

Article

From Awareness to Action: Pathways to Eco-Socially Responsible Behavior Among Jordanians

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Abstract

Grounded in an integrated conceptual framework combining the Cognitive–Affective–Conative model, Social Cognitive Theory, and the Theory of Planned Behavior, this study examines the direct and indirect pathways through which environmental awareness translates into eco-socially responsible behavior among Jordanians. Data on socio-demographic characteristics and eight environmental constructs were collected through a telephone survey of 417 Jordanian adults. Path analysis confirmed that environmental awareness had a significant positive effect on eco-socially responsible behavior, with a total effect of $\beta = 0.347$ ($p < 0.001$), combining a direct effect ($\beta = 0.250$) and indirect effects ($\beta = 0.097$) operating through attitudes and behavioral intention. PBC and behavioral intention emerged as the most proximate determinants of behavior. Behavioral intention functioned as one of the key mediating pathways through which awareness, attitudes, norms, and self-efficacy converged before reaching behavior. Place of residence significantly moderated the awareness–behavior relationship, with urban residents showing a stronger association than rural ones, pointing to the role of structural enabling conditions in shaping sustainable behavior. These findings have implications for sustainability-oriented environmental programming in Jordan and similar resource-constrained contexts in the MENA region, calling for multi-pronged approaches that move beyond awareness-raising to address the psychological and structural intermediaries shaping eco-socially responsible behavior.

Keywords: environmental awareness; eco-socially responsible behavior; behavioral intention; environmental norms; attitudes; self-efficacy; perceived behavioral control; path analysis; Jordan; sustainability; SDG

1. Introduction

Jordan faces a range of pressing environmental challenges, including water scarcity, land degradation, and growing pressures from rapid urbanization and climate change [1,2]. In response, the Jordanian government has introduced national environmental strategies and made several international commitments [3]. These commitments place Jordan within the broader global sustainability agenda, particularly Sustainable Development Goal (SDG) 12 on responsible consumption and production and SDG 13 on climate action. However, environmental protection does not depend only on policy frameworks but also on whether citizens recognize environmental issues and act responsibly. Between recognizing the environmental issues and acting on them, there lies a set of processes that translate awareness into eco-socially responsible behavior. Several factors, including attitudes, norms, intentions, and perceived capacity, mediate the relationship between awareness and action [4]. Unpacking these pathways provides a more nuanced understanding of how awareness is



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translated into action among Jordanians. This can guide the design of more targeted and effective environmental interventions.

The relationship between environmental awareness and eco-socially responsible behavior has been studied extensively in both developed and developing country contexts. Empirical research has documented that awareness is positively associated with responsible behavior, but the strength of this relationship varies by context [5,6]. Although studies from different contexts have mapped the various pathways that translate awareness into behavior [7,8], understanding around these pathways is still evolving. It is evident from empirical studies that knowledge alone is not sufficient to bring behavior change [9]. For behavior change to happen, individuals need to develop attitudes, feel motivated to act, feel appreciated by their immediate community for their individual action, and should not feel constrained by external factors. Societies where individuals have an improved understanding of environmental issues and a greater willingness to adopt eco-friendly lifestyles have demonstrated a better response to environmental degradation and climate change [10,11]. Therefore, understanding how Jordanians stand on these aspects of environmental engagement and how they shape the awareness–behavior relationship is important.

Several theoretical frameworks have been used by researchers to explain these pathways. Three theoretical perspectives have found prominence. The first among them is the Cognitive–Affective–Conative (CAC) framework, which suggests that knowledge sequentially progresses through various stages of emotional engagement before resulting in action [12–14]. The second in this space is the Social Cognitive Theory (SCT), which argues that self-efficacy, observational learning, and social reinforcement shape the progress from knowledge to behavior [15,16]. Finally, the Theory of Planned Behavior (TPB) considers behavioral intention and perceived behavioral control (PBC) as the most proximate determinants of behavior, and in turn, awareness and attitudes shaping them [17–20]. Each framework implies a different configuration of mediating pathways. Taken together, they suggest that the awareness–behavior relationship is neither direct nor simple, but is instead a product of multiple overlapping psychological processes that interact in ways that single-construct studies cannot fully capture [8,21].

Studies from developing country contexts have documented that the awareness–behavior relationship is shaped by structural constraints that are less prominent in wealthier settings. Resource scarcity, limited infrastructure, and economic pressures reduce individuals' perceived capacity to act on their environmental knowledge, even when awareness and motivation are present [6,8]. In contexts where basic material needs compete with environmental priorities, the gap between awareness and behavior tends to be wider and more persistent [5,21]. These findings suggest that psychological frameworks developed in high-income settings may need adaptation when applied to resource-constrained contexts such as Jordan.

Despite the explanatory value of these frameworks, their application in Jordan and the wider MENA region remains limited. Studies from the region show that structural factors, including limited access to environmental infrastructure and economic pressures, constrain behavior even when awareness and motivation are present [22–25]. A study comparing Jordan and Egypt found that environmental consciousness alone did not guarantee green purchasing behavior, with financial attitudes and price sensitivity significantly shaping the pathway [26]. In Jordan specifically, existing studies have focused predominantly on students and educational settings. Research among classroom teachers found strong environmental attitudes but low environmental knowledge and moderate self-reported behavior [27]. Studies among school and university students similarly documented moderate awareness levels without examining whether awareness translates into action [28,29]. None of these studies tested an integrated multi-theoretical framework in a nationally

representative adult population. The present study addresses this gap by combining the CAC, SCT, and TPB frameworks to examine the full awareness–behavior pathway among Jordanian adults.

Building on these three frameworks, this study adopts an integrated conceptual framework that positions environmental awareness and concern as cognitive and affective starting points, which shape attitudes, norms, and self-efficacy, which in turn influence behavioral intentions and PBC, and ultimately eco-socially responsible behavior. A visual representation of this framework is presented in Figure 1.

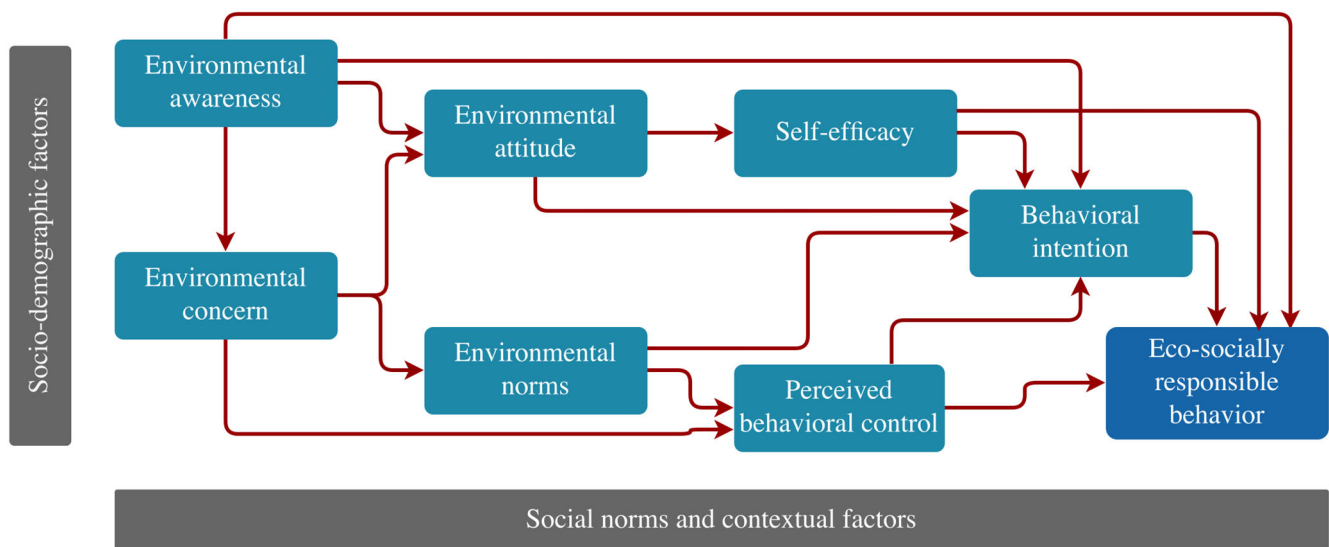


Figure 1. Conceptual framework depicting linkages between environmental awareness and eco-socially responsible behavior.

The constructs depicted in the framework are conceptually distinct, although they share a common domain of environmental engagement. Environmental awareness and concern are often conflated in the literature, but they are not the same. Awareness refers to the cognitive recognition of environmental problems. Concern reflects the affective weight individuals attach to those problems. A person may know about water scarcity without feeling personally troubled by it. Similarly, attitude and behavioral intention differ in their psychological function. Attitude captures how favorably an individual evaluates environmental protection as a general orientation. Intention reflects a directed motivational commitment to act in a specific way. Environmental norms and PBC are both antecedents of intention in TPB, but they operate through different mechanisms. Norms reflect what individuals perceive their social environment expects of them. PBC captures its own sense of whether acting is practically within reach. These distinctions guided the specification of directional paths between constructs in the framework.

Building on this conceptual framework, the present study addresses the following research questions. First, what are the direct and indirect effects of environmental awareness on eco-socially responsible behavior? Second, which psychological constructs serve as the most important mediators in the awareness–behavior pathway? Third, does the awareness–behavior relationship vary by key socio-demographic characteristics, including sex, education, and place of residence? In addressing these questions, the study contributes population-based evidence on the mechanisms linking awareness to behavior in Jordan. Three hypotheses guide the empirical analysis. H1: Environmental awareness is positively associated with eco-socially responsible behavior, both directly and indirectly through intermediate constructs. H2: Behavioral intention mediates the relationship between upstream

environmental engagement constructs and eco-socially responsible behavior. H3: Perceived behavioral control is the most proximate determinant of eco-socially responsible behavior.

2. Materials and Methods

2.1. Data

Data were collected via mobile phone from Jordanians who were 18 years and older and currently residing in Jordan. Mobile numbers for the survey were generated using the Random Digit Dialing (RDD) method. RDD is a highly publicized probability-based sampling technique commonly used in settings where a ready-made sampling frame is not available [30]. Through this approach, 12-digit phone numbers were generated in Excel. Each number included Jordan's international country calling code (962), followed by the unique identifier for mobile network operators (79 for Zain, 77 for Orange and 78 for Umniah), and seven randomly generated digits. Considering a 95% confidence level with a 5% margin of error, a minimum sample size of 400 was estimated. Between 24 February and 4 March 2026, enumerators made 960 calls to complete 417 interviews. Each interview took approximately 24 min.

The survey used a structured questionnaire to collect data. The questionnaire included questions on participants' socio-demographic characteristics and psychometric scales to assess the constructs indicated in the conceptual framework. The items for the constructs were taken from previous research studies [14,21,31–35]. The items were adjusted to make them relevant for the Jordanian context. The questionnaire was first developed in English, then translated into Arabic, and back-translated into English.

2.2. Measures

The constructs included in the conceptual framework were operationalized by calculating a composite score for each construct. The composite score was calculated by taking the average of all items in the scale. If any items within a scale were negatively worded, they were reverse-coded before averaging. Given that the original items were on a scale of 1 to 5, the range of composite scores also lay in that range. Higher scores reflected greater levels of the underlying construct. As shown in Table 1, most constructs demonstrated acceptable to good internal consistency, with Cronbach's α values ranging from 0.693 for environmental norms to 0.900 for eco-socially responsible behavior. Among the constructs, PBC was found to have the lowest score (3.32), and behavioral intention scored the highest (3.79). It is to be noted that formal assessment of convergent and discriminant validity through confirmatory factor analysis was not pursued for each construct. This was because construct scores were operationalized as item averages rather than latent variables with individual indicators.

Table 1. Mean score and internal consistency fit statistics of environmental awareness, attitudinal, and behavioral constructs (N = 417).

Construct	# of Items	Cronbach's α	Mean Score
Environmental awareness	10	0.777	3.63
Environmental concern	10	0.893	3.71
Environmental attitude	6	0.823	3.57
Environmental norms	7	0.693	3.64
Self-efficacy	5	0.759	3.59
Behavioral intention	6	0.777	3.79
Perceived behavioral control	5	0.723	3.32
Eco-socially responsible behavior	16	0.900	3.51

Socio-demographic characteristics included sex (male, female), place of residence (rural, urban), age (continuous), education (categorized as Secondary or below; above secondary), household income (<JD 300; JD 300–599; JD 600+), and household size (continuous). These characteristics were used to examine differences in mean construct scores across subgroups and as control variables in regression models.

2.3. Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki. The Institutional Review Board of German Jordanian University reviewed the study and granted a formal exemption from full ethical review, given the minimal-risk nature of the research, the anonymous telephone survey design, and the absence of identifiable personal data.

Verbal consent was sought from all respondents. The consent script included the purpose of the study, the voluntary nature of participation, risks and benefits associated with participation, and the expected duration of the interview. Before starting an interview, enumerators read the consent script. The enumerators emphasized the voluntary nature of participation and the confidentiality of information provided. Participants were also informed that they could decline to answer any question or stop the interview at any point.

2.4. Statistical Analyses

Univariate and multivariate analyses were performed. Univariate analysis was conducted to present the profile of respondents. Means and standard deviations were presented for continuous variables; otherwise, percentages were presented for categorical variables. Path analysis was performed to test whether the hypothesized pathways specified in the conceptual framework were supported empirically. Composite scores were used as observed variables in the path model rather than specifying latent variables with individual item indicators. This approach was adopted given the ratio of items to sample size and the primary goal of testing structural pathways between constructs rather than assessing measurement properties at the item level. The model assumed robust standard errors to account for the non-normal distribution of Likert-based composite scores. Direct paths were specified from awareness to concern, attitude, and intention; from concern to attitude, norms, and PBC; from attitude to self-efficacy and intention; from norms to PBC and intention; from self-efficacy to intention; from PBC to behavior; from intention to behavior; and from awareness directly to behavior. Socio-demographic variables were included as exogenous covariates with direct paths to all endogenous constructs, serving as controls without modeling relationships among themselves. Model fit was evaluated using the Standardized Root Mean-square Residual (SRMR), Coefficient of Determination (CD), chi-square statistic and its ratio to degrees of freedom, Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker–Lewis Index (TLI). Standardized path coefficients were obtained to facilitate comparison of effect magnitudes across constructs. Direct, indirect, and total effects were calculated to test mediation pathways. A pathway was considered to exhibit partial mediation where both a statistically significant indirect effect and a significant direct effect were present. Similarly, full mediation was inferred where the direct effect became non-significant in the presence of a significant indirect effect. To understand how sex, education, and place of residence moderate the relationship between environmental awareness and eco-socially responsible behavior, three separate Ordinary Least Squares (OLS) regression models were fitted. Each model included an interaction term of the three variables with awareness, with all socio-demographic control variables retained from previous analyses. Results from OLS are reported as unstandardized regression coefficients (β) with standard errors. All data were managed and analyzed using Stata V17 (StataCorp, College Station, TX, USA).

3. Results

Table 2 presents the profile of respondents. Of the 417 respondents, nearly three-fifths (59%) were from urban areas, and a little over half (54%) were females. Respondents were, on average, 38 years old and belonged to households with 4.6 members. Over two-fifths (43%) had above-secondary education. Respondents in urban areas reported higher income than those in rural areas, as only 27% of rural respondents reported a monthly income of JD 600 or more, as compared to 52% among urban residents.

Table 2. Background characteristics of respondents by place of residence, Jordan (N = 417).

Background Characteristics	Rural (N = 170)	Urban (N = 247)	Total (N = 417)	N
Age, Mean (SD)	37.8 (13.0)	38.1 (12.3)	38.0 (12.6)	417
Sex				
Male	47.6	45.7	46.5	194
Female	52.4	54.3	53.5	223
Place of residence				
Rural	100.0	0.0	40.8	170
Urban	0.0	100.0	59.2	247
Education				
Secondary or below	58.8	56.3	57.3	239
Above secondary	41.2	43.7	42.7	178
Household income				
<JD 300	35.9	20.6	26.9	112
JD 300–599	37.1	27.1	31.2	130
JD 600+	27.1	52.2	42.0	175
Household size, Mean (SD)	5.3 (2.0)	4.1 (1.7)	4.6 (1.9)	417

SD = Standard Deviation.

Standardized and unstandardized direct, indirect, and total effects have been presented in Table 3, and the path diagram depicting the connections between the constructs, along with standardized coefficients, has been presented in Figure 2. Environmental awareness demonstrated a strong total effect on eco-socially responsible behavior (total $\beta = 0.347$, $p < 0.001$), with both direct ($\beta = 0.250$, $p < 0.001$) and indirect effects ($\beta = 0.097$) operating through intermediate constructs. The indirect pathways from awareness ran primarily through behavioral intention and attitude. Awareness was also significantly associated with attitude ($\beta = 0.266$, $p < 0.001$), intention ($\beta = 0.249$, $p < 0.001$), and self-efficacy ($\beta = 0.103$, $p < 0.001$), and to a lesser degree with norms and PBC. Among all constructs, PBC registered one of the stronger total effects on eco-socially responsible behavior (total $\beta = 0.324$, $p < 0.001$). Much of this effect operated through a direct pathway ($\beta = 0.299$, $p < 0.001$). Behavioral intention also showed a direct effect on behavior ($\beta = 0.246$, $p < 0.001$). For environmental norms, a total effect of 0.164 ($p < 0.001$) was observed, a portion of which passed through intention and PBC as mediating constructs. Environmental concern, on the other hand, did not directly predict behavior in a meaningful way, yet its associations with attitude ($\beta = 0.370$, $p < 0.001$) and norms ($\beta = 0.372$, $p < 0.001$) were quite strong. This suggests that concern operates mostly in an indirect manner through these constructs. Self-efficacy also contributed to behavior through both a direct and an indirect route via intention, with the total effect reaching 0.129 ($p < 0.01$).

Table 3. Direct, indirect, and total effects of the path model of eco-socially responsible behavior, Jordan.

Pathway	Direct Effect β (SE)	Indirect Effect β (SE)	Total Effect β (SE)
Awareness $\rightarrow$ Concern	0.087 (0.045)	—	0.087 (0.045)
Awareness $\rightarrow$ Attitude	0.266 (0.038) ***	0.032 (0.017)	0.298 (0.041) ***
Awareness $\rightarrow$ Intention	0.249 (0.048) ***	0.089 (0.021) ***	0.338 (0.051) ***
Awareness $\rightarrow$ Behavior	0.250 (0.046) ***	0.097 (0.022) ***	0.347 (0.045) ***
Concern $\rightarrow$ Attitude	0.370 (0.051) ***	—	0.370 (0.051) ***
Concern $\rightarrow$ Norms	0.372 (0.075) ***	—	0.372 (0.075) ***
Concern $\rightarrow$ PBC	0.066 (0.059)	0.135 (0.034) ***	0.201 (0.068) **
Attitude $\rightarrow$ Self-Efficacy	0.344 (0.052) ***	—	0.344 (0.052) ***
Attitude $\rightarrow$ Intention	0.211 (0.051) ***	0.059 (0.022) **	0.270 (0.048) ***
Norms $\rightarrow$ PBC	0.362 (0.058) ***	—	0.362 (0.058) ***
Norms $\rightarrow$ Intention	0.190 (0.057) **	0.037 (0.019)	0.228 (0.057) ***
Self-efficacy $\rightarrow$ Intention	0.171 (0.057) **	—	0.171 (0.057) **
Self-efficacy $\rightarrow$ Behavior	0.087 (0.048)	0.042 (0.017) *	0.129 (0.048) **
PBC $\rightarrow$ Intention	0.103 (0.051) *	—	0.103 (0.051) *
PBC $\rightarrow$ Behavior	0.299 (0.046) ***	0.025 (0.015)	0.324 (0.046) ***
Intention $\rightarrow$ Behavior	0.246 (0.053) ***	—	0.246 (0.053) ***

Note: Socio-demographic control variables (sex, place of residence, age, education, income, and household size) were included in all equations; SE = Standard Error; Direct, Indirect and Total Effects are unstandardized Beta coefficients; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; — indicates no indirect path specified; Model fit: SRMR = 0.082, CD = 0.618, χ^2 (12) = 275.05, $p < 0.001$; χ^2 /df = 22.92; RMSEA = 0.230 (90% CI: 0.206–0.253); CFI = 0.773; TLI = −0.459 Standardized path coefficients are presented in Figure 2.

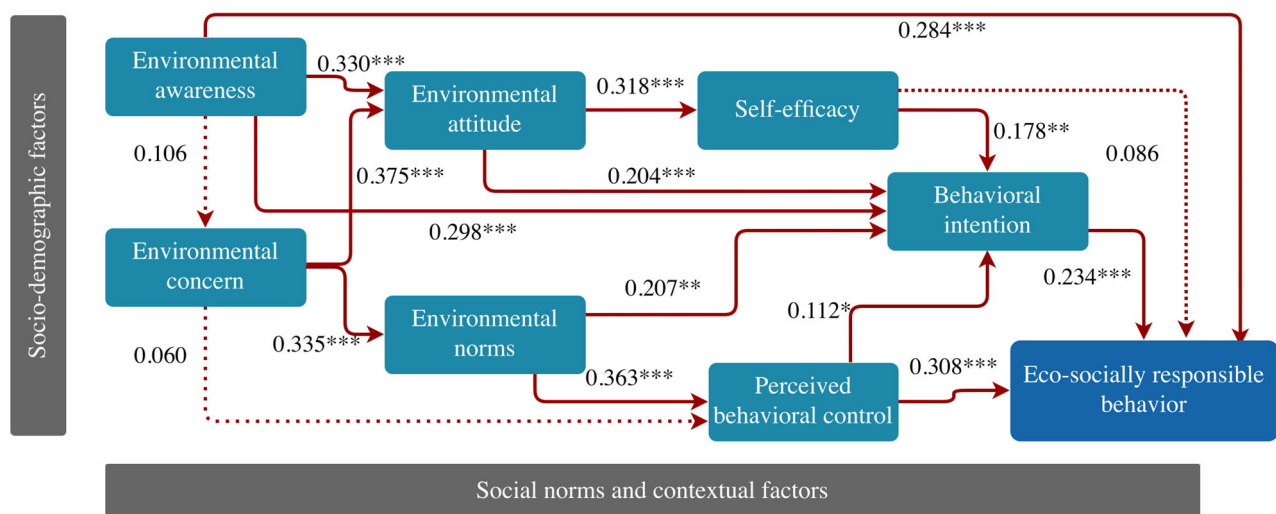
**Figure 2.** Path diagram with standardized coefficients linking environmental awareness, attitudinal, and behavioral constructs to eco-socially responsible behavior, Jordan. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Dotted lines indicate the path is not statistically significant at 5% level of significance.

Table 4 reports findings from the analysis to understand how sex, place of residence, and education moderate the awareness–behavior relationship. In all three models, awareness score remained positively and significantly associated with eco-socially responsible behavior, which points to the robustness of awareness as a predictor irrespective of the moderator tested. Neither sex nor education moderated this relationship. In the case of place of residence, urban respondents showed a stronger awareness–behavior association compared to rural ones ($\beta = 0.261$, $p < 0.01$).

Table 4. Moderation of the awareness–behavior relationship by sex, place of residence, and education, Jordan.

Variables	Model 1: β (SE)	Model 2: β (SE)	Model 3: β (SE)
Environmental awareness	0.488 (0.064) ***	0.378 (0.053) ***	0.421 (0.059) ***
Sex			
Male	Referent		
Female	0.276 (0.300)		
Female X environmental awareness	−0.062 (0.081)		
Place of residence			
Rural		Referent	
Urban		−1.101 (0.375) **	
Urban X environmental awareness		0.261 (0.099) **	
Education			
Secondary or below			Referent
Above secondary			−0.021 (0.304)
Above secondary X environmental awareness			0.070 (0.081)

β = Unstandardized Regression Coefficient; SE = Standard Error; ** $p < 0.01$, *** $p < 0.001$.

4. Discussion

The pathway from environmental awareness to eco-socially responsible behavior is not a simple or direct one. What sits between knowing about environmental issues and acting on that knowledge is a set of overlapping psychological processes. Understanding how these processes are configured is important to spell out why some people translate awareness into action while others do not. Driven by a conceptual framework that is grounded in the CAC framework, SCT, and TPB, the study demonstrates that multiple pathways connect awareness to eco-socially responsible behavior. The findings confirm that this theoretical integration offers a useful and empirically grounded lens for understanding environmental behavior in the Jordanian context. The majority of the paths depicted in the conceptual framework were confirmed by the path analysis, with most constructs showing significant associations in the expected directions. Notably, the analysis showed a direct connection between awareness and behavior. Beyond this direct pathway, awareness also connects to behavior through intermediate constructs including attitudes, norms, self-efficacy, intentions, and PBC, supporting H1. This supports the existing body of evidence that argues that awareness–behavior should not be seen through a narrow lens; instead, the complexity of how knowledge reaches action needs to be understood thoroughly for better environmental programming [6–8,21]. The study also found that the awareness–behavior relationship was significantly moderated by place of residence, with urban residents showing a stronger association between awareness and eco-socially responsible behavior than rural ones. Urban residents are more likely to have enabling conditions such as access to recycling infrastructure, eco-friendly products, and public transport alternatives than rural residents. In Jordan, for instance, waste collection coverage is estimated at 90% in urban areas compared to 70% in rural areas [36,37]. This structural disparity in access to environmental services likely shapes the extent to which awareness translates into action across residential contexts [38]. It can be concluded that the enabling conditions that allow awareness to be converted into action are playing an active role in shaping this relationship.

The awareness-to-action pathway in Jordan operates through at least three distinct channels. The first is a direct path from awareness to behavior without any intermediary. The second one is an attitudinal path where awareness shapes how individuals evaluate environmental protection, which in turn strengthens their intention to act. The third is a

motivational-control path, where intentions and PBC jointly determine whether awareness ultimately translates into behavior. However, these paths do not operate in isolation. They overlap and reinforce each other, and their relative importance varies depending on which construct is included as an intermediary. Among the constructs examined, PBC and behavioral intention emerged as the most proximate determinants of eco-socially responsible behavior, which is consistent with the central proposition of TPB [17,19]. PBC registered one of the strongest total effects on behavior in the model, with most of this effect operating through a direct pathway, supporting H3. This suggests that motivation to act in environmentally friendly ways is not the primary constraint for Jordanians. Rather, what holds behavior back is the perceived capacity to act. This gap between intention and PBC has been documented in other contexts as well [9,39]. Structural conditions, including access to eco-friendly infrastructure, affordable sustainable options, and organized community initiatives, shape PBC, which ultimately determines whether intentions translate into action [7,40]. In Jordan, where such enabling conditions are unevenly distributed [36,37], this structural dimension of PBC is particularly relevant. Behavioral intention also showed a meaningful direct effect on behavior, confirming that motivational readiness contributes independently to action even when PBC is held constant. Meanwhile, environmental awareness retained a significant direct effect on behavior even after all other constructs were included in the model. Also, a substantial indirect effect was noted, running primarily through attitude and behavioral intention. This partial mediation pattern is consistent with what the CAC framework would predict, where awareness first activates affective and evaluative orientations before these feed into behavioral engagement [9,13,14,41]. These findings reaffirm that awareness is necessary but not sufficient for eco-responsible action, and that the conditions enabling people to act are as consequential as the knowledge driving them to want to.

Among the constructs included in the path analysis, behavioral intention stands out not just as a proximate predictor of behavior but also because of the number of other paths converge to it before moving to behavior. Awareness, attitude, norms, self-efficacy, and even concern all influence behavior partly or fully through intention. According to TPB, intention is the most immediate psychological precursor of behavior, and attitudes, norms, and PBC shape behavior primarily by first shaping intention [17,19]. The analysis confirms this in the Jordanian context, supporting H2. The interesting part is the breadth of intention's mediating role in this context. It is not just attitudes and norms that feed into behavior through intention, but also awareness and self-efficacy. These are constructs that originate in the cognitive and social learning dimensions of the CAC framework and SCT, respectively. This suggests that intention functions as one of the key mediating pathways in the awareness-behavior pathway, drawing together cognitive, affective, and social influences before channeling them toward action. It is important to note that PBC is an exception to this pattern. TPB specifies two distinct pathways for PBC [17,42]. The first operates through intention, reflecting its motivational influence on behavioral readiness. The second is a direct path to behavior, reflecting PBC as a proxy for actual behavioral control. Therefore, the gateway role of intention applies to the motivational antecedents of behavior, namely awareness, attitude, norms, and self-efficacy, rather than to PBC.

In Jordan, this direct PBC-behavior pathway is particularly meaningful. Recycling infrastructure remains limited and unevenly distributed, and waste collection coverage varies significantly between urban and rural areas [36,37], and access to affordable eco-friendly alternatives is constrained by broader economic pressures faced by Jordanian households [26,43]. In such conditions, whether a person actually engages in eco-socially responsible behavior depends less on their willingness and more on whether the physical and economic conditions to act exist in their immediate environment. This pattern has

been documented in other developing countries and MENA contexts, where structural constraints limit individuals' capacity to translate motivation into action, making PBC a more binding constraint than intention [6,44–46]. For program design, interventions that successfully build awareness, strengthen attitudes, reinforce social norms, and develop self-efficacy are only likely to produce behavior change if they are successful in channeling those influences into genuine behavioral intention.

The findings also highlight the importance of norms, self-efficacy, and attitude in the awareness–behavior pathway. They are active carriers of influence that shape how awareness reaches behavior in ways that a simple awareness–behavior model cannot capture. For example, environmental norms played an important role in shaping behavior through intention and PBC. This indicates that social expectations around environmental behavior do not push people directly into action but rather they first shape their motivational readiness and perceived capacity to act [8,47,48]. This is consistent with TPB, which treats subjective norms as antecedents of intention rather than direct drivers of behavior [17,19]. Also, this is in line with the empirical evidence showing that normative pressure tends to influence behavior through its effect on how motivated and capable people feel rather than independently [8,47,48]. Similarly, self-efficacy contributed to behavior both directly and through intention. This is consistent with SCT's proposition that confidence in one's capacity to act is a necessary enabling condition for behavioral engagement [15,16]. Notably, self-efficacy also mediated the relationship between attitude and intention. This indicates that evaluative orientation toward environmental protection translates into motivational readiness partly through building confidence in one's ability to act.

Interestingly, the study found that concern does not lead to behavior directly. Instead, it operated through attitude and norms. This means concern is an active intermediate step that energizes evaluative and normative orientations, which then shape intention and finally, behavior. This contrasts with the empirical studies, which have generally treated concern as a direct predictor of behavior [5,6]. Given that the study findings show that concern contributes to behavior indirectly, studies examining only its direct association with behavior are likely underestimating its role while examining awareness–behavior linkages. Considering concern activates and deepens evaluative and normative orientations rather than triggering action on its own, it belongs to the affective stage of the CAC framework [13,34,49]. For program design, this suggests that building concern among populations is worthwhile, but only when it is accompanied by efforts to strengthen the attitudinal and normative orientations through which concern reaches behavior.

The study is not without limitations. First, data collection via telephone may have introduced coverage bias, as individuals without reliable mobile phone access may have been systematically excluded from the sample. Second, the use of self-reported psychometric scales is subject to social desirability bias, and respondents may have expressed more favorable environmental views than their actual attitudes and behaviors warrant. Third, the study did not conduct a formal assessment of convergent or discriminant validity at the item level. The reliance on composite scores, while appropriate for the path analytic approach adopted here, does not correct for measurement error and precludes examination of average variance extracted or inter-construct discriminant validity. Future studies should consider a full latent variable specification to assess these psychometric properties more rigorously. Fourth, the cross-sectional design of the study means that the pathways identified through path analysis reflect mere statistical associations rather than causal effects. Reverse causation is entirely possible; for example, engaging in eco-socially responsible behavior may itself strengthen environmental awareness over time. Similarly, unmeasured third-variable confounders such as personality traits may account for some of the observed associations. Longitudinal research would be needed to confirm whether

the associations reflect genuine causal effects. Fifth, the global model fit indices fell short of conventional thresholds, with RMSEA at 0.230 and CFI at 0.773, while SRMR at 0.082 marginally exceeded the conventional threshold of 0.08. The elevated RMSEA is partly attributable to the small degrees of freedom, which were only 12 in this study [50]. Also, the TLI (−0.459) should be interpreted with caution, as TLI is a non-normed index whose values can occasionally fall below zero in models with small degrees of freedom and high chi-square penalties [51]. More broadly, fit index cutoffs are rules of thumb rather than absolute standards and should be interpreted flexibly in theoretically constrained models [52]. In this study, paths were excluded on a conceptual basis rather than on empirical grounds, and modification indices suggested that adding paths from norms to behavior and from self-efficacy to intention would improve model fit. However, these were not included as they lack sufficient theoretical grounding within the integrated CAC-SCT-TPB framework. The poor global fit means that the model may not fully capture the empirical structure of the data, and some associations between constructs may be either over- or underestimated. Therefore, conclusions should be interpreted with caution, with greater weight placed on the direction and significance of individual path coefficients than on overall model fit. Future research should explore more flexible model specifications and examine whether paths excluded on theoretical grounds carry empirical significance in the Jordanian context, as this could reveal important deviations between established theoretical expectations and local behavioral realities. Finally, given that it was a telephonic survey, the authors focused on collecting data on a selected number of parameters. However, there could be several other factors that may be contributing to the awareness–behavior relationship but are not captured by this study. Future studies not relying on a telephonic survey should collect information on all possible covariates to strengthen the evidence presented in this study.

Despite these limitations, the findings carry several practical implications for environmental programs in Jordan. First, environmental programs in Jordan should move beyond awareness-raising activities. Environmental protection programs need to adopt a multi-pronged approach that addresses intermediary constructs like attitudes, norms, self-efficacy, and intention. Without addressing these intermediaries, the success of programs may remain limited. Second, beyond addressing motivation and attitude, there is a need for structural investment. Creating the enabling conditions that make responsible action practically feasible will be important for willing individuals to act. Third, there needs to be a deliberate effort to engage people in pro-environmental activities. This could include organizing neighborhood environmental initiatives, community clean-up campaigns, or peer-led recycling programs that give people concrete opportunities to act on their knowledge within their own communities. Fourth, programs need to be adaptive to the context. For example, in rural areas, where concern and self-efficacy are already relatively high but structural enablers are limited, the priority should be on improving access to practical resources. In urban areas, where awareness is higher but normative consensus around environmental action is weaker, strengthening the social dimensions of environmental engagement may be more important. Finally, programs working towards raising environmental concern should treat it as a catalyst that can help build emotional engagement around environmental issues. This means programs need to have interventions that can translate the concerns into an appropriate attitude for individuals to act responsibly.

5. Conclusions

This study advances understanding of how environmental awareness reaches eco-socially responsible behavior among Jordanian adults by mapping the direct and indirect pathways connecting these two endpoints. The findings demonstrate that the awareness–behavior relationship is neither simple nor linear. There are multiple intermediaries,

including attitudes, norms, self-efficacy, intention, and PBC, which play active roles in translating awareness into action. Behavioral intention appeared as the construct through which the largest number of upstream influences converges before reaching behavior, while PBC appeared as the most proximate structural constraint on whether those influences ultimately produce action. Taken together, these findings provide empirical support for the integrated CAC-SCT-TPB framework in the Jordanian context. By identifying the psychological and structural conditions under which environmental awareness translates into eco-socially responsible behavior, the study offers actionable insights for sustainability-oriented programming in Jordan and the broader MENA region.

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Abbreviations

The following abbreviations are used in this manuscript:

CAC	Cognitive–Affective–Conative
CD	Coefficient of Determination
CFI	Comparative Fit Index
JD	Jordanian Dinar
MENA	Middle East and North Africa
OLS	Ordinary Least Square
PBC	Perceived Behavioral Control
RDD	Random Digit Dialing
RMSEA	Root Mean Square Error of Approximation
SCT	Social Cognitive Theory
SD	Standard Deviation
SE	Standard Error
SRMR	Standardized Root Mean-square Residual
TPB	Theory of Planned Behavior
TLI	Tucker–Lewis Index

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