

BRIDGING THE KNOWLEDGE-BEHAVIOR GAP IN UNIVERSITY STUDENTS' WATER CONSERVATION: EVIDENCE FROM KAP, TPB, AND INSTITUTIONAL BARRIERS IN PAKISTAN

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Abstract

This study examines the gap between awareness and water conservation behavior among university students using an integrated framework of the Knowledge-Attitude-Practice (KAP) model, the Theory of Planned Behavior (TPB), and institutional perspectives. A mixed-method design was applied, combining a survey of 50 students with exploratory qualitative insights from students and support staff. Findings show that students possess moderate knowledge and generally positive attitudes toward water conservation, along with strong concern about water scarcity. However, this awareness does not translate into consistent action, as students mainly engage in simple personal conservation practices while participation in institutional and collective behaviors remains limited. The study finds that this gap is shaped by established behavioral barriers, particularly immediacy, uncertainty, and marginality, which reduce the translation of concern into action. In addition, hot cognition influences how environmental risks are interpreted, while the AMO framework indicates that limited and unclear institutional opportunities further restrict engagement. A key contribution of this study is its integrated explanation of the awareness-behavior gap by linking psychological barriers with institutional constraints within a single framework. The study concludes that improving water conservation behavior in universities requires structured engagement systems, clearer participation pathways, and stronger institutional support rather than relying on awareness alone.

INTRODUCTION

Water scarcity has emerged as a serious environmental and developmental challenge, particularly in countries like Pakistan, where rapid population growth, urban expansion, and climate change are placing increasing pressure on already limited water resources. Recent studies show that

declining water availability, weak governance, and inefficient usage patterns are accelerating the country's movement toward water stress conditions (Ishaque et al., 2023; Farooq, M.U., 2026).

Alongside these structural issues, problems related to water quality and accessibility continue to intensify, creating risks not only for environmental

sustainability but also for public health and long-term development (Ishaque et al., 2024). These challenges highlight the need for responses that go beyond policy and infrastructure and also focus on behavior change, especially within institutions that shape awareness and social norms (Jacob, 2026).

Universities are particularly important in this context because they function as spaces of knowledge production and social influence. However, research consistently shows that awareness alone is not enough to ensure meaningful behavioral change. Even when individuals understand environmental issues, this knowledge does not always translate into consistent action due to institutional, social, and psychological barriers (Colombo et al., 2025; Sousa et al., 2021; Yang et al. 2025).

This study is conducted as a preparatory step for designing effective public relations campaigns on water conservation within the university setting. It applies the Knowledge-Attitude-Practice (KAP) framework to understand students' awareness, attitudes, and behaviors regarding water use, and to identify the gap between knowledge and action. The aim is to generate evidence that can directly inform targeted, behavior-oriented PR strategies that are realistic, context-specific, and capable of improving student engagement in water conservation initiatives.

Although the KAP model provides a useful starting point for understanding behavior change, recent literature suggests that the relationship between knowledge, attitudes, and practice is not strictly linear. Instead, behavior is shaped by broader contextual and institutional factors, including perceived responsibility, access to participation opportunities, and the presence of effective communication systems (Joseph et al., 2023).

Despite growing attention to water sustainability, limited research has examined these behavioral dynamics within university environments in Pakistan. Most existing studies focus on macro-level governance and infrastructure challenges, with less emphasis on micro-level behavioral patterns among students (Prasetya et al., 2025). This study addresses this gap by focusing on

student-level awareness, attitudes, and practices within a university context, with direct implications for designing effective communication and engagement strategies.

Overall, the study is positioned not only as an academic inquiry but also as an applied foundation for developing PR campaigns that promote sustainable water behavior through informed communication, student participation, and institutional engagement.

Problem Statement

Even though increasing awareness of water scarcity in Pakistan, individual and institutional responses remain limited (PCRWR, 2023). Universities, as spaces of knowledge production and social influence, are expected to play a central role in promoting sustainable practices (HEC, 2023). However, existing evidence suggests a disconnect between students' awareness of environmental issues and their actual engagement in conservation behaviors (Rani, 2025).

Recent research indicates that environmental knowledge does not automatically translate into action, as behavior is shaped by a combination of cognitive, social, and institutional factors (Akhtar et al., 2021; Chen & Erfanian, 2026). In university settings, this gap is further influenced by limited participation opportunities, unclear roles, and weak institutional engagement mechanisms (Wang et al., 2024).

Within the context of Pakistan, while macro-level water challenges have been widely studied, there is limited empirical work examining how students perceive water conservation and how their knowledge and attitudes translate into everyday practices (Tariq et al., 2021). In particular, the role of institutional trust and engagement in shaping student participation remains underexplored (Arjomandi et al., 2023; Younis et al., 2025)

This creates a need to systematically examine students' awareness, attitudes, and behaviors within a structured framework, while also identifying the factors that contribute to the gap between intention and action.

Research Objectives

The study aims to:

1. To examine students' awareness and attitudes toward water scarcity and conservation within a university context.
2. To assess students' self-reported water conservation practices and the extent of their engagement in sustainability-related activities.
3. To analyze the relationship between awareness, attitudes, and practices, with particular attention to the role of institutional engagement in shaping behavior.

Research Questions

1. What is the level of students' awareness and knowledge about water scarcity and conservation?
2. How do students perceive their personal and institutional responsibility toward water conservation?
3. To what extent do students engage in water conservation practices in their daily lives?
4. How do knowledge and attitudes relate to students' reported behaviors?
5. How do institutional factors, such as engagement opportunities and communication, influence students' willingness to participate in conservation initiatives?

Significance of the Study

This study contributes to the growing body of research on environmental behavior by examining water conservation through a student-centered lens within a developing country context. While previous studies have focused largely on structural and policy-level challenges, this research highlights the importance of behavioral and institutional dimensions in shaping sustainable practices.

By applying the KAP framework in a university setting, the study provides insight into the gap between awareness and action, offering evidence that can inform more effective intervention strategies. The findings are particularly relevant for higher education institutions seeking to move beyond awareness campaigns toward more participatory and behavior-oriented approaches. Additionally, the study contributes to the field of communication by emphasizing the role of

institutional messaging, engagement, and trust in influencing pro-environmental behavior. This makes it relevant not only for environmental policy but also for scholars interested in behavior change communication and sustainability discourse.

Literature Review

Understanding the Knowledge–Behavior Gap

The Knowledge–Attitude–Practice (KAP) framework is widely used to examine how awareness and beliefs translate into behavior, especially in environmental contexts. It assumes a progression from knowledge to attitudes and then to practice, making it useful for identifying gaps between what individuals know, feel, and do. However, this relationship is rarely linear and is often shaped by situational and structural factors (Launiala, 2009).

Across studies, a clear pattern emerges: awareness does not guarantee action. Students often report strong environmental knowledge and positive attitudes, yet their participation in sustainability practices remains low (Pratama et al., 2025; Owojori et al., 2022). Evidence from Universiti Malaya further shows a weak negative relationship between sustainability knowledge and practice, reinforcing that awareness alone is insufficient (Afroz & Ilham, 2020). Similar findings are reported by Nousheen et al. (2020), where positive attitudes did not translate into meaningful engagement due to external constraints.

The Intention–Behavior Gap

This disconnect is better explained by the intention–behavior gap. Individuals may hold positive attitudes and intentions but still fail to act. A meta-analysis of 90 studies shows that attitudes, subjective norms, and perceived behavioral control strongly influence intention, but have a weaker effect on actual behavior (Huang et al., 2024). This suggests that even informed and motivated individuals may not translate intention into practice.

The Theory of Planned Behavior links behavior to attitudes, social norms, and perceived control. When individuals lack resources, opportunities, or support, behavior is unlikely to follow, even if

attitudes are favorable. In addition, habits, emotions, and cultural context further shape action (Singha et al., 2022; Zulkepeli et al., 2024).

Barriers to Pro-Environmental Behavior

The gap between awareness and action is shaped by both internal and external factors. Stern (2000) notes that environmental behavior depends not only on knowledge but also on situational constraints and social norms, while Kollmuss and Agyeman (2002) emphasize the combined influence of psychological and contextual conditions.

A growing body of research explains this gap through behavioral barriers that limit the translation of pro-environmental values into action. Even when individuals hold strong environmental concern, action often weakens due to three key psychological barriers: immediacy, uncertainty, and marginality. Immediacy refers to the tendency to delay action when environmental consequences are perceived as distant rather than immediate. Uncertainty reduces engagement when individuals are unsure about the effectiveness of their actions or the outcomes they can expect. Marginality reflects the belief that individual contributions are too small to make a meaningful difference, which weakens motivation for collective action (Hoffmann, Kanitsar, & Seifert, 2024). These barriers can also reduce reciprocity and weaken peer influence, further reinforcing inaction.

In addition, hot cognition plays an important role in shaping environmental decision-making. It refers to emotionally and identity-driven reasoning, where individuals interpret environmental issues through pre-existing beliefs rather than objective evaluation. As a result, environmental risks may be minimized or dismissed when they conflict with personal or ideological positions, leading to selective acceptance of information (Hennes et al., 2020).

Beyond these psychological mechanisms, some individuals disengage due to skepticism or disbelief about environmental issues (Hoffman, 2011; Sarathchandra & Haltinner, 2021). Others are willing to act but lack clarity about appropriate or effective actions (Sarewitz, 2011; Khatibi et al.,

2021). Practical constraints such as limited infrastructure, habitual behavior, and socio-economic pressures further restrict action (Zhao & Cheah, 2023).

Together, these findings suggest that the awareness-behavior gap is not caused by a single factor but emerges from interacting cognitive, emotional, social, and structural barriers that shape perceptions of relevance, effectiveness, and responsibility in environmental action.

Role of Institutions

Behavior is also shaped by institutional context. Social Cognitive Theory explains behavior as the result of interaction between individual and environmental factors. In universities, institutional support determines whether sustainability awareness translates into practice.

Even motivated students face barriers when facilities, engagement opportunities, and curriculum integration are weak. Research suggests that combining education, participation, and structural support is essential for enabling behavior change (Zhao & Cheah, 2023).

Student-led initiatives such as sustainability ambassador programs have been effective in increasing engagement and long-term behavioral change (Shrivastava et al., 2017; Lee et al., 2023; Jensen & Pilgaard, 2024). Similarly, embedding sustainability into coursework through project-based learning improves both understanding and application (Al-Naqbi & Alshannag, 2018). Community partnerships with government, NGOs, and industry further strengthen real-world engagement (Zhao & Cheah, 2023).

Bridging the Gap

Overall, the literature confirms that the awareness-behavior gap is persistent and multi-dimensional. While KAP helps identify this gap, it does not fully explain it. Behavioral outcomes are shaped by psychological, social, and institutional factors.

Bridging this gap requires more than awareness campaigns. It requires institutional commitment, structured participation opportunities, and targeted interventions that address specific

barriers. Within this context, institutional trust plays a key moderating role. Skepticism is often driven by “hot cognition,” where individuals interpret environmental issues through emotional and ideological biases (Hennes et al., 2020). Higher institutional trust can reduce such resistance by highlighting the broader social and practical benefits of action, such as resilience and innovation (Bain et al., 2012; Riahi-Farzad et al., 2023). When universities demonstrate visible and consistent sustainability commitments, they strengthen students’ sense of agency and reduce free-rider tendencies, supporting the shift from

awareness to action (Filho et al., 2016; Tariq et al., 2021).

Integrated Conceptual Model

This study integrates the Knowledge–Attitude–Practice (KAP) framework, the Theory of Planned Behavior (TPB), and the Ability–Motivation–Opportunity (AMO) perspective to explain water conservation behavior among university students. Within this combined framework, knowledge forms the cognitive base of awareness, attitudes shape evaluative judgments, and intentions reflect readiness to act, while actual behavior depends on both psychological and contextual conditions (Ajzen, 1991; Appelbaum et al., 2000).

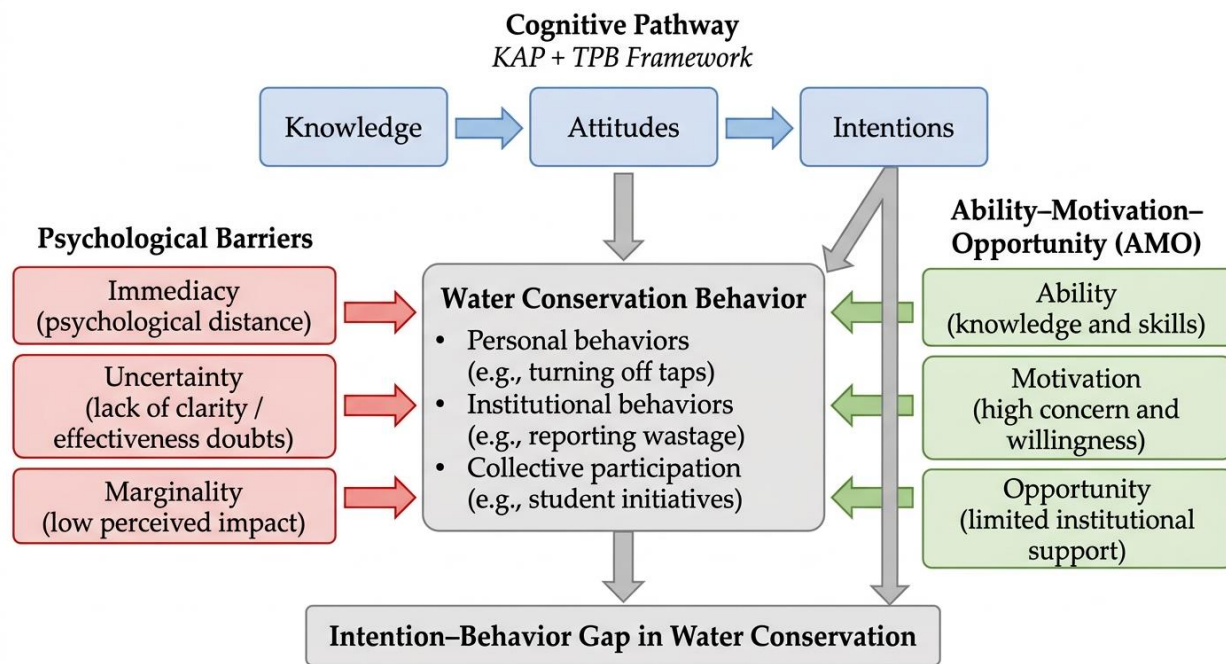


Figure 1: The framework illustrates how water conservation behavior emerges from cognitive and attitudinal foundations (KAP and TPB), but is constrained by psychological barriers (immediacy, uncertainty, marginality) and institutional limitations (AMO), resulting in a persistent intention–behavior gap.

However, the transition from awareness to action is not linear. The findings highlight a persistent intention–behavior gap, which is shaped by three key psychological barriers. First, immediacy limits action when environmental problems are perceived as distant or delayed in impact, reducing present-day behavioral response (Spence et al.,

2012; Van Lange et al., 2018). Second, uncertainty weakens engagement when individuals are unclear about how to act effectively or doubt the usefulness of their contribution (Stern, 2000; van Valkengoed & Steg, 2019). Third, marginality reduces participation when individuals believe their personal actions have negligible impact,

leading to diffusion of responsibility in collective settings (Isaac & Walker, 1988; Kollmuss & Agyeman, 2002).

Alongside these psychological constraints, institutional conditions play a critical role in shaping behavior. The Ability–Motivation–Opportunity (AMO) framework suggests that behavior emerges when individuals possess sufficient ability, motivation, and opportunity to act (Appelbaum et al., 2000; Jiang et al., 2012). In this study, students demonstrate adequate motivation through strong concern for water scarcity and willingness to engage. However, their ability to translate intention into action is constrained by limited practical knowledge of engagement pathways, while opportunities remain weak due to unclear or underdeveloped institutional mechanisms for participation.

Together, these frameworks explain why strong awareness and positive attitudes do not consistently translate into action. The interaction of psychological distance, uncertainty, perceived marginality, and limited institutional facilitation creates a structural–cognitive disconnect between intention and behavior. This integrated model highlights that improving pro-environmental behavior requires not only awareness-building but also reducing psychological barriers and strengthening institutional opportunities for engagement.

Methodology

Research Design

This study adopted a mixed-method, cross-sectional design to examine water conservation behavior among university students. The quantitative component was based on the Knowledge–Attitude–Practice (KAP) framework, while the Theory of Planned Behavior (TPB) informed the interpretation of how cognitive factors relate to behavioral outcomes.

To complement the survey data, qualitative insights were drawn from exploratory discussions with students and university support staff. These were used to understand institutional conditions and practical constraints influencing behavior. The Ability–Motivation–Opportunity (AMO)

perspective guided the interpretation of behavioral barriers and institutional dynamics.

Sample and Data Collection

Quantitative data were collected from 50 students using convenience sampling through an online questionnaire. The sample mainly comprised undergraduate students aged 21–24, with 70% female and 30% male participants.

Qualitative data were obtained through informal, semi-structured discussions with a small group of students and university support staff involved in campus operations. These discussions focused on existing conservation practices, reporting mechanisms, and perceived barriers to student engagement.

This study employs a convenience sampling technique, a choice supported by recent methodological guidelines for quantitative research when targeting specific institutional populations (Memon et al., 2025). While probability sampling remains the gold standard, convenience sampling is justified here due to logistical constraints and the homogeneity of the student population under study (Etikan et al., 2016; Memon et al., 2025). Furthermore, this approach is suitable for early-stage behavioral research aimed at identifying directional patterns of institutional trust and participation rather than achieving broad national generalizability (Hinton et al., 2004; Wolf et al., 2013).

Research Instrument

The survey instrument consisted of 20 items, including three demographic questions and 17 items measuring knowledge, attitudes, and practices related to water conservation. The instrument was organized into three sections aligned with the study framework.

Section A: Knowledge of Water Issues

This section assessed awareness of Pakistan’s water crisis, groundwater depletion in Lahore, and common conservation practices such as fixing leaks and rainwater harvesting. These items capture the cognitive dimension of the KAP framework.

Section B: Attitudes Toward Water Conservation

This section measured perceptions of the university’s role in water use, concern about future water shortages, and support for institutional investment in conservation systems. These items reflect the attitudinal component of KAP and correspond to the attitude construct in TPB.

Section C: Water Conservation Practices

This section examined self-reported behaviors, including willingness to change personal water-use habits, routine conservation actions (e.g., turning off taps), reporting water wastage, and participation in conservation initiatives.

An additional item assessed willingness to participate in a student-led “Water Ambassador” initiative. This item served as an indicator of behavioral intention and engagement readiness, consistent with TPB.

Theoretical Alignment of Measures

Survey items were developed within the KAP framework and mapped onto key TPB constructs (Table 1). Knowledge items measure awareness and provide the basis for attitude formation. Attitude items capture evaluative beliefs about water conservation and institutional responsibility.

Behavior-related items assess both intention and actual practice. Willingness to change habits and interest in the “Water Ambassador” initiative indicate behavioral intention, while reported actions such as turning off taps, reporting wastage, and participation in activities reflect observed practices.

Although behavioral barriers (e.g., immediacy, uncertainty, marginality) and AMO-related institutional factors were not directly measured, they were inferred from response patterns, particularly where high awareness did not translate

into active participation.

Data Analysis

Quantitative data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. Composite indices for knowledge, attitudes, and practices were constructed by aggregating relevant items. Reliability was assessed using Cronbach’s alpha.

Qualitative data were used to support and contextualize the quantitative findings, particularly in explaining the gap between awareness, attitudes, and behavior. This integrated approach allowed for a more nuanced understanding of how cognitive, behavioral, and institutional factors interact within the university context.

Construction and Reliability of KAP Indices

Composite indices for knowledge, attitudes, and behavior were constructed by summing relevant items within each KAP component. Internal consistency was assessed using Cronbach’s alpha.

The knowledge ($\alpha = 0.60$) and behavior ($\alpha = 0.60$) indices showed acceptable reliability for exploratory research, while the attitude index showed lower reliability ($\alpha = 0.44$), likely due to the broader and more heterogeneous nature of its items.

The moderate to low reliability values, along with a KMO value of 0.564, reflect the exploratory nature of the study, the multidimensional structure of KAP constructs, and the small sample size ($N = 50$). Given the limited number of items per scale and diverse content coverage, lower internal consistency was expected.

Methodological literature supports the use of such indices in early-stage behavioral research for identifying patterns rather than validating measurement scales (Hinton et al., 2004; Tavakol & Dennick, 2011).

Table 1
Alignment of Survey Items with KAP-TPB Theoretical Framework

Section	Survey Item	Measured Construct	KAP Component	TPB Component	Interpretation / Notes
A	Awareness of Pakistan's water crisis	Environmental awareness	Knowledge	Background belief	Captures general awareness of national water issues
A	Knowledge of Lahore's groundwater depletion	Local environmental knowledge	Knowledge	Background belief	Reflects contextual understanding of local crisis
A	Awareness of conservation practices	Procedural knowledge	Knowledge	Background belief	Indicates familiarity with actionable solutions
B	Universities contribute to water wastage	Institutional perception	Attitude	Subjective norm (indirect)	Reflects perception of institutional responsibility
B	Concern about future water shortage	Risk perception	Attitude	Attitude toward behavior	Indicates perceived severity of the issue
B	Support for investment in water-saving systems	Policy support	Attitude	Attitude toward behavior	Reflects approval of institutional action
C	Willingness to change habits	Behavioral readiness	Practice (intention stage)	Behavioral intention	Indicates readiness to adopt conservation behavior
C	Turning off taps	Routine personal behavior	Practice	Actual behavior	Low-effort individual conservation action
C	Reporting water wastage	Institutional engagement behavior	Practice	Perceived behavioral control (indirect)	Indicates interaction with institutional systems
C	Participation in conservation activities	Collective engagement	Practice	Actual behavior	Reflects higher-effort, socially embedded action
—	Interest in "Water Ambassador" initiative	Water Participation intention	Practice (intention stage)	Behavioral intention	Reflects willingness for structured engagement

Note. The table presents the alignment of survey items with the Knowledge-Attitude-Practice (KAP) framework and key constructs of the Theory of Planned Behavior (TPB). Behavioral barriers (immediacy, uncertainty, marginality) and

institutional factors based on the Ability-Motivation-Opportunity (AMO) framework were not directly measured but are interpreted from patterns in responses, particularly the gap between awareness, intention, and observed behavior.

Data Analysis

The study included 50 participants, with a gender distribution of 70% female (n = 35) and 30% male (n = 15). Apart from 8% postgraduate students, all respondents were undergraduates aged between 21 and 24 years.

4.1 Section A: Knowledge of Water Issues (Cognitive Base)

Respondents' knowledge of water-related issues was measured using three items (see methodology).

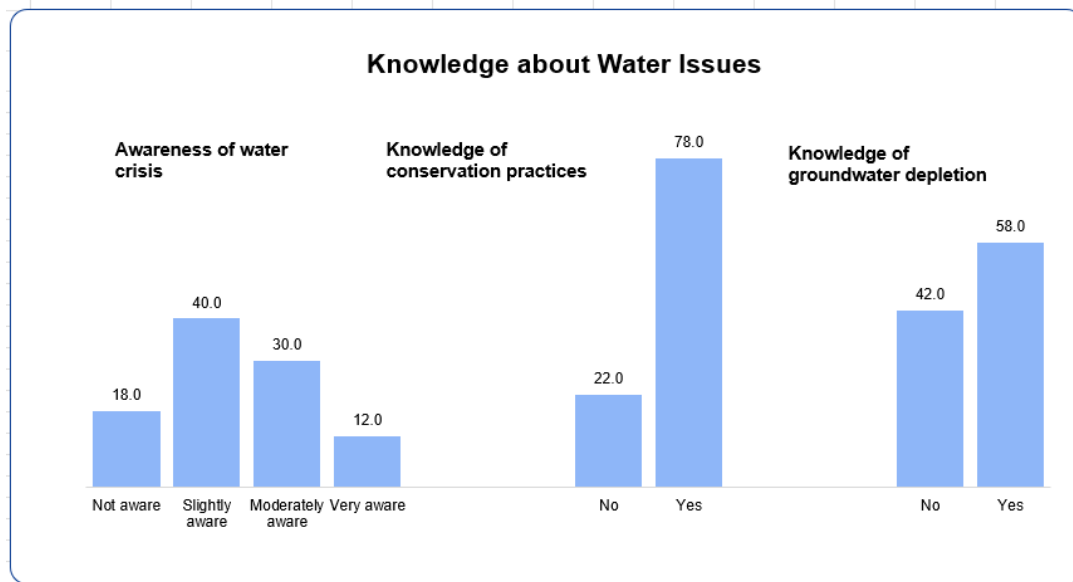


Figure 2: Percentage of respondents knowledges about water issues.

The results indicate a moderate and uneven level of awareness. Regarding Pakistan's water crisis, only 12% of respondents reported being extremely aware, while 30% were fairly informed and 40% slightly aware. A further 18% reported no awareness. This suggests that general awareness exists, but depth of understanding is limited.

In contrast, awareness of local environmental issues was higher. A large majority (78%) reported knowledge of declining groundwater levels in Lahore, indicating that proximity to environmental problems increases awareness.

Knowledge of practical conservation methods was comparatively lower but still moderate. About 58% of respondents were aware of basic practices such as fixing leaks, using efficient fixtures, and rainwater harvesting, while 42% lacked this knowledge. Overall, students show basic but uneven awareness, with stronger understanding of visible local issues than broader environmental or technical knowledge.

4.2 Attitudes Toward Water Conservation (Evaluative Layer)

Students generally expressed positive attitudes toward water conservation and institutional responsibility.

A majority (74%) agreed that universities contribute to water wastage, reflecting recognition of institutional responsibility. Concern about future water scarcity was even stronger, with 90% agreeing that Pakistan may face severe water shortages.

Support for institutional action was also high, with 86% favoring university investment in water-saving systems such as leak repair, aerators, and rainwater harvesting.

Overall, the findings show strong awareness of the problem and clear support for institutional-level solutions, indicating a positive evaluative orientation toward conservation.

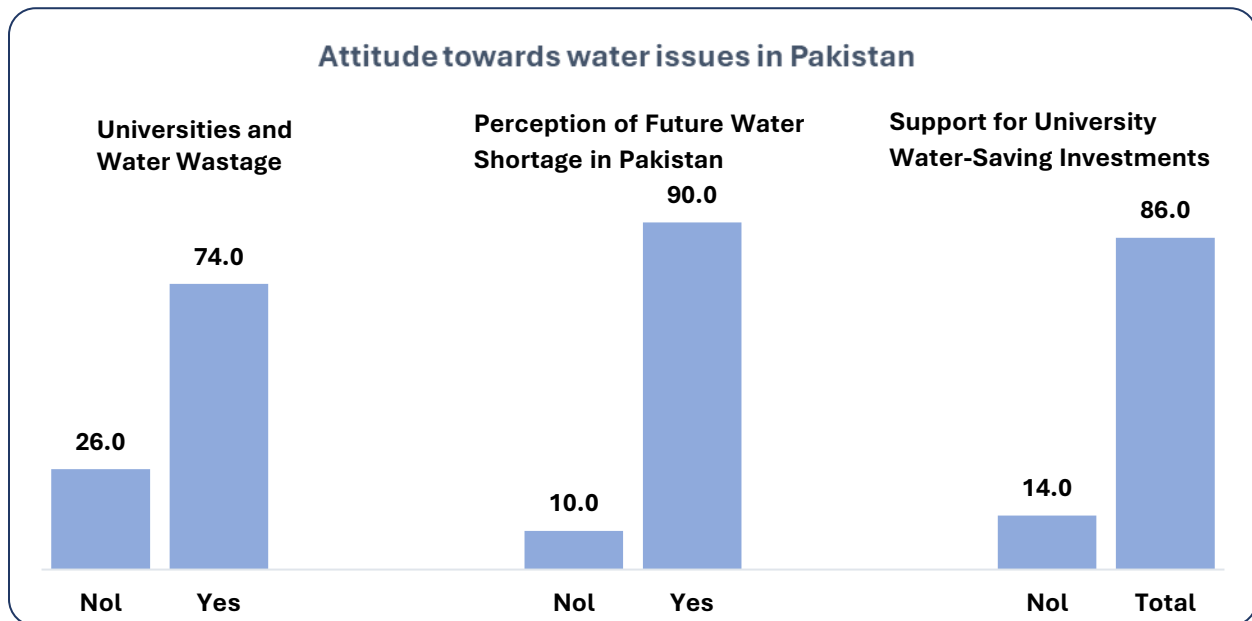


Figure 3: Respondents' attitudes toward water issues in Pakistan: perception of universities' contribution to water wastage, anticipated future water shortages, and support for university investments in water-saving systems. Percentages reflect the proportion of respondents holding each attitude.

4.3 Behavioral Intentions and Actual Practice

Students showed strong willingness to adopt water-saving behaviors at the individual level. A combined 76% reported being very willing (32%) or willing (44%) to change their water-use habits, while only 10% expressed unwillingness.

However, willingness declined when behavior required structured participation. Only 36% expressed interest in joining a student-led "Water Ambassador" initiative, while 54% were unsure and 10% were not interested. This shift suggests that while personal intention is strong, uncertainty increases when engagement requires defined roles or institutional involvement.

4.4 Water Conservation Practices (Behavioral Outcomes)

4.4.1 Personal Water-Saving Behavior

Self-reported personal water conservation practices were relatively strong. A majority of respondents (60%) reported consistently turning off taps while brushing or washing, while 24% did so occasionally. Only 16% reported rarely or never engaging in this behavior. This indicates that

students are more likely to adopt simple, routine, low-effort conservation actions in daily life.

4.4.2 Institutional Engagement Behavior

In contrast, behaviors that require interaction with institutional systems were significantly weaker. A large proportion of respondents (38%) reported never reporting water wastage on campus, while 30% reported doing so rarely. Only 16% indicated that they report such issues frequently. This pattern suggests low interaction with institutional reporting mechanisms, despite awareness and willingness at the individual level.

4.4.3 Participation in Conservation Activities

Participation in organized conservation initiatives was also low. A majority of respondents (62%) reported that they had never taken part in any water conservation activity or awareness drive. Only 19% reported occasional participation, and an equal proportion reported frequent involvement. This indicates that collective and organized forms of engagement remain weak among students.

4.5 Gap Between Awareness, Intention, and Behavior

The results show a clear disconnect between awareness, intention, and actual behavior. While students demonstrate moderate knowledge, strong positive attitudes, and high personal willingness, this does not translate into consistent engagement in institutional or collective actions.

The gap is most visible in reporting behavior and participation in organized initiatives, where engagement remains low despite awareness of the issue. This suggests that awareness and intention alone are not sufficient to drive sustained behavioral change, particularly when action

depends on institutional structures.

4.6 Descriptive Statistics of KAP Indices

Respondents reported moderate levels of knowledge regarding water-related issues ($M = 1.91, SD = 0.48$) and relatively positive attitudes toward water conservation ($M = 1.83, SD = 0.25$). Self-reported behavior was comparatively higher ($M = 2.46, SD = 0.60$), largely driven by routine personal practices rather than institutional or collective actions. Overall, the pattern suggests a gap between positive attitudes and consistent behavioral engagement, particularly in structured conservation activities.

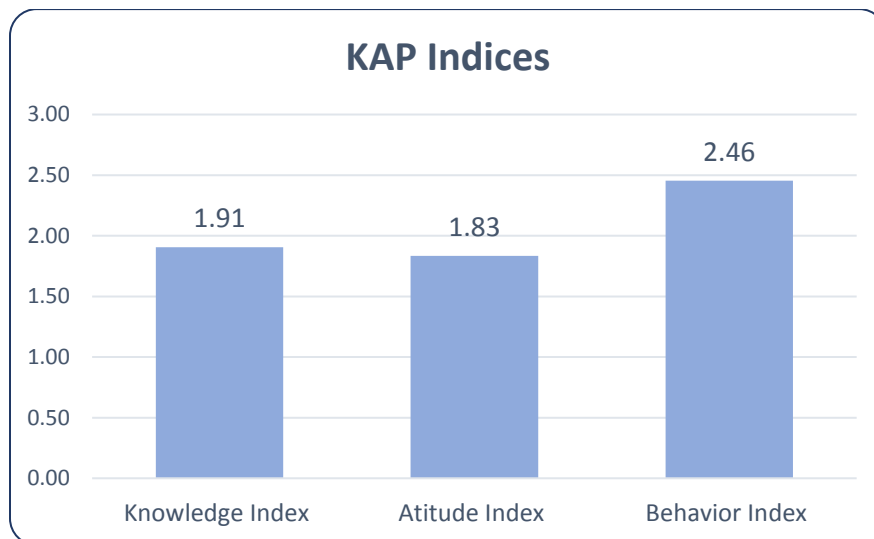


Figure 4: Mean levels of knowledge, attitudes, and self-reported water-conservation behavior among respondents.

4.7 Behavioral Barriers and Institutional Gaps (Interpretive)

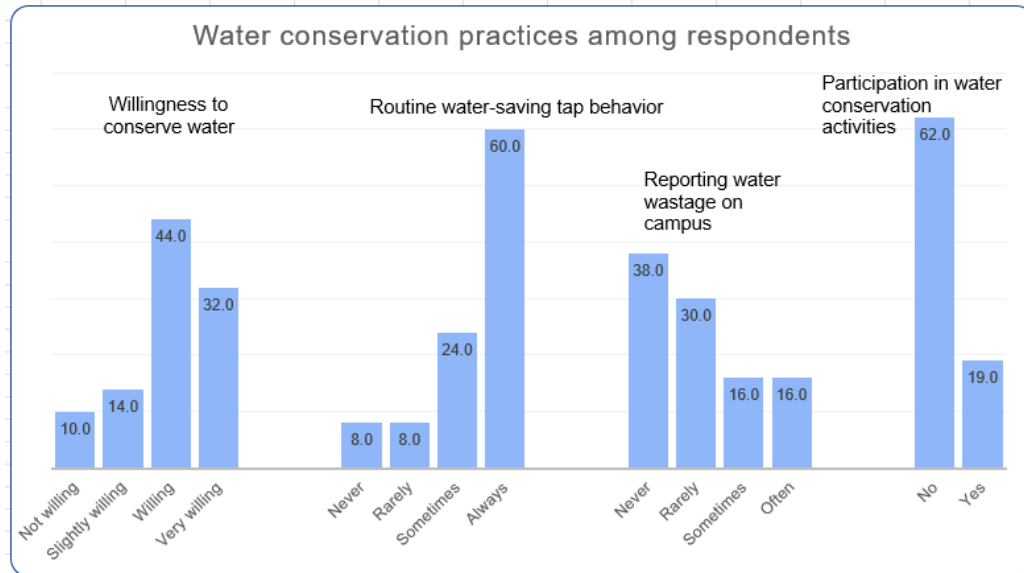


Figure 5: Respondents' self-reported water conservation behaviors: willingness to change personal habits, routine water-saving practices, reporting of water wastage on campus, and participation in water conservation or awareness activities. Percentages represent the distribution of responses for each behavior item.

Although not directly measured, the data suggest the presence of underlying behavioral and institutional barriers. High concern about water scarcity, combined with low participation in collective action, indicates a disconnect between awareness and engagement.

Similarly, the large proportion of respondents who were unsure about joining the "Water Ambassador" initiative reflects uncertainty about roles, expectations, and perceived effectiveness. Low reporting behavior further suggests limited interaction with institutional systems, possibly due to unclear procedures or perceived inconvenience. Overall, the patterns indicate that while students are aware and generally willing, structural and procedural factors may be restricting active participation in water conservation practices.

4.8 Awareness and Interest in "Water Ambassador" Initiative

A single-item measure assessed interest in joining a student-led conservation initiative. Although awareness of the program was limited, responses showed moderate interest: 36% were willing to participate, 54% were unsure, and 10% were not interested.

The high proportion of uncertainty suggests that many students do not fully understand the concept or their potential role in such initiatives. This indicates that lack of clarity and awareness, rather than outright rejection, may be limiting participation.

Overall, while a portion of students is ready to engage in sustainability initiatives, the majority remain undecided, highlighting a clear opportunity for universities to strengthen awareness and provide clearer pathways for involvement.

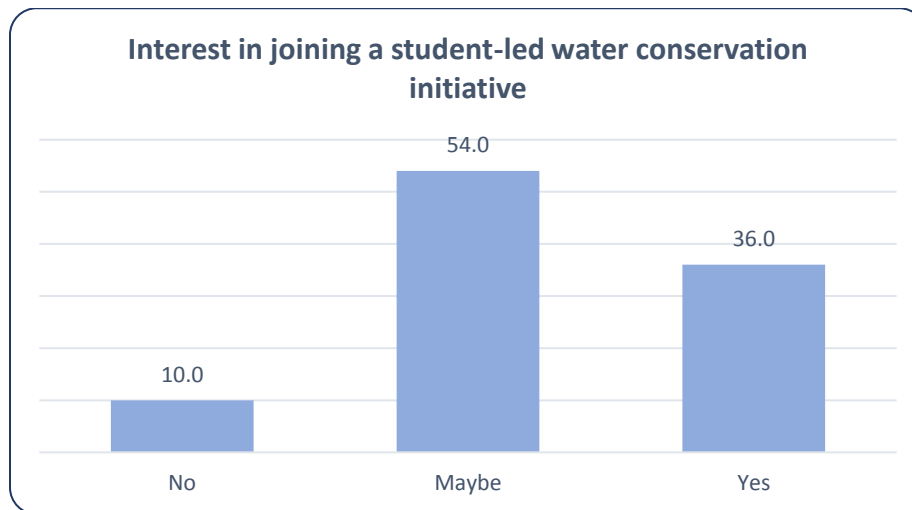


Figure 6: Percentage of Interest in Joining a “Water Ambassador” or Student Conservation Initiative

4.9 Qualitative Insights (Exploratory)

Exploratory discussions with students and university support staff were used to contextualize the survey findings and better understand the gap between awareness and action in water conservation behavior.

A recurring theme among students was uncertainty about how to translate awareness into practical engagement. Some participants expressed limited belief in the impact of individual actions, reflected in views such as “sirf hum tap band kar ke kya farq parta hai” (what difference does it make if only we turn off taps). Others highlighted a sense of diffusion of responsibility, noting “koi bhi nahi karta” (no one else does), which discouraged active participation in conservation efforts.

In contrast, support staff displayed a more skeptical stance toward the severity of water scarcity. Some stated, “aaj tak to khatam nahi hua pani” (water has never run out so far), while others added, “hum to zameen se bore karke pani lete hain, yeh to zaya karna nahi hota” (we extract water through boreholes, so it is not really wasted). These views reflect a perception that water availability is not an immediate concern, which may influence how conservation practices are prioritized in routine operations.

At the institutional level, staff also pointed to limited engagement mechanisms. Reporting systems for water wastage were described as underused, and follow-through on student-led initiatives was seen as inconsistent. Students similarly reported uncertainty about structured programs such as the “Water Ambassador” initiative, suggesting a lack of clarity regarding roles and participation pathways.

Overall, these exploratory insights support the quantitative findings by indicating that barriers to water conservation behavior are shaped not only by individual attitudes but also by institutional perceptions, weak facilitation structures, and differing interpretations of resource scarcity.

6. Discussion & Conclusion

The findings of this study reveal a consistent gap between students’ awareness, attitudes, and actual water conservation behavior. Quantitative results show moderate knowledge of water issues ($M = 1.91$) alongside generally positive attitudes ($M = 1.83$), yet this cognitive and evaluative awareness does not translate into sustained or collective action. Although most students recognize the seriousness of future water scarcity and support institutional investment in water-saving systems, only a small proportion demonstrate deep, operational understanding of water issues. This

indicates that awareness exists, but it remains fragmented and insufficiently developed to guide consistent behavior.

Qualitative insights strengthen this pattern by showing that perceptions of water scarcity are not uniform. While some students question the immediacy or severity of the crisis, others become more aware when exposed to concrete and localized examples. This suggests that environmental understanding is not purely knowledge-based but shaped by visibility, communication, and contextual framing. Together, the quantitative and qualitative evidence confirms that the cognitive foundation for behavior is present but unstable and uneven.

A clearer divide emerges when examining behavior. Students report relatively strong engagement in simple, routine conservation practices such as turning off taps, indicating that low-effort individual actions are more easily adopted. However, behaviors that require institutional interaction or collective engagement remain weak. Reporting water wastage and participating in organized conservation activities are limited, highlighting a sharp drop when action demands coordination, effort, or reliance on institutional systems. This pattern suggests that behavior is not only a function of awareness but also of perceived feasibility and structural support. This divergence is further reflected in behavioral intentions. While students express willingness to adopt personal conservation habits, their responses become uncertain when engagement requires structured participation. The hesitation around involvement in formal initiatives indicates a gap between general willingness and actionable clarity. This suggests that students may be motivated, but they lack clear pathways to translate motivation into meaningful engagement.

These findings align with established critiques of the KAP model, which argue that knowledge and attitudes alone are insufficient predictors of behavior. Environmental action is shaped by a combination of psychological and contextual constraints rather than a linear progression from awareness to practice (Launiala, 2009; Kollmuss & Agyeman, 2002). In this study, positive attitudes coexist with limited behavioral follow-through,

reinforcing the non-linear nature of behavior formation.

The results can be further understood through the Theory of Planned Behavior (TPB). Students demonstrate strong attitudes and moderate intentions, yet perceived control over behavior appears weak, particularly in relation to structured or institutional participation. This suggests that even when individuals recognize the importance of an issue, uncertainty about how to act limits translation into behavior. The gap between intention and action is therefore not motivational alone but also cognitive and situational.

Behavioral barriers provide further explanation of this disconnect. First, immediacy plays a role, as water scarcity is largely perceived as a future rather than present concern, reducing urgency for action. Second, uncertainty limits engagement when students are unclear about the effectiveness of their contribution or the correct way to participate. Third, marginality reduces collective engagement, as individuals often perceive their actions as too small to create meaningful change. These barriers collectively weaken the transition from awareness to action, particularly in collective settings.

Institutional context further shapes these outcomes. The Ability–Motivation–Opportunity (AMO) framework shows that while students possess motivation and basic awareness, opportunities for engagement remain limited or poorly defined. Weak reporting mechanisms, unclear participation structures, and low visibility of initiatives reduce the likelihood of sustained involvement. This indicates that behavioral outcomes are shaped not only by individual cognition but also by institutional design and facilitation.

Qualitative evidence reinforces this interpretation by highlighting gaps in institutional communication and engagement pathways. Students are often willing but unsure how to participate, while institutional actors exhibit varying levels of urgency regarding water conservation. This misalignment between individual motivation and institutional facilitation contributes to the persistence of the behavior gap.

Overall, the findings demonstrate that water conservation behavior among university students is shaped by an interaction of cognitive, psychological, and institutional factors. Awareness and attitudes are necessary but not sufficient conditions for action. The persistence of the knowledge–intention–behavior gap reflects the combined influence of psychological distance, uncertainty, perceived marginality, and weak institutional opportunities.

The findings of this study can be fully understood through an integrated lens that combines KAP, behavioral barriers, institutional theory, and trust dynamics. While students demonstrate moderate knowledge and strong pro-environmental attitudes, this awareness does not consistently translate into action. This reflects the limitation of linear assumptions in the KAP model, where knowledge is expected to naturally lead to practice. Instead, the results align with behavioral research showing that environmental action is shaped by psychological constraints such as skepticism, uncertainty, and perceived marginality (Kollmuss & Agyeman, 2002). In this study, these barriers are visible in students' hesitation toward structured participation and their reliance on low-effort individual practices. At the same time, institutional limitations reduce opportunities for engagement, reinforcing the gap between intention and behavior.

From a Social Cognitive Theory perspective, behavior emerges from the interaction between personal motivation and environmental conditions. Although students show strong concern and willingness to act, weak institutional facilitation limits their ability to translate intention into practice. This is consistent with the Ability–Motivation–Opportunity logic, where motivation is present, but opportunity structures remain underdeveloped.

Finally, the findings highlight the importance of institutional trust in shaping environmental engagement. When trust in institutional commitment is weak, skepticism becomes more likely, and environmental risks are interpreted through biased cognitive frames (Hennes et al., 2020). Conversely, visible institutional action can strengthen perceived effectiveness and reduce

resistance to collective behavior. This suggests that universities are not passive settings but active drivers in shaping whether awareness becomes action.

Overall, the study shows that the water conservation behavior gap is not a failure of awareness, but the outcome of interacting psychological and institutional constraints.

Conclusion

This research underscores that addressing water sustainability within Pakistani higher education requires a transition from purely technical solutions to a behavioral framework centered on institutional engagement. The findings confirm that while students possess high environmental awareness, their transition to active conservation is obstructed by psychological barriers such as "hot cognition" and a perceived lack of agency. However, the results demonstrate that institutional trust and visible green initiatives act as powerful catalysts in bridging this gap. By fostering an environment where students feel their actions are part of a transparent, committed system, universities can overcome individual skepticism and the diffusion of responsibility. Ultimately, the university must evolve from a space of theoretical knowledge into a living laboratory for sustainable practice, where institutional "hardware" and behavioral "software" are integrated to drive lasting cultural change.

Limitations of the Study

Despite the insights provided by this research, several limitations must be acknowledged. First, the use of **convenience sampling** restricts the generalizability of the findings beyond the specific university context studied. As noted by **Memon et al. (2025)**, while this method is a practical and dominant choice for quantitative research in educational settings, it may not fully capture the diversity of the broader national student population. To mitigate potential bias, effort was made to ensure the sample was representative of various academic departments within the institution.

Second, the **sample size**, while sufficient for exploratory pattern identification and initial

behavioral analysis (Hinton et al., 2004; Wolf et al., 2013), may limit the statistical power required for complex multi-group comparisons. Future research should aim for larger, multi-institutional samples to validate these findings across different geographical and socio-economic regions of Pakistan.

Finally, the reliance on self-reported data introduces the possibility of social desirability bias, where students may over-report their pro-environmental attitudes. Future studies could benefit from incorporating objective measures of water consumption or longitudinal designs to more accurately track the translation of awareness into long-term habits.

Recommendations

The findings suggest that improving water conservation behavior in universities requires a structured approach that aligns with the behavioral framework discussed in the literature review. Since behavior is shaped by internal beliefs and external conditions, interventions should first focus on correcting key belief-related barriers, followed by strengthening institutional systems, and then building structured student participation.

First, there is a need to address internal beliefs that shape behavior. Three belief-related barriers stand out: **immediacy, uncertainty, and marginality**. Students need to move away from the perception that water scarcity is a distant issue. Communication should make the problem feel more immediate by linking water use directly to daily campus life and showing local examples of water wastage. At the same time, uncertainty about the effectiveness of individual actions should be reduced by demonstrating clear and visible outcomes of conservation efforts. Students should be able to see that their actions lead to real change. Finally, the belief of marginality should be challenged by emphasizing that small individual actions, when combined across the student body, produce meaningful collective impact.

Second, external and structural conditions within the university should support these belief changes. A simple and responsive reporting system for water wastage should be introduced. It should

allow students to report issues easily and ensure timely institutional response. Importantly, feedback should be provided after action is taken so students can see the outcome of their reporting. This helps strengthen trust and further reduces uncertainty about effectiveness.

Third, a structured student engagement mechanism should be developed through a “Water Ambassador” program. The role of ambassadors should not focus on monitoring or supervision. Instead, they should act as peer communicators who help shift beliefs and promote practical conservation behavior among students. Their work should focus on spreading awareness, encouraging everyday water-saving practices, and addressing the barriers of immediacy, uncertainty, and marginality through peer influence. They can also contribute ideas for campus-based activities that make water conservation more relatable and visible in student life.

Overall, the study suggests that effective behavior change in universities requires a step-by-step approach. First, belief-related barriers must be addressed. Second, institutional systems should make participation visible and responsive. Third, students should be engaged as active communicators to sustain awareness and encourage collective responsibility. This integrated approach is essential to bridge the gap between awareness and actual water conservation behavior on campus.

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