

INSIGHTS TOWARDS THE ENVIRONMENTAL RISK PERCEPTIONS AND BUILT ENVIRONMENTAL BEHAVIORS: GUIDELINES FOR ENVIRONMENTAL GOVERNANCE AND REGULATIONS

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Abstract

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The present study explores Saudi Arabian university students' insights into environmental risk perceptions (*ERPs*) and built environmental behaviors (*BEBs*). Based on the findings of previous studies such as Geng et al. (2015), Islam et al. (2019) and Alnaim et al. (2022) and the dire need for further exploration, the researchers developed the conceptual framework and model for confirmation in the context of Saudi Arabia. The researchers applied a quantitative approach and utilized 248 valid samples to infer the results. The findings of the study reveal a positive and significant effect of environmental protection (*EP*), knowledge of the environment (*KoE*) and environmental values (*EVs*) on *BEBs*. On the other hand, *ERPs* have a negative and insignificant effect on *BEBs*. Furthermore, *ERPs* mediate the relationship between *EP*, *KoE*, *EVs* and *BEBs*. The study findings would assist policymakers and environmental protection agencies in developing *BEBs* among all the country's citizens. Besides, the results of a study would also support individuals in establishing *BEBs* regarding the recycling of restorative materials by avoiding the use of hazardous materials which is harmful to the environment and the healthy lives of human.

Keywords: Environmental Protection, Knowledge of the Environment, Environmental Values, Environmental Risk Perceptions, Built Environmental Behaviors

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1. INTRODUCTION

Currently, almost every country in the world is faced with the most significant environmental challenges regarding climate change. Such challenges include: 1) water security, 2) energy security, 3) biodiversity, 4) food security and 5) many more (Onel & Mukherjee, 2016). These rapidly growing environmental issues and their damaging impacts worldwide signal the urgent need to discover as quickly as possible solutions to the problems caused by human activity (Steg & Vlek, 2009). These problems can be addressed, also, through developing individuals' attitudes and intentions to carry out pro-environmental behaviors (PEBs) along with society's assistance (Nilsson & Küller, 2000; Levine & Strube, 2012; Alnaim et al., 2022). In this regard, environmental protection (EP), knowledge of the environment (KoE), environmental values (EVs) and environmental risk perceptions (ERPs) are valuable factors which improve the PEBs and built environmental behaviors (BEBs).

The existing literature demonstrates that different factors, such as: 1) attitudes, 2) intentions, 3) values and knowledge perceptions, 4) individuals' values, 5) environmental willingness, 6) environmental knowledge, 7) green innovation, 8) green innovation strategy, 9) environmental culture, 10) green creativity, 11) risk behaviors, 12) consumer efficiency, 13) ecological concerns and 14) value orientation (Fraj & Martinez, 2006; Nilsson & Küller, 2000; Acuña-Rivera et al., 2014; Kobal Grum, 2018; Alnaim et al., 2022; Aldoghan et al., 2022; Kim & Lee, 2022) are exert strong predictive powers on PEBs and BEBs. Broadly, EP shows the individuals' interests and great responsibilities in helping to tackle environmental challenges (Tantawi et al., 2007). Likewise, KoE points to the knowledge through which individuals are made aware of the effect of global warming (Onel & Mukherjee, 2016). The EVs help to develop favorable behaviors that protect against harmful effects on the environment (Klerck & Sweeney, 2007; Onel & Mukherjee, 2016). Finally, ERPs are associated with concerns about the damaging impact on the environment caused by the dangerous usage of different pollution apparatus (Onel & Mukherjee, 2016). These factors affect the PEBs.

There are deep-seated environmental issues in Saudi Arabia (Alzubaidi, 2018). However, the Saudi Arabian university students have a positive perception of awareness about environmental issues and they want to achieve a sustainable environment (Khan et al., 2020). Based on this need, the researchers sought answers to the following questions:

RQ1: What roles do EP, KoE and EVs play in developing BEBs?

RQ2: How do ERPs mediate the EP's, KoE's and EVs' relationships with BEBs?

This study's findings aim to support the development of positive and significant individuals' attitudes towards the environment. Hopefully, this study's findings will contribute to overcoming the BEBs issues. Finally, by developing literature in the context of Saudi Arabia this study's findings aim to contribute significantly contribute to the existing literature about the environment.

In addition to the introduction in Section 1, this paper is structured as follows. Section 2 is the literature review and the development of this

study's hypotheses. Section 3 explains the methods employed in this study. Section 4 sets out the data analysis and the results. Section 5 discusses the results. Finally, Section 6 details this study's limitations and recommendations for future research studies, and provides this study's overall conclusion.

2. LITERATURE REVIEW AND DEVELOPMENT OF THE HYPOTHESES

Pro-environmental behaviors are individuals' environmentally friendly behaviors that reduce the maximum environmental damage (Alnaim et al., 2022). PEBs can be developed by reducing energy and resource usage; decreasing waste production; and using non-toxic materials which are dangerous to people's health (Kollmuss & Agyeman, 2002; Wilkinson & Zalejska-Jonsson, 2021). In this aspect, the different scholars offered several factors which affected environmental attitudes and behaviors. However, it is measured by a multi-dimensional factor's contribution rather than based on a single domain or characteristic. For instance, scholars, such as Nilsson and Küller (2000), Polonsky et al. (2012), Luu (2019) and Mukherjee and Chandra (2022) highlight the role of psychological constructs, namely, attitudes, intentions, values and knowledge perceptions which robustly develop PEBs. Moreover, some studies' findings have confirmed the effect of the individuals' values on environmental willingness to behave in an ecologically friendly manner (Fraj & Martinez, 2006). In addition, Nilsson and Küller (2000) and Levine and Strube (2012) have added the positive role of environmental knowledge as the key predictor of behavioral outcomes. According to Alnaim et al. (2022), green innovation strategy, green innovation, and green creativity help to overcome internal and external environmental challenges. Similarly, an organization's environmental culture can develop ecological sustainability and environmental performance (Aldoghan et al., 2022). In this regard, Acuña-Rivera et al. (2014) findings confirm the mediating effect of risk perception between safety and place disorder.

In South Korea, a quantitative assessment has significantly influenced autonomous motivation, self-efficacy, environmental concerns, the generation of green ideas and the promotion of PEBs (Kim & Lee, 2022). These adverse environmental pollution factors, such as high levels of noise, poor air quality and the substandard quality of housing, have created psychological and physiological stress and improved the risk behaviors (Kobal Grum, 2018). According to Wilkinson and Zalejska-Jonsson (2021), limited knowledge has resulted in an inability to connect one's activities to the environmental relevance of those acts and to adopt risk-averse behaviors. In Vietnam, by mediating the employees' environmental engagement, there is a positive association between PEBs and employee behaviors (Luu, 2019). In Hong Kong, students' attitudes towards garbage pricing policies through social norms and lifestyles impact on their PEBs by (Islam et al., 2019). Among Chinese nationals, pro-environmental holiday intentions do not accord with their actual PEBs at home. It is observed that neither PEBs nor pro-environmental intentions change either over time or location (Wu et al., 2021). The constructs, such as perceived consumer efficiency, environmental concerns and value orientation, have had a significant effect on purchase behaviors (Lee et al., 2014). De Groot and

Thøgersen (2018) recognize the importance of values in relation to environmental attitudes and behaviors. Further, environmental concerns imitate both general attitudes towards the environment and personal assessments of environmental issues. The findings of a Taiwanese survey show that individuals' experiences and the impact of media coverage about global warming have had substantial and positive influences on PEBs. Similarly, Bissing-Olson et al.'s (2013) findings demonstrate that the fostering of PEBs, which affect employees, can assist organizations to promote them in the workplace. The usual predictors of environmental behaviors are age, general knowledge and acquired education (Geiger et al., 2019). Islam et al.'s (2019) findings show that, when observing their organization's participation in environment-related social responsibilities, employees, who are highly empathetic, reveal more PEBs and identify more with their organizations.

Consequently, there continues to be significant gaps in the literature, which need to be filled. More specifically, in various contexts and times, there are various factors that directly affect the PEBs (Lee et al., 2014; Geng et al., 2015; Islam et al., 2019; Alnaim et al., 2022). Despite its strong associations with PEBs and EP, KoE and EVs, no previous study has examined the mediating role played by ERPs (Masud et al., 2015; Bradley et al., 2020; Su et al., 2021; Zeng et al., 2022). Moreover, the perceptions of BEBs and their predictors are contextually unseen in Saudi Arabia. To fill these gaps, the researchers developed the model (Figure 1) in support of the existing relationships in the literature and to use it to explore Saudi Arabian students' perceptions about the BEBs.

2.1. Environmental protection and built environmental behaviors

Individuals' connections and their perceptions about EP develop their PEBs (Geng et al., 2015). Educated individuals' PEBs predict a sense of obligation to reduce environmental problems. The associated KoE affects appropriate environmental actions (Janmaimool, 2017). According to Harth et al. (2013), EP enhances the individuals' social responsibilities and pride and leads to PEBs. In other words, there is a significant association between EP and PEBs. Similarly, Stern's (2000) findings show that a positive relationship between behavioral programs and EP meaningfully encourages individuals to protect the environment. There are significant differences and gaps between men and women in terms of the household-level of EP. Compared to men, women engage more frequently in EP and PEBs (Kennedy & Kmec, 2018). According to Abdelwahed et al. (2022), the intention to adopt climate change is a strong predictor of PEBs. The public's knowledge of EP and the deeper their thoughtfulness of the significance of environmental issues directly enhances their adoption of PEBs. This study's findings also show a significant connection between EP awareness and PEBs.

Consequently, by their nature, it is the individual's responsibility to act accordingly when shown the evidence that EP is the significant predictor of PEBs (Geng et al., 2015; Kennedy & Kmec, 2018). However, there is a need to explore further and, more particularly among Saudi Arabian students, the relationship between EP and BEBs.

Therefore, the researchers' formulated the following hypothesis:

H1: EP has a positive and significant association with BEBs.

2.2. Knowledge of environment and built environmental behaviors

Broadly, *knowledge of environment* is understanding the association between human beings and the natural world. It offers the awareness of environment-related issues which presently affect society and a conception of how to classify and solve environmental crises either independently or as a group. Several scholars have identified the association between KoE and environmental behaviors and have made a similar assumption about the effect of diverse knowledge on environmental behaviors (Raymond et al., 2010; Foroughi et al., 2022). These contradictory findings and the resultant effects reveal that one type of knowledge is more significant and leads to PEBs (Afsar et al., 2016). Klerck and Sweeney's (2007) findings provide substantial evidence about the subjective knowledge offering different paradigms with various effects on perceived risk. Similarly, results Alp et al.'s (2008) multiple regression findings give glimpses of the significant and positive impacts of environmental effects, and behavioral intentions as meaningful forecasters of self-reported environmentally friendly behaviors. On the contrary, elementary school students' behaviors toward the environment differ from their KoE issues. In hotels, environmental and social values affect the guests' PEBs. Environmental and social values mediate the relationship between KoE and environmental concerns (Foroughi et al., 2022). The findings of China's General Social Survey demonstrate a strongly positive correlation between KoE and PEBs (Xie & Lu, 2022). Likewise, with the support of green human resource management and KoE, green transformational leadership significantly boosts PEBs (Farrukh et al., 2022).

Consequently, while the existing literature confirms the positive links between KoE and PEBs, it gives little consideration in practical terms to the Saudi Arabian students' perceptions. Therefore, to fill this gap, the researchers formulated the following hypothesis:

H2: KoE has a positive and significant association with BEBs.

2.3. Environmental values and built environmental behaviors

EVs are the most crucial analysis of individuals' attitudes and behaviors toward the environment. Values are associated with the standards that the individuals choose to validate their actions (Fraj & Martinez, 2006). Every individual holds definite values developed by their experiences and learning process. The findings of Mukherjee and Chandra (2022) empirical study show that a predictor of environmental intentions has a greater and more influential impact as when the environmental concern is also the potent factor in predicting the individual's eco-attitudes and intentions. Among modern western societies' consumers, individual constructs, such as identities and values, affect a broader assortment of behaviors. However, in the United Kingdom (UK), identity and values are strong predictors of residents' PEB

(Gatersleben et al., 2014). The biospheric value plays a significantly important role in developing PEBs. The KoE factor is negative in moderating the association between environmental attitudes and pro-social values (Tamar et al., 2021). Internal factors, such as: 1) awareness, 2) pro-environmental knowledge, 3) attitudes, 4) values, 5) priorities, 6) locus of control, 7) emotions and 8) responsibilities affect PEBs (Kollmuss & Agyeman, 2002). The environmental actions gathered during this study reveal the association between environmental actions, personal situations, attitudes, and values.

In summary, the literature demonstrates that EVs influence attitudes and PEBs (Gatersleben et al., 2014; Mukherjee & Chandra, 2022). However, there is little evidence of the mediating role played by ERPs. Therefore, the researchers formulated the following hypothesis:

H3: EVs have a positive and significant association with BEBs.

2.4. Environmental risk perceptions and built environmental behaviors

The risk is seen as a negative aspect to the things which people value in terms of their personal health and safety (Klabi & Binzafrah, 2023). *Environmental risks* (known also as *recognized ecological risks*) are the threats towards productivity and human and natural environmental systems. The perceived environmental risk is an individual's judgment on how the accomplishment of either a specific activity or lifestyle can result in a risk to the environment (Huang et al., 2017). According to Laroche et al. (2001), eco-friendly products are affected by an individual's perceptions of risk to the environment. During the COVID-19 pandemic, factors, such as perceived vulnerability, uncertainties and the perceived risk of COVID-19, affected the entrepreneurs' environmental concerns (Soomro & Shah, 2022).

In summary, the ERPs are the negative perceptions which are commonly observed as the negative predictor that detracts from the PEBs. Therefore, to confirm this, the researchers formulated the following hypothesis:

H4: ERPs have a negative and significant association with BEBs.

2.5. Environmental risk perceptions as a mediator

The ERPs represent the factor which makes the most significant and influential direct and indirect contribution. It either builds on the connection or mediates the association between KoE and PEBs (Klerck & Sweeney, 2007). At the level in those

countries where there is a high perceived environmental risk towards technological prevalence, their environmental awareness is a positive mediator between perceptions of risk and technological diffusion. According to Fernandes and Costa (2023), perceptions of risks for human health and food quality can reduce the positive impact of individuals' attitudes towards risk and can partially mediate the contribution between pesticide expenditure and risk attitude. There is a negative association between perceptions of risk in relation to the COVID-19 pandemic risk and a willingness to help. In comparison, interpersonal alienation mediates the association between perceptions of risk in relation to the COVID-19 pandemic and willingness to help (Zeng et al., 2022). According to Bradley et al. (2020), the factors, such as psychological adaptation, response efficacy and perceptions of risk, play a mediating role when developing the associations between climate change precursors and PEBs among Australian and French residents. In Chinese universities, the association between worldviews of culture and PEBs is mediated by perceived environmental risks (Zeng et al., 2020). According to Zhou et al. (2020), there is a meaningful correlation between perceptions of risk of soil pollution and PEBs. Household income moderates the influence of the perceptions of risk of soil pollution on PEBs. There is a significant correlation between perceptions of risk and behavioral willingness and PEBs. The ERPs and moral anger play a perilous role mediating the contributions to the association between EVs and PEBs (Li et al., 2022). There are positive and significant connections between students' EVs and young adults' PEBs. Constructive hope moderates these relationships (Maartensson & Loi, 2022). According to Masud et al.'s (2015) findings, individuals are more likely to accept PEBs only if they have good acceptance of the opposing effects to no action. Su et al.'s (2021) findings show that through ecological awareness ERPs indirectly affect EP behaviors.

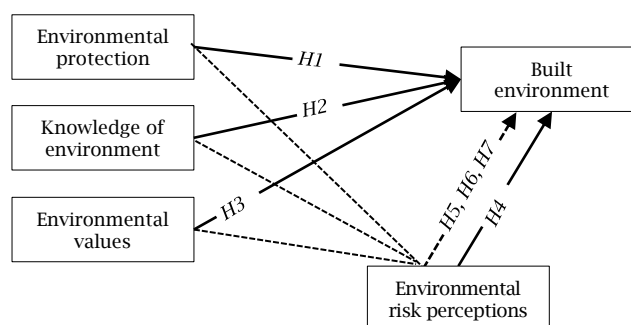
Consequently, previous studies in this domain indicate that ERPs have a negative and direct effect on PEBs. However, in mediation, it may contribute to developing the positive relationship between EP, KoE, EVs and BEBs. Based on this argument, the researchers formulated the following hypotheses:

H5: ERPs mediate the relationship between EP and BEBs.

H6: ERPs mediate the relationship between KoE and BEBs.

H7: ERPs mediate the relationship between EVs and BEBs.

Figure 1. Conceptual model of the study



Note: direct effects →; indirect effects →.

Source: Authors' own conceptualization.

3. METHODS

3.1. Survey strategy and units of analysis

In environmental science, psychology and management, several methods, such as: 1) qualitative, 2) mixed methods and 3) quantitative methods, can be applied to investigate environmental and behavioral issues. In this way, every method has either its pros and cons or chances of bias such as common method bias and response bias. However, the researchers preferred to apply the survey strategy (quantitative approach) since it involved a larger sample and did not need a relatively long time for data collection. In addition, the researchers consulted, also, the authors of previous studies, by such as Lee et al. (2014), Islam et al. (2019), Bradley et al. (2020), Su et al. (2021) and Alnaim et al. (2022), who examined PEBs, BEBs and associated environmental concerns through using quantitative methods.

The researchers selected Saudi Arabian university students since they play a significant role in bringing socio-economic development and well-being to the country (Mi et al., 2023). They intended to achieve normative goals which would lead to PEBs (Chakraborty et al., 2017). The students are those individuals who are always ready to participate in sustainability programs and robust orientations. In Arab countries, students have a high understanding, values, and strong positive attitudes and behaviors towards sustainable development and environmental care (Gheith, 2013). They think the cleanliness of the environment is better for health. In Saudi Arabia, environmental issues are regarded as deep seated and devastating which possibly can be addressed only through the development of PEBs (Alzubaidi, 2018). In this regard, the researchers chose university students due to their increased perception of awareness about environmental issues which lead, ultimately, to a sustainable environment (Khan et al., 2020).

3.2. Survey tools and ways of data collection

The researchers used a questionnaire as a significant means to collect data and sourced the questionnaire from the existing literature. The researchers used English as the language for this questionnaire. The researchers visited the Saudi Arabian universities to obtain the students' perceptions and views about the BEBs through either personal visits or using an online questionnaire which was issued to the participants through either email or WhatsApp groups to obtain their responses. The researchers applied convenience sampling since it was one of the most frequently used sampling procedures in management and social science research. Moreover, this sampling technique is less expensive and there is no need to list all the population elements.

More importantly, the researchers respected the ethics of this study's respondents by informing them about the aim and objectives of this study and how the collected data would be used. Also, the researchers assured the participants of their privacy and the confidentiality of their responses respondents and made them aware of their voluntary feedback. Having obtained their consent to participate

in this study, the researchers sent the questionnaire to the participants. Thereafter, the researchers successfully obtained a sample of 248 valid completed questionnaires.

3.3. Scale reliability and validity

The questionnaire is one of the most extensively applied tools to collect data and, more particularly, in social science and management research. The consistency and accuracy of the questionnaire is a significant feature of a research methodology and is known as validity and reliability. Therefore, any researcher must use carefully a reliable and valid questionnaire. Accordingly, the researchers ensured the reliability of this study's questionnaire through using Cronbach's alpha and loading the items to establish its relationship with their parent variables. We noted that this study's Cronbach's alpha results were above the suggested values (> 0.60) (Hair et al., 2019). In addition, the researchers conducted factor loading to ensure the relationships of the items with their respective factors. In this regard, we noted loading scores greater than 0.70 (Hair et al., 2019) for most items. Moreover, the researchers ensured validity which means measure what is intended to be measured (Field, 2005). The researchers sent the questionnaire to a few university professors to ensure its face validity and content or physical appearance in terms of clearness of language and content. Also, the researchers asked the students for their feedback on any difficulties that they experienced when completing the questionnaire. Consequently, following minor modifications, the researchers distributed a reliable and valid questionnaire to collect the large-scale data.

3.4. Measurement scales

In this study, the following measurement scales were used:

Environmental protection (*EP*) — as adopted from Tantawi et al. (2007), the researchers used five items to measure *EP*. The sample item of the scale is "Everyone is responsible for protecting the environment in their everyday life".

Knowledge of environment (*KoE*) — as adopted from Onel and Mukherjee's (2016) empirical investigation, the researchers used five items to assess *KoE*. The sample item of the scale is "Effect of global warming: polar bears become extinct".

Environmental values (*EVs*) — as adopted from Klerck and Sweeney (2007) and Onel and Mukherjee (2016), the researchers used eight items to evaluate this factor. The sample item of the scale is "Environment affects everyday life".

Environmental risk perceptions (*ERPs*) — as adopted from Onel and Mukherjee (2016), the researchers used seven items to evaluate the *ERPs*. The sample item of the scale is "Industrial air pollution danger to the environment".

Built environmental behaviors (*BEBs*) — as adopted from Onel and Mukherjee (2016), the researchers used six items to measure *BEBs*. The sample item of the scale is "How often do you: Recycle cans and bottles". The researchers gauged all the items by using a five-point Likert scale.

4. ANALYSIS AND RESULTS

4.1. Demography

In total, the researchers received 248 valid questionnaires from this study's respondents. 71.77% ($n=178$) were received from men and 28.23% ($n=70$) were from women. Most respondents were between 21 to 25 years of age 48.39% ($n=120$), 32.26% ($n=80$) were between 26 to 30 years of age, 10.48% were between 15 to 20 years of age and 8.87% were more than 31 years old. Also, 71.77% ($n=178$) of the students were single and 26.21% ($n=65$) were married. Moreover, 58.87% ($n=146$) held bachelor degrees and 39.52% ($n=98$) were masters' students.

Table 1. Demography

Variables	Category	Frequency	Percent
Gender	Male	178	71.77
	Female	70	28.23
	Total	248	100.0
Age (years)	15-20	26	10.48
	21-25	120	48.39
	26-30	80	32.26
	31 and above	22	8.87
	Total	248	100.0
Marital status	Single	178	71.77
	Married	65	26.21
	Widow/divorced	05	2.02
	Total	248	100.0
Education	Bachelors	146	58.87
	Masters	98	39.52
	M.Phi/PhD	04	1.61
	Total	248	100.0
Field of study	Business	38	15.32
	HRM	36	14.52
	Marketing and information system	56	22.58
	Environmental science	76	30.65
	Others	42	16.93
	Total	248	100.0

Finally, in relation to the field of study, most respondents (30.65%/ $n=76$) were from environmental sciences, 22.58% ($n=56$) were enrolled in marketing and information system disciplines, and 16.93% ($n=42$) were from other disciplines including natural and social sciences (see Table 1).

4.2. Measurement model

The researchers applied path analysis through analysis of moment structures (AMOS). Since this is the essential tool and statistical procedure of updated research. This principle is crucial to explaining the fundamental analysis and guide concisely to the readers in a transparent manner. Consequently, this study's measurement model ensured convergent validity and discriminant validity analysis. Initially, the researchers conducted the factor loading to ensure the relevancy and correlations between the items and the representation of their core constructs (Hair et al., 2019). Thereafter, we observed that most variables were above the suggested values (0.70) (Hair et al., 2019). However, three items namely *evs6*, *erps5* and *beb5*, did not have loaded values greater than 0.70 and, therefore, these were excluded to avoid any adverse effect on the results. Also, the researchers ensured excellent composite reliability scores either above 0.50 or between 0.782 (*EP*) and 0.840 (*EVs*) (Hair et al., 2019). Finally, we ensured that the average variance extracted (AVE) values exceeded the standard value of 0.50 and found its values from 0.783 (*KoE*) to 0.866 (*EP*). Finally, the researchers applied Cronbach's α coefficient to test the reliability of items' internal consistency were above 0.60 or higher (Hair et al., 2019). The scores of all this study's constructs were greater than 0.60 (see Table 2).

Table 2. Measurement model

Construct	Item code	Factor loadings	Composite reliability	AVE	α
Environmental protection (<i>EP</i>)	ep1	0.862	0.782	0.866	0.810
	ep2	0.852			
	ep4	0.844			
	ep3	0.840			
	ep5	0.826			
Knowledge of environment (<i>KoE</i>)	koe1	0.889	0.822	0.783	0.861
	koe2	0.880			
	koe3	0.867			
	koe5	0.852			
	koe4	0.811			
Environmental values (<i>EVs</i>)	evs1	0.898	0.840	0.811	0.888
	evs2	0.876			
	evs3	0.866			
	evs5	0.852			
	evs4	0.849			
	evs8	0.831			
Environmental risk perceptions (<i>ERPs</i>)	erps2	0.882	0.800	0.861	0.815
	erps1	0.869			
	erps3	0.856			
	erps4	0.841			
	erps6	0.821			
	erps7	0.812			
Built environmental behaviours (<i>BEBs</i>)	beb1	0.872	0.792	0.791	0.794
	beb2	0.866			
	beb3	0.842			
	beb4	0.833			
	beb6	0.781			

4.3. Structural model

In terms of the structural model, the path analysis found that *EP* had a significant and positive effect on *BEBs* ($CR = 5.021^{***}$; $p < 0.01$). Therefore hypothesis *H1* is accepted. Likewise, the data confirmed the proposed relationship between *KoE* and *BEBs* ($CR = 6.091^{***}$; $p < 0.01$). Therefore,

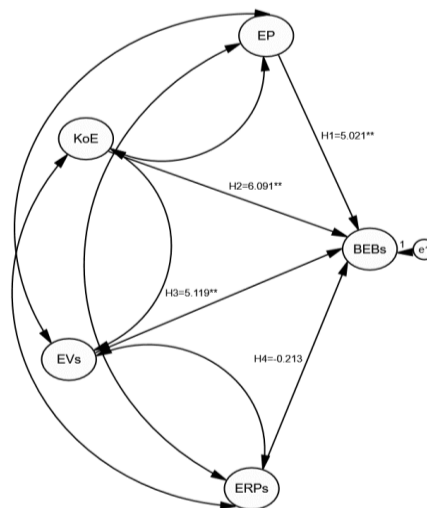
hypothesis *H2* is accepted. Further, the data confirmed that *EVs*' had a positive and predictive effect on *BEBs* ($CR = 5.119^{***}$; $p < 0.01$). Therefore, hypothesis *H3* is accepted. Consistent with expectations, *ERPs* had a negative and insignificant effect on *BEBs* ($CR = -0.213$; $p > 0.01$) Therefore, hypothesis *H4* is accepted (see Table 3 and Figure 2).

Table 3. Path analysis (direct paths)

H. No.	Independent variables	Path	Dependent variable	Estimate	SE	CR	p	Decision
H1	EP	→	BEBs	0.136	0.033	5.021	***	Accepted
H2	KoE	→	BEBs	0.282	0.038	6.091	***	Accepted
H3	EVs	→	BEBs	0.231	0.041	5.119	***	Accepted
H4	ERPs	→	BEBs	-0.021	0.071	-0.213	0.666	Accepted

Note: SE = standard error; CR = critical ratio; p = significance level *** p < 0.05.

Figure 2. Path analysis (direct paths)



Furthermore, the indirect paths indicate *ERPs*' positive and significant mediating role in developing the association between *EP* and *BEBs* ($CR = 4.201^{***}$; $p < 0.01$). Therefore, hypothesis *H5* is accepted. Turning to *ERPs*' mediating role between *KoE* and *BEBs*, the results show that there is positive and significant relationship between them

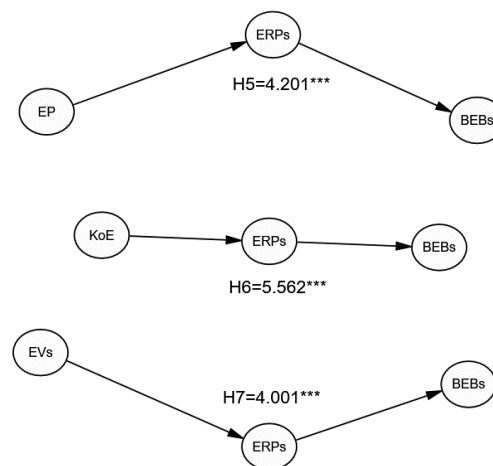
($CR = 5.562^{***}$; $p < 0.01$). Therefore, hypothesis *H6* is accepted. Finally, the mediating paths indicate *ERPs*' positive and crucial indirect role in developing the relationship between *EVs* and *BEBs* ($CR = 4.001^{***}$; $p < 0.01$). Therefore, hypothesis *H7* is accepted (see Table 4 and Figure 3).

Table 4. Indirect paths

H.No.	Independent variables	Path	Mediator	Path	Dependent variable	Estimate	Total effects	SE	CR	p	Decision
H5	EP	→	ERPs	→	BEBs	0.127	0.263	0.029	4.201	***	Accepted
H6	KoE	→	ERPs	→	BEBs	0.251	0.533	0.032	5.562	***	Accepted
H7	EVs	→	ERPs	→	BEBs	0.208	0.439	0.029	4.001	***	Accepted

Note: SE = standard error; CR = critical ratio; p = significance level ***p < 0.05.

Figure 3. Path analysis (indirect paths)



5. DISCUSSION

In this study, the researchers aimed to investigate in the context of Saudi Arabia the university students' insights about ERPs and BEBs. This study's findings that EP has a positive effect on BEBs are consistent with those of previous studies by such as Harth et al. (2013), Geng et al. (2015), Janmaimool (2017) and Abdelwahed et al. (2022). These findings reflect the fact that individuals are willing to contribute to EP due to its significant effects. Students are accountable for protecting the environment in their everyday lives and, more specifically they indicate the importance of all Saudi Arabian citizens recycling their household waste. They must take the initiative to ensure that the damage to the environment does not become an even more serious problem. Their key priority must be to protect and conserve the environment from further damage.

On the one hand, this study's findings confirm the positive connection between KoE and BEBs and are consistent with those of previous studies by Raymond et al. (2010), Afsar et al. (2016), Foroughi et al. (2022) and Farrukh et al. (2022). On the other hand, this study's findings are not supported by Alp et al. (2008) who did not find that KoE had a significant effect on BEBs. Notwithstanding, the students are aware of the devastating impact of global warming and its threat to the survival of animals such as polar bears. They realize, also, that through KoE, individuals can take action to overcome the threats to the environment. In order to achieve such outcomes, KoE helps them to perform constructive behaviors which help to avoid environmental disasters.

Further, this study's analysis confirms that EVs have a positive effect on BEBs. These findings are consistent with those of previous studies by Kollmuss and Agyeman (2002), Gatersleben et al. (2014) and Mukherjee and Chandra (2022). These findings confirm also, that the sampled Saudi Arabian university students are aware of the harmful effects to the environment that they can cause in their daily lives. However, they conceptualize that the environmental threats are somewhat exaggerated and that people are uneasy about too much emphasis being placed on EP to the detriment of Saudi Arabia's economy and in

providing them with jobs. Nevertheless, they hold strong environmental values and are ready to help their communities to overcome the environmental issues through developing positive attitudes to PEBs.

Similarly, as shown by the findings of previous studies by such as Huang et al. (2017), and Soomro and Shah (2022), ERPs have a negative and insignificant impact on BEBs. The negative findings show that the risk factor hinders the students dramatically in having positive attitudes towards BEBs. They consider that car pollution, pesticides and industrial air pollution have the most dangerous impacts on the environment. More particularly, water pollution is harmful to people's health. The rising global temperature is greatly caused by climate change which, ultimately, is destructive to the environment.

Turning to the indirect paths, the analysis confirms that ERPs' play mediating roles between EP and BEBs; KoE and BEBs and EVs and BEBs. This analysis confirms ERPs' positive contributions and is consistent with the findings of previous studies by such as Masud et al. (2015), Su et al. (2021), Li et al. (2022) and Maartensson and Loi (2022). They probably wanted to accept PEBs only if they could demonstrate the benefits as opposed to the effects of taking no action. ERPs' mediating contributions in developing the relationships between EP, KoE and EVs show that students improve their attitudes towards EP when they think seriously about risk aspects to the environment and, then, create positive feelings towards EP. In this regard, the students considered that the open disposal of bottles ought to be banned and that to create BEBs, they ought to recycle their rubbish and avoid purchasing bags for their daily accessories. More importantly, to protect the environment, they believed that water had to be saved and fuel consumption reduced by driving less.

6. CONCLUSION

The limitation of this study is that the researchers used only a questionnaire to collect the cross-sectional data and applied limited predictors (PE, KoE, EVs and ERPs) and a criterion variable (BEBs) in arriving at its findings. The researchers limited this study to examining only the role played by ERPs as mediators and predictors of BEBs and did not consider ERPs' other

associations with EP, KoE and EVs. Finally, the researchers based this study's findings on the constructs rather than a particular theory and only on a sample of 248 validated responses to the questionnaire.

In these circumstances, the researchers recommend that future studies use a larger sample size to investigate more fully the same phenomenon. In this regard, the researchers recommend that future studies consider the factors such as environmental motivation, environmental intentions and attitudes, personal assessment of the environment, and the role of pollution in damaging the environment. In addition, the researchers recommend that future researchers consider the theory of planned behavior (TPB), the theory of reasoned action (TRA), and other environmental and attitude theories and that their investigations be extended to include the perceptions of other students in medical colleges and schools rather than universities.

This study's overall findings demonstrate that EP, KoE and EVs have a positive and significant effect on BEBs. On the other hand, ERPs have a negative and insignificant impact on BEBs. Moreover, the findings shows that ERPs play a positive mediating role in developing among Saudi Arabian university students the associations between EP, KoE and EVs with BEBs.

This study's findings support policymakers and planners in developing PEBs to protect the environment. These findings study help to do so through highlighting the need to develop positive attitudes and intentions towards adopting friendly PEBs. These findings help, also, to create responsibilities among individuals to care for their environment by adopting behaviors to recycle household waste and, thereby, help to reduce the damage to the environment which is a serious problem. Finally, the study findings would offer significant contributions to the environment and management literature with glimpses of empirical evidence.

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