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Bridging intentions and behavior: Understanding residents' pro-environmental behavior formation

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Abstract

This study explores the determinants of pro-environmental behavior (PB) in Pakistan, a country facing escalating environmental challenges, with the aim of understanding how psychological constructs and governance-related perceptions influence sustainable behavioral outcomes. By integrating the Theory of Planned Behavior (TPB) with Sustainable Governance Theory (SGT), the research seeks to provide a more comprehensive explanation of individual-level environmental action in a collectivist society. A cross-sectional survey was conducted with a sample of 700 residents, and structural equation modeling (SEM) was used to examine the relationships between attitudes, subjective norms, perceived behavioral control, perceived government incentives, pro-environmental intentions (INT), and actual behavior. The results show that attitudes, norms, and behavioral control significantly enhance pro-environmental intentions, which positively predict behavior. However, perceived government incentives exhibit a counterintuitive effect, directly reducing PB ($\beta = -0.29$, $p < 0.01$) and weakening the intention-behavior relationship ($\beta = -0.12$, $p < 0.01$), suggesting a crowding-out effect on intrinsic motivation. Moreover, a notable intention-behavior gap ($\Delta = 0.27$, $p < 0.001$) indicates that positive intentions do not always translate into action. These findings underscore the need for policymakers to move beyond transactional incentive models and design culturally resonant interventions that reinforce intrinsic values, community engagement, and long-term commitment to environmental sustainability.

Keywords: Perceived government incentive measures, Pro-environmental behavior, Pro-environmental intention, Sustainable governance theory, Theory of planned behavior.

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Contribution of this paper to the literature

This study contributes to the literature by showing that government incentives can backfire in collectivist cultures, weakening the link between pro-environmental intentions and actions in Pakistan, and by offering culturally attuned strategies to close this gap.

1. Introduction

Beneath the loud crashes of melting glaciers and the slow, quiet spread of deserts, a hidden crisis is happening: in countries like Pakistan, which are especially at risk from climate change, millions of people *say* they care about protecting the environment but often *fail to act* on that care. This contradiction sits at the center of pro-environmental behavior (PB), where the gap between people's plans and their real actions grows wider even as environmental disasters become more severe. In 2022, Pakistan's devastating floods which drowned a third of the country, forced 33 million people to flee their homes, and wiped out $30 billion from its economy gave a dark glimpse of a future where well-meaning promises break against hard realities (Qamer et al., 2023; UNDP, 2022).

Globally, household behaviors account for 60% of carbon emissions, yet fewer than 20% of individuals consistently translate environmental intentions into action (Lee et al., 2023). While psychological drivers like attitudes and social norms shape intentions (Ajzen, 1991) systemic barriers such as cost, accessibility, and misaligned policies often derail progress. This study tackles this disconnect by exploring how residents' attitudes, social pressures, and sense of control shape their plans to act sustainably in Pakistan, and to what extent government incentives (like rewards) affect whether those plans turn into real actions.

Recent research on pro-environmental behavior (PB) has increasingly focused on the interplay between individual agency and systemic governance. Studies highlight that psychological driver like attitudes and social norms remain critical, but their interaction with policy interventions such as incentives varies across cultural contexts (Li & Wang, 2023). Even today, the Theory of Planned Behavior (TPB) offers valuable insights into the process of intention formation (Xiao Wang & Lin, 2023) emerging work critiques its limitations in predicting behavior. In Pakistan, rapid urbanization and climate vulnerability amplify the urgency of aligning policies with local norms, yet few studies explore how incentives interact with practices. This gap is critical, as global environmental strategies often replicate Western models, neglecting sociocultural nuances that determine policy success or failure (Kumar, 2023).

Emerging research underscores the potential of well-designed incentives to strengthen the link between pro-environmental intentions and actions, particularly when aligned with cultural and contextual values. Recent studies demonstrate that extrinsic motivators, such as subsidies for renewable energy or tax rebates for eco-friendly practices, can complement intrinsic drivers by reducing practical barriers (e.g., cost, accessibility) and amplifying perceived behavioral control (Pan, Abbas, Álvarez-Otero, Khan, & Cai, 2022; Zhang, Wang, & Xu, 2023). For instance, Pakistan's collaborative solar energy initiatives, driven by organizations like the Pakistan Solar Association (PSA), emphasize public awareness, equitable access, and domestic manufacturing to foster a societal shift toward renewable energy. These efforts align with climate equity goals and aim to position solar adoption as a collective responsibility rather than a transactional exchange, empowering communities through education and partnerships(Pakistan Solar Association, 2025). Similarly, non-monetary incentives like public recognition for sustainable practices have been shown to enhance social norms, creating a ripple effect where eco-friendly actions become aspirational benchmarks within communities (Stieglitz, Eschmeier, & Steiner, 2013). Drawing on the Theory of Planned Behavior (TPB) offers a powerful lens for examining this synergy; incentives act as external enablers that bridge the intention-behavior gap by strengthening perceived control and aligning policies with existing values (Wang, Wang, Yang, Li, & Zhou, 2020). In collectivist societies like Pakistan, where communal decision-making shapes behavior, incentives that resonate with local traditions such as village-level rewards for water conservation can transform individual intentions into collective action, offering scalable solutions to environmental challenges (UNDP, 2023).

To untangle this problem, the study combines two key ideas: the Theory of Planned Behavior (TPB) (Ajzen, 1991) which explains how personal beliefs, societal expectations, and feelings of control shape plans to act, and Sustainable Governance Theory (SGT) (Lafferty & Meadowcroft, 2000) which argues that policies must align with society's values and involve communities. The stakes could not be higher. For Pakistan struggling with fast-growing cities, water shortages, and worsening climate disasters this is not just about research. It is about survival. For the world, it shows how policies can honor cultural identity while protecting the planet. This is not just a study of behavior it is a mission to connect humanity's best intentions with real action in a time of global crisis.

This research bridges a critical gap by integrating the Theory of Planned Behavior and Sustainable Governance Theory to examine pro-environmental behavior in Pakistan, a climate-vulnerable, collectivist context overlooked in mainstream literature. It uniquely uncovers how government incentives *weaken* the intention-behavior link (a paradoxical "crowding-out" effect), challenging universal policy assumptions and underscoring the imperative for culturally grounded governance frameworks.

2. Research Framework and Hypotheses

2.1. Theoretical Foundation: Integrating the Theory of Planned Behavior and Sustainable Governance Theory in Pro-Environmental Behavior Research

The Theory of Planned Behavior (TPB) Ajzen (1991) offers a well-established psychological framework for understanding human behavior, including pro-environmental behavior (PB). According to TPB, behavior is primarily guided by behavioral intentions, which are influenced by three core cognitive factors: attitudes (personal evaluations of the behavior), subjective norms (perceived social expectations), and perceived behavioral control (PBC), or the perceived ease or difficulty of performing the behavior. TPB has been widely applied in environmental research, spanning domains such as waste management, energy conservation, and sustainable consumption. However, the theory has faced criticism for its emphasis on individual agency, often overlooking structural and contextual influences. Notably, TPB struggles to fully account for the intention–behavior gap,

wherein individuals with strong environmental intentions do not consistently follow through with corresponding actions.

A major limitation of TPB is that it does not sufficiently account for structural and institutional factors that enable or hinder behavior. For instance, individuals with positive attitudes toward recycling may still fail to engage in the behavior due to infrastructure limitations or financial constraints. Similarly, while subjective norms can strongly influence behavior in collectivist societies, they may be weaker predictors in individualistic or fragmented regulatory environments where policy enforcement is inconsistent. Additionally, PBC, though a key component of TPB, is not solely a psychological construct but is shaped by external enablers such as waste collection systems, policy incentives, and financial accessibility.

To address these limitations, this study integrates Sustainable Governance Theory (SGT) Lafferty and Meadowcroft (2000) which emphasizes the role of institutional mechanisms such as policies, incentives, infrastructure, and regulations in shaping individual pro-environmental behavior (PB). SGT posits that governance structures play a critical role in bridging the intention–behavior gap by minimizing external barriers (e.g., financial constraints, lack of access to sustainable alternatives) and reinforcing supportive social norms (e.g., regulatory mandates, public engagement campaigns) (Bouman, Steg, & Dietz, 2021). By embedding sustainability into institutional frameworks, governance can influence both the context in which individuals make decisions and their perceived capacity to act sustainably.

For example, financial incentives such as subsidies, tax rebates, or low-interest loans for renewable energy technologies (e.g., solar panels, electric vehicles) can lower entry costs, thereby enhancing the feasibility of adopting pro-environmental options (Nguyen & Hoang, 2022). These economic instruments not only address affordability issues but also serve as signals of government commitment to sustainability, potentially shifting public attitudes and expectations. Furthermore, policy-driven initiatives such as national recycling campaigns or zero-waste programs help shape subjective norms by communicating collective values and desired behaviors. When individuals perceive sustainable actions as socially endorsed and institutionally supported, they are more likely to align their behaviors accordingly.

Moreover, the implementation of enabling infrastructure such as accessible recycling facilities, public transit systems, or green energy grids can significantly improve perceived behavioral control (PBC), a key determinant of behavioral intention. SGT underscores that behavior change is unlikely without supportive structural conditions that reduce effort and increase convenience. Community-based programs, such as those observed in participatory waste management initiatives, demonstrate how the integration of infrastructure with local governance enhances both awareness and action (Wang et al., 2020). Such initiatives provide practical avenues for individual engagement while reinforcing institutional trust and legitimacy. In the context of this study, SGT offers a relevant analytical lens to examine how governance interventions interact with individual-level cognitive and motivational factors. By focusing on the systemic conditions that enable or constrain PB, this framework supports a more holistic understanding of environmental behavior beyond psychological predispositions alone. As such, incorporating SGT contributes to the development of more robust, policy-relevant models of behavior change, particularly in the face of complex sustainability challenges that demand coordinated institutional responses and individual agency.

By integrating TPB with SGT, this research moves beyond an individual-level cognitive approach to a holistic perspective that incorporates both psychological determinants and governance structures. While TPB explains the formation of pro-environmental intentions, SGT contextualizes how systemic enablers facilitate or hinder the translation of these intentions into action. This dual approach provides a more comprehensive understanding of pro-environmental behavior, addressing the intention-behavior gap and offering insights into policy interventions that can enhance sustainable action.

In summary, TPB and SGT collectively provide a robust theoretical foundation for understanding pro-environmental behavior, emphasizing both individual decision-making and systemic support mechanisms. This study contributes to sustainability research by exploring how psychological factors and governance interventions interact to promote effective environmental action, with implications for both theory development and policy design.

2.2. Determinants of Behavioral Intention

In the context of pro-environmental behavior (PB) research, extensive empirical evidence has established that attitudes, subjective norms, and perceived behavioral control (PBC) are key predictors of individuals' intentions to engage in sustainable actions. Rooted in the Theory of Planned Behavior (Ajzen, 1991) these constructs reflect individuals' evaluations of outcomes (attitudes), perceived social expectations (subjective norms), and the perceived ease or difficulty of performing the behavior (PBC). For instance, Wang et al. (2020) found that individuals with positive attitudes toward waste sorting, strong social expectations, and a sense of control were significantly more likely to intend to sort waste. Similarly, Lee, Kim, and Roh (2023) reported that attitudes, subjective norms, and PBC all positively influenced intentions to adopt electric vehicles. These findings highlight the multidimensional nature of behavioral intention and underscore the importance of targeting these psychosocial factors in promoting pro-environmental actions.

Research shows that attitudes, defined as favorable evaluations of behaviors, play a critical role in shaping intentions toward sustainability. Positive attitudes regarding energy conservation, responsible waste disposal, and ecological care contribute significantly to the formation of pro-environmental intentions. Studies have indicated that individuals who view these behaviors as beneficial are more likely to intend to engage in themBamberg and Möser (2007) and Klöckner (2013). In the context of Pakistan, where issues such as energy shortages and waste mismanagement are prevalent, fostering positive attitudes is essential for encouraging sustainable behaviors. Therefore, we hypothesize that a positive attitude toward these PBs is linked to stronger intentions to engage in them.

Subjective norms, which capture the perceived social pressure to perform certain behaviors, also significantly influence pro-environmental intentions. In collectivist societies like Pakistan, social influences can play a crucial role in determining individual behaviors. When family, peers, or community leaders advocate for sustainable

practices, individuals are more likely to develop stronger intentions to adopt such behaviors (Kim & Lee, 2020; La Barbera & Ajzen, 2020). This suggests that individuals who perceive higher social pressure to engage in energy conservation, waste disposal, care for plants and animals are more likely to express pro-environmental intentions.

Perceived behavioral control (PBC) reflects individuals' beliefs about their ability to execute specific behaviors, incorporating both internal factors, such as knowledge and skills, and external constraints, such as access to resources and infrastructure. Research consistently demonstrates a positive correlation between PBC and behavioral intention, indicating that individuals who believe they have the capability to perform a behavior are more likely to intend to do so (Conner, McEachan, Taylor, O'Hara, & Lawton, 2015). In Pakistan, individuals may face barriers like inadequate recycling facilities and limited access to energy-efficient appliances, which can impact their perceived control over engaging in PBs. Therefore, those who perceive higher levels of control are more likely to intend to engage in sustainable practices.

Based on these insights, the following hypotheses are proposed:

H_1: Residents' attitudes positively influence their intentions to engage in pro-environmental behaviors.

H_2: The influence of subjective norms positively impacts residents' intentions to engage in pro-environmental behaviors.

H_3: Residents' perceived behavioral control is positively linked to their intentions to engage in pro-environmental behaviors.

2.3. Intention-Behavior Relationship

The relationship between intention and behavior is a core premise of the Theory of Planned Behavior (TPB) Ajzen (1991) which identifies intention as the most immediate and significant predictor of actual behavior. This theoretical assumption has been consistently supported by empirical evidence across a range of domains, including environmental sustainability, public health, and technology adoption. Within the context of pro-environmental behavior, intention reflects an individual's motivation and readiness to act, serving as a crucial link between cognitive antecedents and observable action. Based on this foundation, the following hypotheses are proposed. For instance, Wang et al. (2020) demonstrated that residents' intentions to sort waste are positively correlated with their actual waste sorting behavior. When individuals have strong intentions toward pro-environmental actions, they are significantly more likely to translate those intentions into tangible behaviors, which is crucial for addressing pressing environmental issues. Conner and Norman (2022) emphasized the importance of intention strength in forecasting actual conduct, underscoring that the more committed individuals feel toward their pro-environmental intentions, the more likely they are to engage in sustainable practices. Additionally, Ates (2020) explored the link between pro-environmental intentions and behaviors among employees at public middle schools, finding a positive association between the two, which further supports the need for fostering strong pro-environmental intentions within various populations.

Given these insights, it is evident that promoting pro-environmental intentions is essential for encouraging actual environmentally friendly behaviors. Therefore, the following hypothesis is proposed:

H_4: Pro-environmental intention is positively related to pro-environmental behavior.

2.4. Intention-Behavior Discrepancy and the Governance Gap (TPB + SGT)

While a positive relationship between intention and behavior is well-established in psychological theories like the Theory of Planned Behavior (Ajzen, 1991) many studies have identified a significant "intention-behavior gap." This gap refers to the failure of individuals' intentions to consistently translate into actions, posing challenges for addressing environmental issues. Closing this gap between residents' pro-environmental intentions and actual behaviors is crucial, and this study explores the role of perceived government incentives in aligning these intentions with concrete actions.

External barriers, such as limited time, resources, and opportunities, often impede the realization of intentions (Gollwitzer & Sheeran, 2006). Sheeran and Webb (2016) found that even strong intentions to engage in healthy behaviors may not lead to action due to these constraints. In pro-environmental contexts, practical challenges like costs and the availability of eco-friendly options can hinder individuals from following through on their intentions (Liu et al., 2023).

Engaging in pro-environmental behaviors typically require additional investments of time, money, and effort. Government incentives can offset these costs, encouraging individuals to act on their pro-environmental intentions. Research shows that effective government policies significantly motivate pro-environmental actions, such as waste recycling (Wan, Shen, & Yu, 2014). Households receiving financial incentives, like subsidies and tax rebates, are more likely to adopt energy-efficient practices (Agrawal, Rosell, & Simcoe, 2020; Dai & Chapman, 2022; Nguyen & Hoang, 2022; Xiaozhen Wang, Zheng, Jiang, & Tao, 2021). Furthermore, Mansouyar and Bruzas (2023) highlight that combining economic incentives with behavioral nudges can enhance sustainable urban mobility.

Despite the intention-behavior link, a persistent "gap" arises when individuals face structural barriers, such as financial costs or lack of infrastructure. SGT highlights the role of institutional measures in bridging this gap. We argue that robust government support strengthens individuals' intentions regarding pro-environmental behaviors (PB). Government incentives such as tax rebates for solar panel installation or public campaigns promoting biodiversity protection reduce the perceived and actual costs of PBs, making it easier for individuals to act on their intentions. By facilitating the adoption of PB, they can transform intentions into consistent actions. Based on this premise, the following hypotheses are proposed:

H_5: Perceived governmental incentive measures are positively related to pro-environmental behavior.

H_6: Perceived governmental incentive measures strengthen the relationship between pro-environmental intention and pro-environmental behavior.

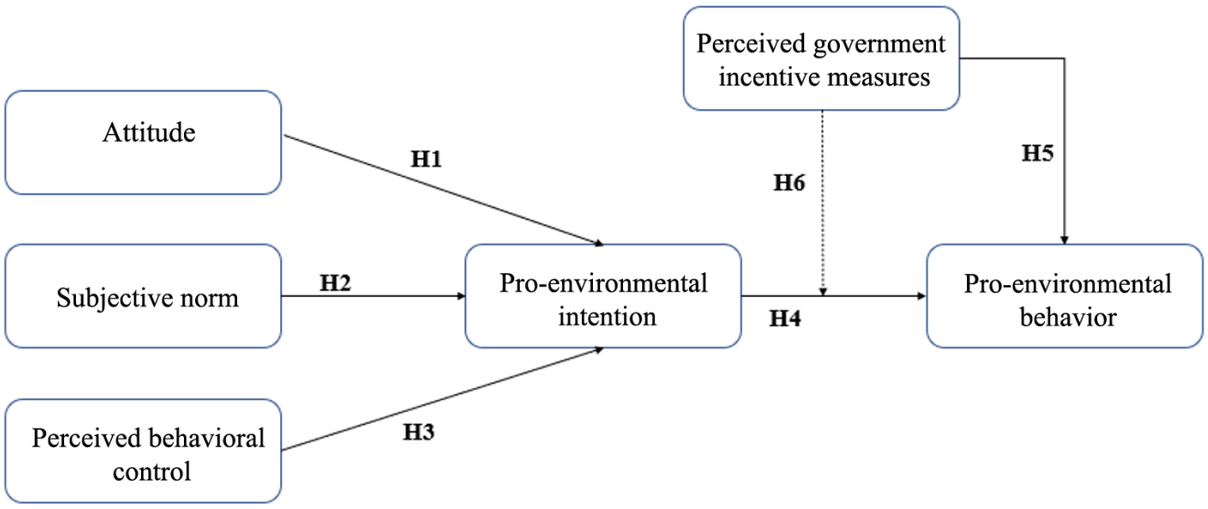

Figure 1. Research framework.

3. Data and Methodology

3.1. Measurement Development

The latent variables in the research framework (Figure 1) were operationalized using validated measurement items adapted from prior studies to align with the current context (see Table 1 for details). The core constructs of the Theory of Planned Behavior (TPB) attitudes, subjective norms, and perceived behavioral control were measured with three items each, sourced from Wang et al. (2020). Respondents evaluated these items on a 5-point Likert scale, where 1 represents "strongly disagree" and 5 represents "strongly agree."

The moderating variable, perceived government incentive measures, was assessed using three additional items, also adapted from Wang et al. (2020) employing the same 5-point Likert scale. To enhance specificity and relevance, pro-environmental behavioral intentions were measured through four concrete actions: regularly disposing of garbage, protecting animals and plants, saving energy and resources, and participating in environmental activities. This targeted approach, informed by Wang, Wang, Zhao, and Yang (2019) and Webb, Soutar, Mazzarol, and Saldaris (2013) ensures that the measurement reflects actionable behaviors in daily life. Respondents rated their intentions using the same 5-point Likert scale.

Actual pro-environmental behavior was evaluated based on the frequency of these actions, following methodologies established by Onwezen, Antonides, and Bartels (2013) and Zhang, Lai, Wang, and Wang (2019). For this assessment, a 5-point Likert scale ranging from 1 (never) to 5 (always) was utilized.

Table 1. Descriptions of the measurement items.

Constructs	Items	Factor loadings
Attitude	AT1: I think conducting pro-environmental behavior is helpful to alleviate the environmental problems	0.887
	AT2: I think conducting pro-environmental behavior is beneficial to deal with ecological degradation problems	0.888
	AT3: I think participating in environmental protection activities is helpful to improve the human living environment	0.897
Subjective norms	SN1: My neighbors think that I should exhibit pro-environmental behavior in my daily life	0.886
	SN2: My family members want me to display pro-environmental behavior in my daily life	0.890
	SN3: My relatives wish me to show pro-environmental behavior in my daily life	0.887
Perceived behavioral control	PBC1: I have the skills and abilities to exhibit Pro-environmental behavior in my daily life	0.896
	PBC2: I feel it is easy and convenient to display Pro-environmental behavior in my daily life	0.896
	PBC3: I have confidence that if I want to show Pro-environmental behavior in my daily life, I can do it	0.888
Perceived government incentive measures	PGIM1: If I perceive I can get a monetary reward from the government, I think I will exhibit pro-environmental behavior in my daily life	0.724
	PGIM2: If I perceive I can get bonus points from the government that I can later exchange for products, I think I will display pro-environmental behavior in my daily life	0.770
	PGIM3: If I perceive I can receive an honorary title such as "environmental protection guard" or an environmental certificate from the government, I think I will engage in Pro-environmental activities	0.739
Pro-environmental intention	INT1: I intend to dispose garbage regularly in daily life	0.724
	INT2: I intend to protect animals and plants in daily life	0.736
	INT3: I am willing to save energy and resources in daily life	0.718
	INT4: I am willing to participate in environmental protection activities	0.720
Pro-environmental behavior	PB1: Disposing of garbage regularly in daily life	0.825
	PB2: Protecting animals and plants in daily life	0.849
	PB3: Saving energy and resources in daily life	0.827
	PB4: Participating in environmental protection activities	0.823

3.2. Questionnaire Design and Pilot Test

After developing the measurement items for each latent variable, a comprehensive questionnaire was designed to assess residents' pro-environmental intentions and behaviors. A pilot test was conducted to evaluate the questionnaire's effectiveness in measuring the research constructs and ensuring that items were understood by respondents. Initially, a meeting was held with five scholars specializing in pro-environmental behavior to review the questionnaire, leading to modifications based on their feedback, such as rephrasing items.

Subsequently, a small-scale survey was conducted with 30 participants to identify any ambiguous items or inappropriate statements. Based on this feedback, further revisions were made, resulting in a refined questionnaire. The final version of the measurement items for each variable is presented below.

3.3. Sample and Data Collection

A structured questionnaire was administered to residents in Pakistan to generate numerical data suitable for identifying patterns and testing hypotheses related to pro-environmental behavior. A cross-sectional design was employed to capture a snapshot of intentions and behaviors simultaneously, facilitating the analysis of correlational relationships while controlling for demographic and contextual factors. Given the significant environmental challenges, vulnerability to climate change, rapid urbanization, and population growth in Pakistan, understanding residents' pro-environmental behavior is both appropriate and necessary. The study aimed for generalizability with a sample size of 700 respondents.

Data were collected through both online and offline methods to ensure broad reach and enhance representativeness. The online survey platform guaranteed anonymity and confidentiality, while offline surveys were administered in person by trained research assistants who ensured informed consent and collected completed forms. Participants were recruited from a diverse pool, stratified by age, gender, and other demographic characteristics, resulting in a final sample composed of 46.9% female and 46.9% male respondents, with a mean age of 34 years (SD = 8.52).

To maintain data integrity, incomplete or inconsistent responses were excluded from the analysis. Ethical guidelines were strictly adhered to, with participants provided informed consent forms detailing the research purpose, the voluntary nature of participation, and the right to withdraw at any time. All responses remained anonymous, with no personally identifiable information collected. The online platform used for data collection ensured secure handling of participant data.

The demographic characteristics of respondents align with those of residents in Pakistan, as presented in Table 2. In addition, a T-test was conducted to assess non-response bias by comparing demographic variables including gender, age, education level, income, and family size between respondents and non-respondents. The analysis showed no statistically significant differences, suggesting that non-response bias was not a major concern in this study.

Table 2. Demographic information of respondents.

Variable	Category	Number	Percentage
Gender	Male	372	53.1%
	Female	328	46.9%
Marital status	Single	299	42.7%
	Married	401	57.3%
Age (In years)	18-27	167	23.9%
	28-37	303	43.3%
	38-47	188	26.9%
	48-57	42	6.0%
Family size	1-2	40	5.7%
	3-5	293	41.9%
	6-7	257	36.7%
	8-10	110	15.7%
Educational level	Higher secondary	35	5.0%
	Bachelor's degree	243	34.7%
	Master's degree	305	43.6%
	PhD degree	117	16.7%
Income per month (In rupees)	Below 20000	7	1.0%
	21000-30000	13	1.9%
	31000-40000	194	27.7%
	41000-50000	153	21.9%
	51000 and above	333	47.6%

4. Data Analysis and Results

4.1. Descriptive Statistics Analysis

Statistical analysis was conducted using SPSS 21.0 to perform descriptive statistics. As shown in Table 3, the mean score for perceived government incentive measures (4.28) is relatively high, while the means for attitudes (4.03), subjective norms (4.02), and perceived behavioral control (4.01) are moderate. In contrast, the mean for pro-environmental behavior (3.35) is notably lower than for pro-environmental intention (3.63). This suggests an existing gap between pro-environmental intention and behavior.

A paired samples t-test was conducted to assess whether a significant gap exists between residents' pro-environmental intentions and their actual behaviors. The results revealed a significant mean difference, $t(699) = 18.74$, $p < .001$, with a 95% confidence interval [0.25, 0.30] and a mean difference of 0.27. This indicates that residents, on average, expressed stronger pro-environmental intentions than were reflected in their actual behaviors. The finding confirms the presence of an intention–behavior gap, suggesting that while many individuals are motivated to act sustainably, this intention does not consistently translate into action.

4.2. Measurement Model Analysis

Confirmatory factor analysis (CFA) was conducted to evaluate the fit of the measurement model. As presented in Table 4, the fit indices indicate that the model provides an adequate representation of the observed data (Dash & Paul, 2021). To assess the reliability and validity of the constructs, both SPSS 21.0 and SmartPLS 4.1.0 were employed. Reliability was examined using Cronbach's alpha (CA) and composite reliability (CR), with all latent constructs exceeding the recommended threshold of 0.70 (Claes Fornell & Larcker, 1981) indicating satisfactory internal consistency.

Validity was assessed through both convergent and discriminant validity (Anderson & Gerbing, 1988). As shown in Table 1, all factor loadings surpassed the 0.70 benchmark, confirming strong associations between measurement items and their respective constructs. Convergent validity was further supported by the average variance extracted (AVE) values in Table 3, all of which exceeded the minimum recommended value of 0.50 (Anderson & Gerbing, 1988). Discriminant validity was confirmed by comparing the square root of each construct's AVE with its correlations with other constructs. As indicated in Table 3, each construct's AVE square root was greater than its inter-construct correlations, in line with the criterion established by Hair, Black, Babin, and Anderson (2009). These results collectively confirm that the measurement model demonstrates acceptable reliability and validity.

Table 3. Descriptive statistics analysis and reliability and validity analysis.

Variable	AT	SN	PBC	INT	PB	PGIM
AT	0.961					
SN	0.027	0.960				
PBC	0.056	0.079	0.960			
INT	0.502	0.508	0.543	0.891		
PB	0.391	0.357	0.422	0.711	0.915	
PGIM	0.041	0.071	0.053	0.058	0.331	0.830
Mean	4.03	4.02	4.01	3.63	3.35	4.28
CA	0.959	0.957	0.958	0.914	0.954	0.791
CR	0.973	0.972	0.973	0.939	0.954	0.868
AVE	0.923	0.921	0.922	0.794	0.837	0.689

Note: (1) AT = Attitudes; SN = Subjective norms; PBC = Perceived behavioral control; INT = Pro-environmental intention; PB = Pro-environmental behavior; PGIM = Perceived government incentive measures. CA = Cronbach's alpha; CR = Composite reliability; AVE = Average variance Extracted. (2) The diagonal elements (in bold) represent the values of the square root of AVE (√AVE).

4.3. Structural Model and Hypothesis Testing Analysis

The fit indices for the structural model, presented in Table 4, indicate an acceptable and satisfactory fit (Dash & Paul, 2021). We calculated several fit indices, including SRMR, d_ULS, d_G, Chi-Square, and NFI. The Standardized Root Mean Square Residual (SRMR) serves as an absolute goodness-of-fit index, with a threshold value of 0.08 (Hu & Bentler, 1998; Sarstedt, Ringle, & Hair, 2021). Additionally, the Normed Fit Index (NFI) exceeds 0.9 (Fornell, 1981). The d_ULS and d_G indices provide a complete adaptation standard, measuring discrepancies between the empirical covariance matrix and the covariance matrix implied by the composite factor model (Dijkstra & Henseler, 2015). Sarstedt et al. (2021) note that the estimation model assesses overall impacts and structures, while the saturation model evaluates all relationships within the structure.

To investigate the relationships among the study variables and to test the proposed hypotheses, partial least squares structural equation modeling (PLS-SEM) was employed. This technique is well-regarded for its robustness and suitability for data that do not meet normality assumptions. The regression analysis was conducted using SmartPLS 4.0, with the results of the hypothesis testing presented in Figure 2.

Table 4. Fit indices of research model.

Complete model		
Fit index	**Saturated model**	**Estimated model**
SRMR	0.035	0.036
d_ULS	0.258	0.272
d_G	0.34	0.345
Chi-square	1483.758	1518.454
NFI	0.892	0.89

Figure 2A presents the path analysis results from SmartPLS, including path coefficients (β), outer loadings, and R^2 values. The path coefficients indicate the strength and direction of relationships between constructs, while outer loadings reflect the association between indicators and latent variables. R^2 values represent the proportion of variance explained for each endogenous construct.

The analysis for H1 revealed a positive and significant relationship between Attitude (AT) and Pro-environmental Intention (INT), with a path coefficient of 0.457, standard deviation (SD) of 0.022, t-value of 20.885, and $p < 0.01$. For H2, the relationship between Subjective Norms (SN) and Attitude (AT) was also significantly positive, with a path coefficient of 0.453 (SD = 0.022), t = 20.209, and $p < 0.01$, confirming that SN positively influences AT. H3 examined the effect of Perceived Behavioral Control (PBC) on Pro-environmental Intention (INT), resulting in a significant positive relationship with a path coefficient of 0.449 (SD = 0.022), t = 20.027, and $p < 0.01$. Thus, H1, H2, and H3 are supported.

Following the suggestion of Hayes and Preacher (2010), a mediation effect analysis was conducted, and the results are presented in Table 5. Regarding H4, Pro-environmental Intention (INT) significantly influences Pro-environmental Behavior (PB) with a path coefficient of 0.482 (SD = 0.042), t = 11.516, and $p < 0.01$, strongly supporting the hypothesis. However, H5 indicated that Perceived Government Incentive Measures (PGIM) negatively affect PB, leading to the rejection of this hypothesis, as the path coefficient was -0.287 (SD = 0.027), t = 10.758, $p < 0.01$. Additionally, H6 proposed that PGIM would enhance the relationship between INT and PB, but

this was not supported; the path coefficient was -0.117 (SD = 0.026), t = 4.548, p < 0.01, indicating a negative effect. Although the interaction effect was statistically significant, the negative sign of the coefficient suggests that PGIM weakens the INT-PB relationship.

To illustrate the moderating effect of PGIM, we followed Aiken (1991) graphical procedure to create an interaction plot. The plot assigns values of one standard deviation above and below the mean for PGIM to visualize its moderating effect. Figure 3 demonstrates that INT positively influences PB across all levels of PGIM, but the strength of this relationship decreases as PGIM increases. Additionally, Figure 2 presents the R^2 values, which measure the percentage of variance explained by the model, reflecting its explanatory ability (Wang et al., 2019). The R^2 values for the Pro-environmental Intention and Pro-environmental Behavior models are 65.8% and 54.9%, respectively.

In conclusion, the results confirm significant relationships among Attitude, Subjective Norms, Perceived Behavioral Control, and Pro-environmental Intention, as well as the positive influence of Pro-environmental Intention on Pro-environmental Behavior. However, the direct and moderating effects of Perceived Government Incentive Measures were found to be negative, leading to the rejection of the corresponding hypotheses. Overall, the model exhibits strong explanatory and predictive power, particularly regarding Pro-environmental Intention.

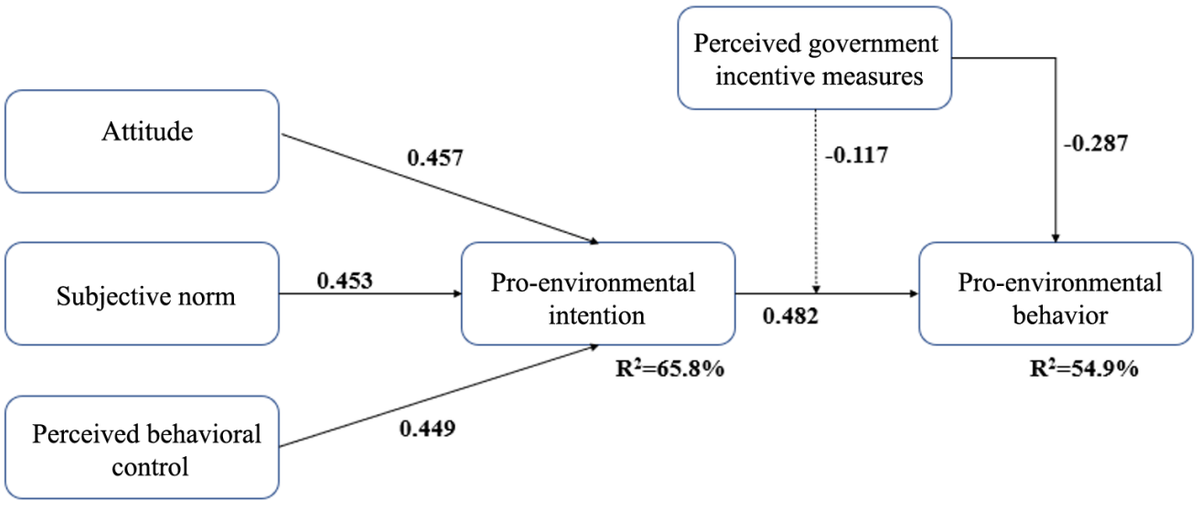

Figure 2. Hypothesis testing results.

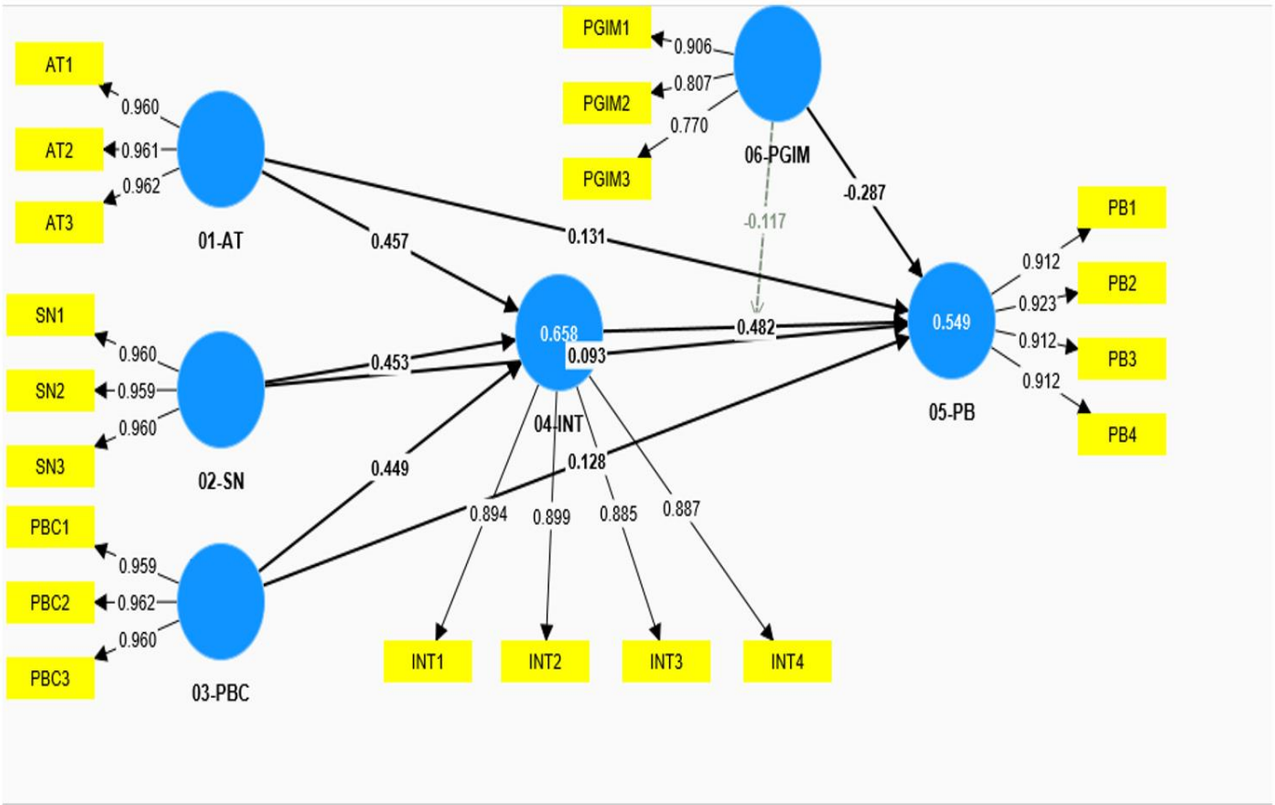

Figure 2A. Structural path analysis results with coefficients, outer loadings, and R^2 values.

Table 5. Mediation effect analysis.

Path	Indirect effect	LBCI	UBCI
Attitude → Pro-environmental intention → Pro-environmental behavior	0.220	0.185	0.259
Subjective norm → Pro-environmental intention → Pro-environmental behavior	0.218	0.184	0.255
Perceived behavioral control → Pro-environmental intention → Pro-environmental behavior	0.216	0.183	0.254

Note: LBCI and UBCI = Lower bound and Upper bound of 95% confidence interval.

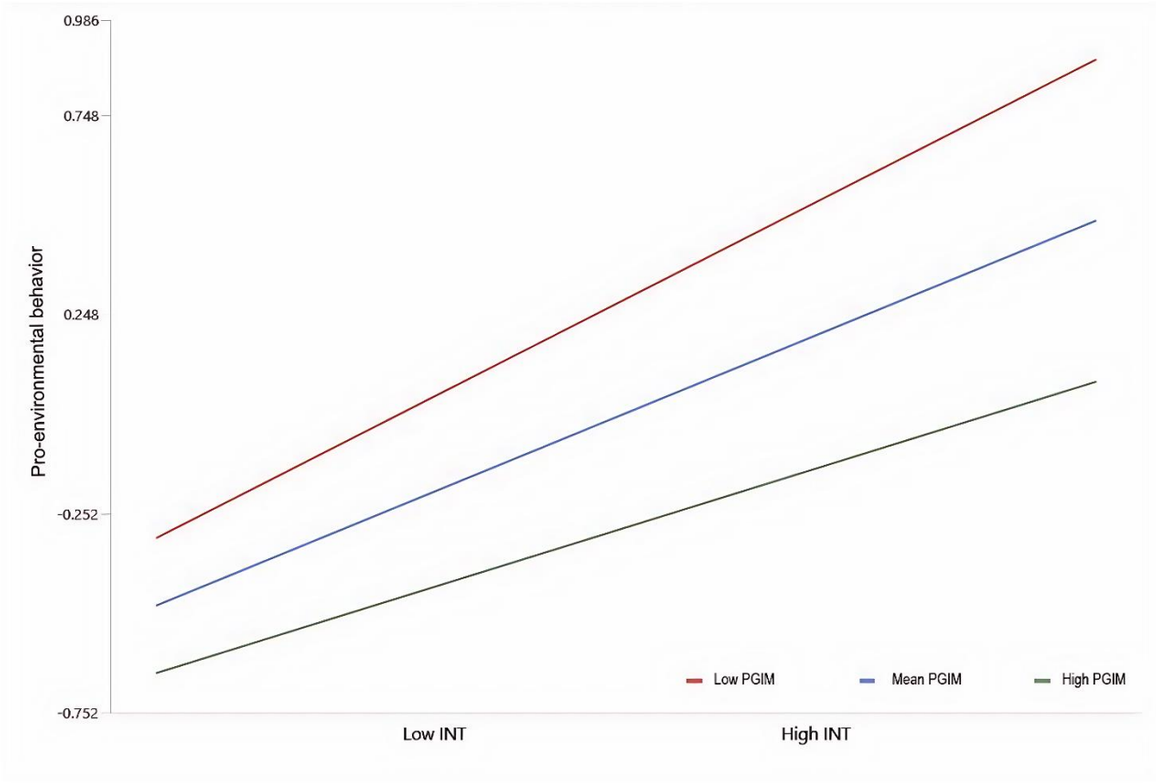

Figure 3. Moderating effect of perceived government incentive measures.

5. Conclusions, Implications, and Research Limitations

5.1. Conclusions and Implication

This study examined the drivers of pro-environmental behavior (PB) in Pakistan, employing the Theory of Planned Behavior (TPB) and Sustainable Governance Theory (SGT) to unravel the interplay between psychological factors, government incentives, and cultural context. The findings revealed that attitudes, subjective norms, and perceived behavioral control core constructs of TPB strongly predicted pro-environmental intentions, consistent with prior research (Wang et al., 2020). However, a significant intention-behavior gap persisted (Δ = 0.27, $p < 0.001$), echoing global observations of discrepancies between aspiration and action (Ates, 2020; Wu, Font, & Liu, 2021). Crucially, perceived government incentive measures (PGIM), which included both monetary rewards (e.g., subsidies, tax rebates) and non-monetary rewards (e.g., appreciation certificates, public recognition), counter-intuitively weakened both direct PB (β = -0.29) and the moderating link between intention and behavior (β = -0.12). Although perceived government incentives were expected to reinforce pro-environmental behavior, findings revealed a counter-intuitive crowding-out effect, particularly where intrinsic motivations were already strong. This aligns with behavioral economics literature suggesting that extrinsic rewards may inadvertently reframe voluntary environmental actions as transactional duties. In Pakistan's collectivist cultural setting, such framing can dilute community-driven stewardship, underscoring the importance of aligning incentive structures with local value systems. This paradoxical outcome reflects the *crowding-out effect* (Bruers, 2024) where extrinsic incentives erode intrinsic motivation, particularly in contexts where communal values already drive sustainability efforts.

The integration of TPB and SGT highlights the dual role of incentives as both enablers and disruptors of PB. While monetary rewards (e.g., subsidies for solar panels) can reduce material costs, and non-monetary rewards (e.g., certificates for eco-friendly practices) may signal social approval, their combined use in Pakistan inadvertently reframed PB as transactional obligations rather than shared responsibilities. For instance, residents who received certificates for waste reduction reported feeling that their intrinsic commitment to environmental stewardship was undervalued, echoing findings from behavioral economics (Gneezy, Meier, & Rey-Biel, 2011). Similarly, monetary subsidies for energy conservation led some households to perceive sustainability as a "paid duty" rather than a moral imperative, undermining self-determined motivation (Pellerano, Price, Puller, & Sánchez, 2017). This suggests that even well-intentioned incentives, when misaligned with cultural norms, risk destabilizing the intrinsic drivers critical for long-term behavioral change.

For policymakers, the urgency lies in crafting interventions that reflect Pakistan's sociocultural realities. Prioritizing autonomy-supportive policies such as participatory decision-making in incentive design could mitigate crowding-out effects while fostering long-term habit formation. Globally, these lessons resonate across collectivist societies, where extrinsic rewards risk undermining intrinsic resolve. By embedding interventions in cultural norms and decentralized governance, Pakistan can transform environmental challenges into opportunities for inclusive resilience, offering insights potentially relevant for other collectivist societies in the Global South.

This study advances the integration of SGT and TPB by demonstrating that governance mechanisms must harmonize structural enablers (e.g., subsidies, infrastructure) with psychological drivers (e.g., norms, attitudes) to foster sustained PEB. While extrinsic incentives are indispensable for overcoming barriers, their design must avoid moral crowding-out by embedding normative narratives into policy frameworks. Future governance strategies should prioritize adaptability, transparency, and crisis resilience to align individual actions with collective sustainability imperatives.

5.2. Study Limitations and Future Directions

This study employed a robust analytical approach (PLS-SEM; SRMR = 0.036, NFI = 0.89) and diverse data collection platforms, enhancing the validity of its conclusions. However, the cross-sectional design limits causal inferences, as it cannot capture temporal changes in behavior or the evolving impact of incentives. A longitudinal design would offer clearer insights into how incentives interact with behavior over time. Additionally, the use of convenience sampling while inclusive of multiple platforms may underrepresent marginalized socio-economic groups, affecting generalizability. The reliance on self-reported data also poses a risk of bias, particularly from social desirability, potentially inflating the observed intention-behavior relationships.

Notably, the study found that incentives failed to significantly close the intention-behavior gap, contrary to expectations. This suggests the presence of unmeasured contextual moderators, such as cultural norms or institutional trust. Future research should explore these factors and adopt mixed-method approaches (e.g., interviews) to understand why incentives underperform. Subgroup-specific analyses (e.g., agrarian Punjab vs. urban Karachi) could help tailor interventions, while testing hybrid incentive models (e.g., combining small rewards with community recognition) might better balance extrinsic and intrinsic motivation.

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