting access to clean drinking water services.

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1. Introduction

Water is one of the most fundamental human necessities, practically needed for all socioeconomic activities, it is also seen as a crucial element for achieving sustainable economic development (Uhlenbrook, 2019). The access to get clean drinking water is a serious and global problem with far-reaching implications for the public health, economic progress, and overall welfare of the nations. A recent World Health Organization (WHO) report indicates that an approximately 2.2 billion of individuals have no access to properly managed safe or clean drinking water, highlighting the persistent challenges in achieving widespread clean drinking water access (WHO, 2022).

The UNICEF and WHO Joint Monitoring Programme (JMP) aims is to ensure drinking water which is safely managed and sanitation services by 2025 for the global population. The 2015 Millenium Development Goals (MDGs) target serves as a key milestone. The JMP strives to be the globally trusted source of data on safe water availability, sanitation and hygiene for governments, donors, and organizations. The main target of JMP is to measure drinking water and sanitations progress to achieves the Sustainable Development Goals (SDGs) six. The data on household drinking water basically monitors the number of people using safe or clean drinking water from different improved sources. These includes the data on water source type, accessibility and availability. Their report indicates that incase of Pakistan only 50.6% of population have access to drinking water which is safely managed.

Pakistan is in the list of 36 most water stress countries. Similarly, has the fourth-highest water consumption rate in the world whereas having the greatest water use per unit of GDP, which further worsens the situation (Ahmad et al., 2021). In Pakistan like many other low-income countries government faces the constraints in providing safe drinking water to their citizens.

The situation in the Northern Western province of Pakistan Khyber Pakhtunkhwa (KP) is even more alarming. As per 2010 report of Pakistan Council of Research in Water Resources (PCRWR) KP province is one of the most backward and impoverished regions, making the situation more worsen. Moreover, a recent assessment by PCRWR regarding water quality data from KP when compared with the standards for quality drinking water, showed that out of 435 sources only (39%) 169 sources were found safe while 61% (267) sources were unsafe for drinking (Rasheed et al., 2021).

Beside the quality of drinking water, the Pakistani nationals also face the water quantity issues. According to Sleet (2019) Pakistan's water resources would run out completely and the nation would be unable to supply enough water due to physical shortages in the long run. According to Malik et al. (2010) in Pakistan, the amount of water available per person has also decreased to 1200 m3, from more than 5000 m3 in the 1950s.Similarly, Ali (2021) claimed that currently Pakistan has seen a 400% decline in the amount of water available per person.

The access to clean drinking water is crucial for human health, economic growth, and overall well-being (Gillani, Bhatti, et al., 2022; Gillani, Shafiq, et al., 2022). However, many communities, particularly in developing regions, still face challenges in getting access to clean drinking water supply which should be available on premises (Majeed & Gillani, 2017). Due to drinking the contaminated water, millions of people are suffering from chronic illnesses like cholera, diarrheal, typhoid, and parasites (Curry, 2010). According to Troeger et al. (2018) diarrhea is the 8th most common cause of fatality across all the age groups which is a water borne disease.

To ensure safely managed drinking water, information regarding attitudinal aspect is gathered. Thus, this study is aligned with SDG 6.1: "Ensure everyone has access to safe and affordable drinking water by 2030", by understanding the household WTP for getting access to clean drinking water. On the other hand, the understanding of behavioural drivers through the extended version of TPB helps in designing effective and sustainable policies for drinking water.

The findings of the study make significant contribution to both academic theory and real-world application. First, it extends the Theory of Planned Behaviour by examining the interrelationships among ATT, SN, IP, EC, and WTP in the context of access to clean drinking water. By incorporating EC and WTP into the extended TPB framework, this research provides a more comprehensive understanding of environmentally responsible actions. Second, prior studies have largely overlooked the role of attitudinal factors in influencing individuals' willingness to secure access to clean or safe water. This study addresses this gap by highlighting how behavioural intentions are shaped by attitudinal dispositions in water sustainability contexts.

2. Literature Review

In field of environmental psychology, the prevalent approach for understanding the relationship between attitudes and intended behaviour TPB is most relevant theory (Ajzen, 1991). The TPB is the predominantly used tool for predicting behavioural intentions to estimate the value of non-marketable resources (Armitage & Conner, 2001; He et al., 2021; López-Mosquera & Sánchez, 2012; Rekola, 2001; Zahedi et al., 2019). These researches confirmed that individuals are more inclined to participate in a particular behaviour when they hold the belief that their actions will lead to some specific outcomes.

In literature the application of TPB is far beyond water-related studies. The TPB has also been used to evaluate the WTP for green energy. A study found that ATT, SN, and PBC affects the WTP for renewable energy in Pakistan, however concerns about high costs had a negative impact (Ud Din et al., 2023). Similarly, in India respondents WTP for adoption intention of electric vehicles is analyzed through extended TPB (Shalender & Sharma, 2021). In the same manner, research in Poland used Structural Equation Modeling (SEM) to assess how environmental concern influences WTP for green energy. The findings revealed that environmental concern indirectly increased WTP through behavioral changes rather than having a direct effect (Neska et al., 2024).

The previous studies on the TPB indicated that individuals who hold a positive intention regarding the suggested payment (ATT), perceive social support from friends and family to make the payment (SN), and believe in their own ability to make the payment (PBC) are more inclined to express an IP for environmental goods and services.

While drawing on the TPB, the study anticipate that individuals will exhibit a stronger intention to pay for access to clean drinking water when they (1) hold favorable attitudes toward the proposed payment scheme, (ATT) (2) Perceive social approval or encouragement from significant others that is family members, peers, or community leaders to make the payment (SN), and (3) believe in their own capacity and resources to complete the payment process (PBC).

However, the IP which is measured independently of any specific monetary value is also expected to positively affect the respondents' stated willingness to pay (WTP) where some specific amount is mentioned. Ultimately, this stated WTP is hypothesized to translate into actual payment behavior.

In current literature specifically on water management and sustainability initiatives the integration of WTP with the TPB is increased. Specifically, for assessing the individuals' WTP for environmental improvements. This combination helps in providing a proper assessment of the psychological and economic factors influencing WTP, offering valuable insights for policymakers. For the estimation of WTP The contingent valuation method (CVM), which gathers people's payment willingness for environmental improvement through hypothetical market is utilized. Likewise, the estimation of willingness to pay for environmental quality improvement in a hypothetical market. The CVM is the most widely used stated preference method. This method helps to estimate the economic value of any specific environmental good or service. By utilizing the CVM both use and non-use value can be determined.

The estimating environmental goods value, such as drinking water, biodiversity and air quality, is challenging due to the unavailability of market prices. The CVM is a widely used survey-based technique to estimate their value. It falls under the "Stated Preference" model, unlike price-based revealed preference models. Both revealed and stated preference models are utility-based procedures. The CVM is extensively used method for assessing the value of environmental resources. In environmental economics, it helps to evaluate both the use and non-use value of environmental goods and services. The CVM use has grown in recent years, especially in studies related to safe drinking water.

The CVM presents respondents with hypothetical market scenarios. They are asked about how much they are WTP for improvements or how much they are WTA as compensation for losses. This method helps policymakers assess the economic value of non-marketed resources.

Prior works have employed the extended version of TPB to investigate the relationship between attitudinal and behavioural factors with WTP for different environmental goods and services. Such as a researcher in Iran employed TPB to comprehend the farmers' intentions to accept water policy options, demonstrating its relevance in water resource management (Mahdavi, 2021). Beside water related issues the TPB is also utilized in other environmental problems like air pollution, deforestation and tourism. A study in China analyzes WTP for green lifestyles using the theory of TPB and the double-bounded dichotomous choice (DBDC) method. Data from 1,377 respondents across five East Chinese cities were assessed. The monthly WTP was 81.8 CNY for green food, 52.5 CNY for clothing, 38.9 CNY for travel, 53.2 CNY for housing, and 37.2 CNY for waste recycling. Attitude and moral norms strongly influenced WTP. The findings indicate TPBs effectiveness in analyzing WTP for green lifestyle decisions (Geng et al., 2023).

Likewise, a study in Catalonia was carried out to explore what actually drives the people's WTP to mitigate air pollution and greenhouse gases (Zahedi et al., 2019). The extended version of TPB model by incorporating the was empirically tested. The 406 households were interviewed. The finding revealed that a strong association between concern for environment and the three main TPB factors. The overall explanatory power of the were found to be 94.7 %.

In the same way Zhang et al. (2021) carried out a study for addressing the urban heat island effect in China. As the issue is crucial for sustainable development and also gaining public acceptance in large cities of China. The research investigated the residents' WTP for the implementation of permeable street as a means to mitigate urban heat influences. In addition, the research also analyzed the factors that drive WTP intention. They responses from urban residents in Guangdong Province through an online questionnaire were collected. For the estimation of the WTP the CVM were employed. The intention for the willingness to pay were empirically analyzed through SEM. The extended version of TPB, along with a moral norm (MN) as an additional component were tested. The findings revealed an average WTP of 17.98 Yuan per month. Additionally, the inclusion of moral norm variable within the TPB model enhanced its the ability to describe WTP intention. Notably, the PBC, ATT, and MN emerged as a significant predictor. However, the variable SN did not significantly influence intention of payment.

To advance our understanding of attitudinal and behavioral factors in influencing the WTP for getting access to clean drinking water services offered by Water and Sanitation Services Companies (WSSCs), this study proposes and tests the following hypotheses:

H1: Intention to pay for getting access to lean drinking water will positively affect an individual WTP.
H2: Attitude towards payment for getting access to clean drinking water will positively affect an individual intention to pay.
H3: Subjective Norms towards payment for getting access to clean drinking water will positively affect an individual intention to pay.
H4: Perceived Behavior Control for getting access to clean drinking water will positively affect an individual intention to pay.

2.1. An Extended Version of TPB Model

The TPB has faced criticism for overseeing additional influencing variables and failing to fully explain behavioral outcomes (Ajzen, 1991; Han & Hansen, 2012). In the literature to address this limitation, several researchers have suggested an extended versions of the TPB by incorporating extra variables (Bamberg & Möser, 2007; He et al., 2021; Kremer et al.,

2009; López-Mosquera et al., 2014). One commonly added factor in environmental studies is the environmental concern, which has shown significant influence on pro environmental attitudes, intentions, and behaviors (Bamberg & Möser, 2007; Chen & Tung, 2014; Zahedi et al., 2019). As noted by some researcher that environmental concern may have a stronger effect on behaviors indirectly rather direct (Bamberg & Möser, 2007; He et al., 2021; Wang et al., 2016; Zahedi et al., 2019; Zhang et al., 2021).

Accordingly, this study integrates EC into the original TPB framework, positioning it as a precursor to the model's primary TPB constructs. Based on this extension, the following hypotheses are proposed:

H5: An individual Environmental Concern will positively affect his/her Attitude for getting access to clean drinking water.
H6: An individual Environmental Concern will positively affect his/her Subjective Norm for getting access to clean drinking water.
H7: An individual Environmental Concern will positively affect his/her Perceived Behavior Control for getting access to clean drinking water.

3. Methodology

This study employed an extended version of TPB to investigate the relationship between attitudinal and behavioral factors with WTP for improved water services in KP. The data were collected through a structured survey, and the proposed relationships among extended version of TPB constructs is tested using SEM to evaluate the model's validity and fit.

3.1. Sample size

To address the challenge of incorporating and analyzing the willingness-to-pay (WTP) of respondents in the study area, we opted for a representative sample. For finite populations, Yamane, (1973) equation, a commonly utilized procedure, was employed to determine a required sample size. The sample size for the current study, set at 401, which was derived from this $\eta = \frac{N}{(N-1)\delta^2+1}$ formula, considering the similarity among sampled households and resource and time constraints. The sampling technique employed a multistage approach, selecting seven sub-cities from the Khyber Pakhtunkhwa (KP) province having WSSCs service. The selection criteria were primarily based on the current water supply situation.

3.2. Method

For investigating the claimed hypothesis, the SEM procedure was employed in Smartpls software. The measurement model is employed to test the reliability and validity of the overall constructs and were found robust. For estimating the willingness to pay the Double Bound Dichotomous Choice CVM procedure is adopted. The value generated through the DBDC procedure is efficient then Single Bound Dichotomous Choice Model (SBDC).

3.3. Measures

All the items of the extended version of TPB used in this study five-point Likert scale anchored between 1 and 5. The TPB basically explains that how an individual behaviour is driven by behavioural intentions, which are influenced by ATT, SN, PBC and EC. Attitude is defined as a individual negative or positive evaluation of performing any behaviour. The PBC measures an individual capacity to perform any specific action. Similarly, the SN measures the effect of social pressure or carry out or not any action. The intention to pay measure the readiness of an individual to pay for any specific good or service. The antecedent variable EC measures the level of awareness and worry a person has about environmental problem. All the item used in the study to measure the household's ATT, SN, PBC and EC were adapted from the (Bhutto et al., 2022; López-Mosquera et al., 2014; Zahedi et al., 2019). For the

WTP values the well-known DBDC CVM procedure utilized to know the respondents' preferences which is used in lot of past studies in the water related issues (Aman et al., 2020; Hao et al., 2023).

3.4. Measurement Result

For providing proper framework to relate latent variable with observable indicators measurement model play a crucial role in the structural equation model (SEM) (Bollen & Bauldry, 2011). In measurement model indicators are defined that how it reflects the meaning of latent variables, and ensures that constructs are measured accurately. For ensuing the robustness of reliability and validity of the model, effective measurement results play a significant role which are vital for the research which is empirical in nature. In studies where integration of CVM and extended version of TPB is done for knowing effects on willingness to pay measurement model become necessary requirement.

Table 1
Measurement Model Results

Constructs & Indicators	Factor Loadings	Composite Reliability	Average Variance Extracted	Cronbach Alpha
Attitude		0.900	0.750	0.833
ATT1	0.820			
ATT2	0.909			
ATT3	0.867			
Environmental Concern		0.882	0.713	0.799
EC1	0.843			
EC2	0.836			
EC3	0.855			
Intention to Pay		0.844	0.643	0.724
IP1	0.808			
IP2	0.823			
IP3	0.773			
Perceived Behavior Control		0.875	0.700	0.785
PBC1	0.813			
PBC2	0.879			
PBC3	0.816			
Subjective Norms		0.902	0.754	0.837
SN1	0.842			
SN2	0.893			
SN3	0.870			

In the above table 1 the factor loading on each item is above than 0.4 which indicates correlation between an observed variable and a latent factor. Construct reliability and convergent validity are verified through Cronbach's alpha, composite reliability, and Average Variance Extracted. All constructs meet the required thresholds of 0.7 for reliability and 0.5 for AVE, confirming strong internal consistency and the ability of constructs to explain their indicators.

Table 2
Proposed Model Statistical Result

Relationships	Coefficients	T statistics	P values	Decision
ATT -> IP	0.116	1.997	0.046	Accepted
EC -> ATT	0.598	14.732	0.000	Accepted
EC -> PBC	0.582	12.178	0.000	Accepted
EC -> SN	0.586	13.456	0.000	Accepted
IP -> WTPF	0.416	9.601	0.000	Accepted
PBC -> IP	0.477	8.020	0.000	Accepted
SN -> IP	0.153	2.644	0.008	Accepted

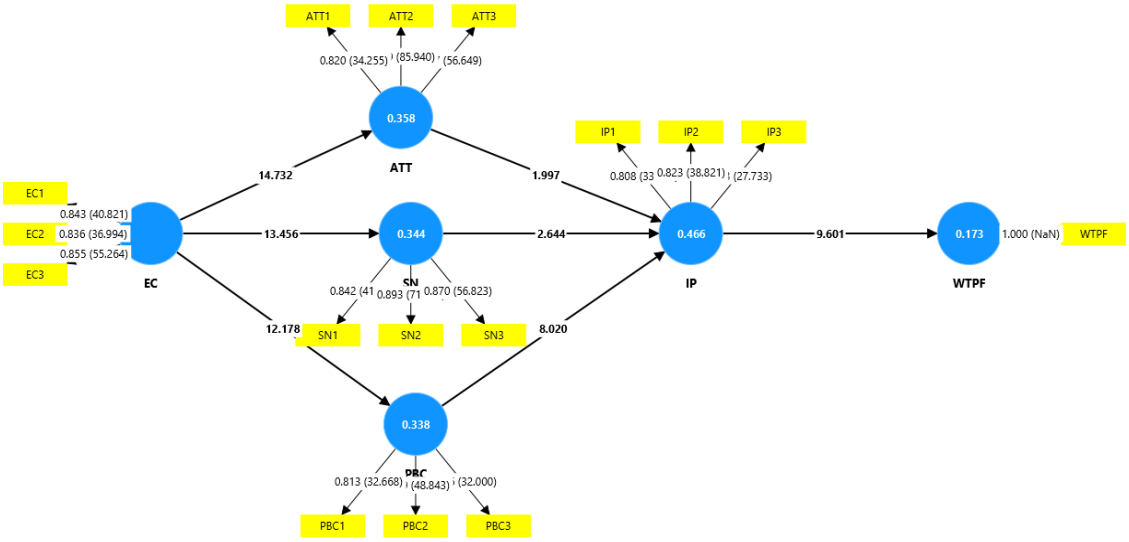

Figure 1: Graphical Output of the Model

The table 2 indicates the structural model path analysis which actually evaluates relationships between constructs. Using the coefficients, T-statistics, and significance P-values for the purpose of inferences after analysis. The path coefficients which basically measure the strength of relationships among the constructs. To interpret the coefficient of path analysis values closer to 1 indicate stronger relationships. The t-statistics assess significance, with values above 1.96 indicating significance at a 95% confidence level. The P-values below 0.05 confirm the statistical significance of the claimed relationship (F. Hair Jr et al., 2014; Hair Jr et al., 2017).

The path coefficient of the bootstrapped Structural model shows the direction, strength and significance of the relationship between latent variables. The coefficient for the relationship between ATT and IP is 0.116 with a t-value of 1.997. this relationship is statistically significant as the P-value below than 0.05. The coefficient indicates that if there is one standard deviation increase in the attitude variable, the IP variable increases by 0.119 standard deviations, on average. Similarly, the effect of EC on the all-core factor of TPB ATT (0.598; p <0.001), PBC (0.582; p <0.001) and Subjective Norm (0.586; p <0.001) is positive and significant. On the other hand, the effect of intention to pay of respondent on the WTP is (0.416; p <0.001) which indicates a positive significant relationship. While in case of PBC and SN effect on IP the table value is (0.477; p <0.001, 0.153; p <0.001). These values are positive and shows a positive and statistically significant relationship between variables.

4. Discussion

The empirical findings of the SEM for investigation of attitudinal factors also reveal a significant relationship among the claimed associations. The factors of TPB significantly and positively influence the IP for getting access to clean drinking water.

The household's intention to pay in the study area is affected by their ATT, SN and PBC. From the empirical literature on the TPB the same positive relationships among the core factors of TBP and intention to pay is observed in the different environmental studies (Chen & Tung, 2014; He et al., 2021; López-Mosquera & Sánchez, 2012; Zhang et al., 2021). Similarly, the study also indicated a positive relationship of concern for environment with ATT, SN and PBC which are also found in line with previous studies of Borzino et al. (2020); Chen and Tung (2014); De Groot and Steg (2007); Lee and Holden (1999); Zahedi et al. (2019). Similarly, the research on predicting the mean WTP for municipal solid waste management show positive relationships between environmental concern and core TPB factors (He et al., 2021).

From the overall discussion, the findings of this current study affirm that the extended version of TPB framework is a robust and appropriate model for understanding individuals'

WTP for access to clean drinking water. The inclusion of additional psychological and contextual variables the EC, enhanced the explanatory strength of the model beyond the core TPB factors. These results suggest that interventions aiming to improve clean water access should not only address economic aspects but also consider the attitudinal, factors that shaping the behavioural intentions.

5. Conclusion & Recommendations

The overall findings of the current study highlighted an importance of integrating psychological and environmental factor into water policy and service strategies. By addressing the key drivers of extended version of TPB stakeholders can get stronger public support and financial commitment toward getting access to clean drinking water. Future interventions should focus on awareness campaigns, accessibility improvements, and community engagement to translate positive intentions into sustained willingness to pay. Such evidence-based strategies can contribute to more effective and sustainable water service delivery in other developing regions as well.

The extended version of TPB model results indicate that EC has a positive and significant effect on behavior related to clean drinking water. Individuals with higher concern for the environment are more likely to support and adopt clean water practices. In addition, attitude, perceived PBC, and SN significantly influence the IP. This suggests that favorable evaluations, a sense of control, and social influence encourage households to express willingness to contribute financially.

Moreover, an intention to pay shows a strong and significant impact on willingness to pay (WTP). This confirms that intention acts as a key mediator between psychological factors and actual financial behavior. Stakeholders, such as Water Sanitation Service Companies, should promote clean drinking water by highlighting environmental benefits, improving affordability and access, and using community-based influence. These targeted efforts can enhance both the intention and actual willingness to pay for clean water services.

Authors Contribution
Zohaib Ali: Conducted the article reviews and summarized the findings.
Atta Ur Rehman: Supervised the whole study and guided all authors.
Muhammad Rafiq: Contributed to the review process and manuscript proofreading.

Conflict of Interests/Disclosures
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