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Understanding the drivers of a pro-environmental attitude in higher education institutions: the interplay between knowledge, consciousness, and social influence

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Academicians with a pro-environmental attitude can play a pivotal role in developing curricula and new programs aimed at education for sustainable development. Therefore, it is of utmost importance to identify the factors that influence academicians' positive attitude toward the environment. This study attempts to investigate the effects of environmental consciousness, environmental knowledge, and biospheric values, as well as the moderating effects of social influence, on the attitude toward the environment among the faculty members of higher education institutions (HIEs) in Southern Pakistan. The data were collected from six universities in the district of Vehari, Punjab, Pakistan. After checking for reliability and validity, the study used the structural equation modeling technique to examine the aforementioned association. The results reveal that environmental consciousness and biospheric values significantly influence the attitude of faculty members toward the environment. Furthermore, social influence positively moderates the relationship only between biospheric values and attitudes toward the environment. Overall, this study contributes original insights into the factors influencing pro-environmental attitudes among faculty in a specific cultural and educational context. Its findings can inform targeted strategies to enhance environmental education and engagement in higher education, making it a valuable addition to the literature on education for sustainable development. The findings could guide policymakers of higher education institutions in promoting a pro-environmental attitude among faculty members by implementing awareness programs that increase environmental consciousness and integrate biospheric values into their core mission. Furthermore, HEIs should also establish "green teams" to induce a positive environmental attitude through social influence.

KEYWORDS

higher education institutions, environmental consciousness, environmental knowledge, biospheric values, attitude toward the environment, social influence, sustainable development

1 Introduction

The concept of Education for Sustainable Development (ESD) emerged between 1990 and 2000 (Acosta-Castellanos et al., 2024), and it was founded on the sustainable development model presented by the United Nations (UN) on 4 August 1987. ESD is defined as "the process of equipping students with the knowledge, understanding, skills, and necessary attributes to work and live in a way that safeguards environmental, social, and economic well-being" (Longhurst et al., 2014). The basic aim of ESD is to address the environmental challenges caused by human activities and promote a sustainable future for coming generations through education (Marouli and Duroy, 2019; Rendón López et al., 2018). Furthermore, in 2014, 17 Sustainable Development Goals (SDGs) were announced by the UN (Biasi et al., 2019). The fourth goal of quality education states that "all students acquire knowledge and skills necessary to promote sustainable development" (Elmassah et al., 2022). In this sense, it has become the core responsibility of higher education institution (HEI) teachers to develop curricula and new programs in line with the concept of SDGs. Environmental education is deemed essential for enhancing pro-environmental behavior and effectively preserving the natural environment (Fortner and Teates, 1980; Michelsen and Fischer, 2017). Comprehending Pakistan's complex environment, a nation confronting numerous environmental challenges, aids in delineating the arduous path that lies ahead. The notion of environmental sustainability is at its nascent stage of comprehension in Pakistan, with most individuals failing to adopt practices for environmental protection and preservation.

Pakistan, an emerging economy, is among the top 10 countries that are prone to environmental catastrophes as a result of global warming (Siddiqui, 2022). Out of 118 economies, it has also been classified as the second-most polluted country in the world (Rasool et al., 2021). Furthermore, 10,000 recorded deaths have been attributed to environmental disasters, and 173 extreme weather occurrences have cost the nation more than USD 4 billion in lost revenue (Siddiqui, 2022). The amount of solid trash that Pakistan produces each year is estimated to be 20 million tons, and it is increasing by 2.4% annually. In the absence of sufficient trash collection and disposal, the majority of this waste is burned or is allowed to decay in dumps, which are typically located in cities. According to the data, more than 90% of polluted industrial and city waste is discarded into the ocean. Recycling and ecologically friendly solid waste management are rarely taken into consideration, even though rubbish collection is occasionally given priority on the national agenda as a result of poor governance. The climate difficulties facing Pakistan have been identified by the US Institute of Peace as a threat to national security that calls for immediate action from the government, businesses, and consumers, indicating that the situation appears dire. Furthermore, economic and industrial development provides many benefits to human life, but it also creates difficulties such as air pollution, water pollution, and climate change. These difficulties affect the environment, society, and economic growth, yet research indicates that over the past two decades, affluent economies have made significant progress toward addressing environmental change (Nozari et al., 2021). However, an important gap between environmental issues and environmental adaptability has been observed in growing economies (Hameed et al., 2019). This gap is frequently attributed to the limited understanding of the population regarding environmental changes (Ikeme, 2003), and the lack of commitment by the HEIs to emphasize mounting environmental degradation issues in the curricula (Habib et al., 2021).

Therefore, the present research concentrates on the academicians of HEIs since they are seen to be influential in encouraging students to adopt green practices by imparting knowledge about environment-friendly items that both normalize and protect the environment. These students can play a pivotal role in establishing eco-friendly mechanisms and practices in the industries where they will find employment after graduation. However, prior research has overly focused on the collaboration of consumers and marketers to reduce pollution and environmental destruction (Nozari et al., 2021). Others have analyzed the impact of environmental knowledge, consciousness, and values mainly on green purchase intentions (Chanda et al., 2024; Li et al., 2021; Sherwani et al., 2021; Zaremohzzabieh et al., 2021). Zsóka et al. (2013) investigated the association between environmental education, environmental knowledge, attitudes, and self-reported behaviors among university and high school students. The study by García-Salirrosas et al. (2024) demonstrates that environmental awareness positively influences attitudes and perceived behavioral control. However, there is a serious lack of research on how these factors influence the positive attitude of the academicians of HEIs toward the environment in an environmentally prone country. Pakistan is confronted with significant environmental challenges, including severe air and water pollution, deforestation, and heightened vulnerability to the impacts of climate change. Understanding how academics perceive and engage with these environmental issues is essential for fostering a culture of sustainability within higher education, which, in turn, can influence future generations. Academics play a critical role in shaping public opinion and policy through their research, teaching, and community engagement. By systematically examining faculty attitudes toward the environment (ATE), this study aims to elucidate how faculty members can effectively serve as advocates for environmental stewardship, thereby exerting a positive influence on their students and the broader community. This exploration is vital for developing strategies that promote sustainability and enhance the role of higher education in addressing pressing environmental concerns. The present study attempts to fill this gap in the literature in the context of Pakistan, where awareness about climate change is still in its infancy. More precisely, the purpose of this study is to analyze the impacts of EK, EC, and BV, as well as the moderating effects of SI, on the attitude toward the environment among the faculty members of higher education institutions in Pakistan using the value-belief-norm theory and the theory of the planned behavior model. This is the first study that uses social influence as a moderator between environmental knowledge, environmental consciousness, biospheric values, and ATE. Bertossi and Marangon (2022) contributes to the scientific literature by highlighting the pivotal function of higher education institutions (HEIs) in promoting sustainable development through the encouragement of pro-environmental behaviors among students, but this research contributes to the literature by focusing on the academicians of HEIs toward the environment.

This study will contribute to the existing body of literature in several ways. First, it adds to the growing debate on sustainability transformation in higher education institutions in emerging economies. This will help developing economies to align their educational policy with ESD. Second, our paper enriches the growing literature on the determinants of positive attitude toward the environment. This attitude will not only help us build a responsible society but also save trillions of dollars through conserving natural landscapes and water resources. Third, students tend to apply the standards and values imparted by their teachers, which will help them make eco-friendly decisions in their practical lives. We also extended the horizon of research on ESD by examining the role of different individual and social indicators in shaping the pro-environmental attitudes of the key players (i.e., academicians) of HEIs. Finally, this research provides theoretical guidance on how HEI policymakers can develop an eco-friendly attitude among their employees.

2 Theory, literature review, and hypothesis development

2.1 Theoretical underpinning

Stern et al. (1999) developed the value-belief-norm (VBN) theory to explain how human values impact behavior in an environmentalist setting. This theory proposes a causal chain of linkages between values, beliefs, norms, and behaviors (Choi et al., 2015; Stern, 2000b; Stern et al., 1999). By serving as a trigger for the activation of personal norms toward pro-environmental behavior, environmental knowledge can reinforce ideas about environmental issues. Environmental consciousness fosters good attitudes and, eventually, pro-environmental behavior by reinforcing beliefs about the effects on the environment and one's own duty. Importantly, people with strong biospheric values are likely to sense a moral need to preserve the environment. Stern et al. (1999) mentioned how beliefs about environmental risks are shaped by values, especially biospheric values. These ideas then trigger individual norms that result in actions to benefit the environment.

The theory of planned behavior (TPB) is the addition of the theory of reasoned action (TRA) (Schiffman et al., 2010). According to the theory of planned behavior (TPB), individuals' behavioral intentions are influenced by three key factors, namely, their attitudes toward the behavior, subjective norms, and perceived behavioral control (Ajzen and Fishbein, 2001). TPB is an attitude mold used to check links between individuals' beliefs and societal standards of their ecological procurement (Khare, 2015). In many studies on green intentions, TPB is utilized as an interpreter (Ko and Jin, 2017; Paul et al., 2016; Yadav and Pathak, 2017). Scalco et al. (2017) showed that TPB is a strong representation to describe personal behavior toward eco-friendly products. TRA was developed to anticipate the intentions in the sectors of green marketing, for instance, reusing behaviors (Davies et al., 2002) and environmentally friendly products (Ha and Janda, 2012; Sparks and Shepherd, 1992; Wahid et al., 2011). Han et al. (2010) mentioned that TPB is authorized to study the impact of individual factors, non-volitional factors, and the public environment on attitude and intentions. Many studies utilized TPB to explore environmental knowledge and concerns (Maichum et al., 2016). Furthermore, TPB also includes subjective norms, which represent the influence of others (e.g., social influence) on an individual's actions. Therefore, TPB serves as the basis for studying teacher's attitudes regarding the environment.

2.2 Environmental knowledge and attitude toward the environment

Blackwell et al. (2006) highlighted that an individual's attitude is a negative or positive belief, action, or behavior, which, in turn, influences their actions or behaviors. If people know the reason and effect of their actions on the environment, their knowledge intensity will enhance and will encourage a positive attitude toward the environment (Cox, 2008; D'Souza et al., 2006). Teachers are considered the most influential in educating youth—the leaders of tomorrow—to protect the environment. Higher education institutions are social entities responsible for educating future leaders who possess the necessary abilities and skills to tackle societal issues (Menon and Suresh, 2022). HEIs can significantly contribute to achieving sustainable development as they can function as "change agents" and "co-creators for sustainability" (Peer and Stoeglehner, 2013; Stephens et al., 2008; Trencher et al., 2014). Thus, they should also have good knowledge about the environment and demonstrate pro-environmental behavior and attitude to integrate the concept of ESD into their teaching methodology (Esa, 2010). Many studies used environmental knowledge as an interpreter of eco-friendly attitudes and intentions. Environmental knowledge and attitude toward environmental products are interlinked (Yadav and Pathak, 2016). EK and attitude toward the environment mutually reinforce each other (Bamberg et al., 2003). Barber et al. (2009) emphasized that attitudes toward the environment tend to shift favorably as environmental knowledge develops. Consumers' attitudes toward eco-friendly products can also change as they acquire new information about these items (Polonsky et al., 2012). Additionally, students and teachers who have taken courses on sustainable development exhibit significantly more positive attitudes toward sustainability (Nousheen et al., 2020). Environmental knowledge, motivation (Vicente-Molina et al., 2013), intellective information, and values play a crucial role in shaping green attitudes and promoting the adoption of environmentally responsible behaviors (Schneiderhan-Opel and Bogner, 2020). Yadav and Pathak (2016a) examined the positive impact of environmental knowledge on attitudes toward green products. Consistent with this study, previous studies, such as Kaiser and Gutscher (2003), have concluded that environmental knowledge positively influences environmental attitudes. According to Rios et al., (2006), Lee (2008a), Kaiser and Gutscher (2003), Huang et al. (2014), individuals with greater knowledge and concern for the environment tend to have a positive attitude toward eco-friendly products. Therefore, based on these findings, we hypothesize the following:

H1: Teachers' EK has a positive impact on their attitude toward the environment.

2.3 Environmental consciousness and attitude toward the environment

Environmental consciousness is an important part that is related to knowledge and ideas about emotional values, behaviors, and beliefs about environmental protection (Shagun et al., 1994). Environmental consciousness explains that people are aware of their environmental troubles and their willingness to resolve and deal with these troubles (Alibeli and Johnson, 2009). The issue of environmental consciousness is rarely studied in the context of teachers and HEIs in Pakistan. Habib et al. (2021) showed that sustainability in Pakistan's higher education institutions is in its infancy. According to Kalsoom et al. (2017), pre-service teachers in Pakistan demonstrated lower levels of sustainability consciousness than those in Swedish upper secondary pupils. However, a bunch of studies are available from the perspective of consumer green purchase intentions (Alsmadi, 2007; Kim and Seock, 2009). Environmentally conscious individuals are more likely to utilize green items (Hu et al., 2010; DiPietro and Gregory, 2012).

Numerous researchers have established a positive relationship between environmental consciousness and the intention to take pro-environmental actions (Chen and Peng, 2012; Schwepker Jr and Cornwell, 1991; Walker, 2013; Wang et al., 2014). Jamanti (2014) suggests that environmental consciousness is associated with changes in beliefs, attitudes, and intentions, which contribute to environmental improvement. Previous studies have also found a positive relationship between environmental consciousness (EC) and individuals' attitudes toward ecological products (Mishal et al., 2017). Individuals with a strong sense of environmental consciousness are more likely to have higher intentions to preserve the natural world (Dhandra, 2019). Law et al. (2017) and Verplanken (2018) demonstrated that environmental consciousness fosters positive environmental attitudes and strengthens the intention to use eco-friendly products. Moreover, environmental consciousness has been shown to positively influence both attitudes and intentions (Salam et al., 2021). Based on these findings, we hypothesize the following:

H2: Teachers' environmental consciousness has a positive impact on their attitude toward the environment.

2.4 Biospheric values and attitude toward the environment

According to Bhattacharyya and Rahman (2020), values are considered key determinants in forecasting and explaining various variables, such as attitudes and behavioral intentions. Biospheric values, in particular, offer a more nuanced perspective on individuals' views toward the natural environment (Lee et al., 2013). These values emphasize environmental superiority, contributing to individual wellbeing (Nguyen et al., 2016). Individuals with higher biospheric values are more concerned about the benefits of the environment and natural resources (Ateş, 2020; Kim and Koo, 2020), and they often identify as pro-environmental (Hughner et al., 2007). Those with a biospheric value orientation tend to prioritize the intrinsic value of nature and the environment (Gkargkavouzi et al., 2019). Moreover, biospheric values are positively correlated with green attitudes (Steg et al., 2014). Stern et al. (1993) suggested that the value orientation model emphasizes the influence of environmental values, particularly biospheric values, on attitudes toward the environment. Lee and Jan (2015) mentioned that biospheric values can significantly shape responsible environmental behavior. Additionally, biospheric values directly influence the development of individuals' pro-environmental attitudes (Stern et al., 1998). Rahman and Reynolds (2019) found that biospheric values, along with attitudes toward the environment, can predict individuals' patronage intentions. Several studies have identified biospheric values as a primary predictor of attitudes toward the environment (Dietz et al., 1998). Hansla et al. (2008) asserted that biospheric values, as part of environmental concerns, directly influence decision-making through attitudes. Individuals who hold values emphasizing human unity, especially those with a biospheric value orientation, are more likely to adopt positive attitudes toward environmental safety efforts (Kempton et al.,1996). Biospheric values also mediate the relationship between attitudes and eco-friendly behavior (Martin and Czellar, 2017). According to Steg and De Groot (2012), biospheric values may serve as a predictor for eco-friendly product preferences, sustainable behavior, intentions, and environment-related norms. Based on these insights, we hypothesize the following:

H3: Teachers' BV has a positive impact on their attitude toward the environment.

2.5 Moderating role of social influence

Social influence (SI) refers to the changes in an individual's attitudes and behaviors as a result of the influence of others around them (Delamater and Myers, 2010). SI occurs when individuals modify their opinions, thought processes, or actions in response to social pressures or their environment (Turner, 1991). It alters perspectives and behaviors to align with those of a broader social group (Chen-Yu and Seock, 2002). SI has been identified as a significant factor in shaping green behavior among university students (Irawan and Darmayanti, 2012) and is considered a substitute for subjective norms (Wahid et al., 2011). Studies by Salazar et al. (2013) and Costa et al. (2014) in advanced countries, with their distinct cultural contexts, highlighted the significant role of SI in influencing green behavior. Lee (2008b) argued that SI is a key factor in shaping green purchase intentions. It is expected that if educators are knowledgeable about the environment, their attitudes toward it will be positive, and this relationship will be further strengthened if individuals in their social circle also encourage environmentally friendly behaviors. People tend to adjust their environmental attitudes based on societal opinions. Therefore, we hypothesize the following:

H4: Social influence will positively moderate the relationship between teachers' EK and ATE.

Hoyer and MacInnis (2004) established that the behavior of people is affected by their feelings and thoughts. In Western countries, different researchers have studied the relationship between environmental consciousness and attitude toward the environment (Roberts and Bacon, 1997; Van Liere and Dunlap, 1981). Teachers as role models have a positive influence on the pro-environmental behavior of students (Liang et al., 2022). Society often expects teachers to be role models in promoting environmental awareness. Furthermore, environmentally conscious parents also exert pressure on educators to equip their children with environmental knowledge. Therefore, it is expected that, if

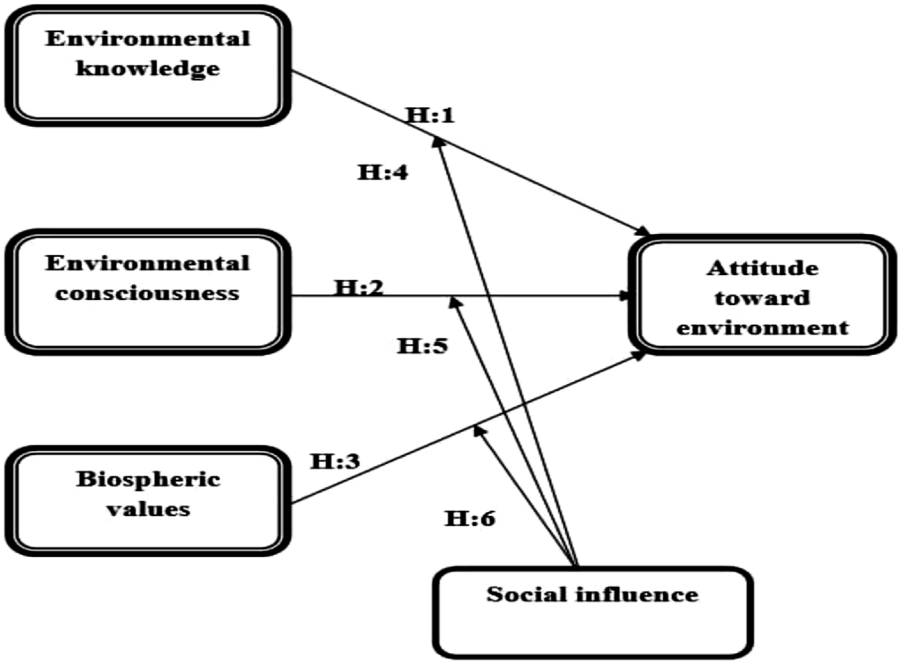

FIGURE 1
Conceptual framework.

teachers are conscious of the environment, they will be more alert regarding the effects of their doings on the environment, and the opinion of other parents/society will strengthen this relationship. Thus, we built the following hypothesis:

H5: Social influence will strengthen the relationship between teachers' EC and ATE.

Biospheric values are essential in motivating eco-friendly beliefs, norms, and behaviors. BV highlights the inherent value of the natural world and the environment. Values, beliefs, attitudes, or norms change with time (Feather, 1995). These values, beliefs, and norms affect the attitudes and behavior of individuals (Nordlund and Garvill, 2003). Many studies have found that values influence behavior, attitude, and motivation (Howell and Allen, 2019), and it also affects attitudes and actions toward the environment (Stern, 2000a). Human attitude toward the environment is strongly affected by values (Liu and Chen, 2020). Therefore, it is expected that people having higher BV will have a positive attitude toward the environment, and this relationship will be strengthened by social influence if the opinion of other people and society also encourages green behavior. The following hypothesis has been developed:

H6: Social influence will positively moderate the relationship between teachers' BV and ATE.

3 Methodology

3.1 Research design

The data for this study were collected through questionnaires. A causal research design was employed to test the hypotheses involving independent, moderator, and dependent variables. Questionnaires were distributed to the target respondents both in person and online. The conceptual framework of the study is presented in Figure 1.

3.2 Procedures

The target population of this study was university teachers of the Vehari district, Pakistan. Respondents are teachers of COMSATS University Islamabad, Vehari campus (CUI, Vehari campus), University of Education Vehari Campus (UE, Vehari campus), Bahaudin Zakariya University, Vehari Campus (BZU, Vehari campus), Virtual University Vehari campus (VU, Vehari campus), University of Agriculture Faisalabad, Burewala Campus (UAF, Burewala campus), and PMAS Arid Agriculture University Burewala Campus (PMAS, Burewala campus). Stratified random sampling—employed in current research—is competent in cost and time (Guthrie, 2010). According to Huysamen (1994), stratified random sampling is a valuable instrument in research. In this study, six strata are formed. Samples are drawn from each stratum according to the whole strength of teachers in each university. The study used the sample size formula by Hair et al. (2014) (28 × 10). According to Hair et al. (2014), the sample size of this study is 280. However, 420 respondents were selected for the study, which is adequate for data analysis.

3.3 Measures

The first independent variable, environmental knowledge, is measured through a questionnaire with five items adopted from

TABLE 1 Respondent demographics (N = 350).

Measure	Category	Frequency	Percentage
Gender	Male	198	56.6
	Female	152	43.4
Age	25–30	59	16.9
	31–40	197	56.3
	41–50	75	21.4
	51 or above	19	5.4
Qualification	MS/M.Phil	205	58.6
	PhD	145	41.4
Job scale	Research associates	123	35.1
	Lecturer	212	60.6
	Assistant professor	15	4.3
Institution	CUI, Vehari campus	130	37.1
	UE, Vehari campus	59	16.9
	BZU, Vehari campus	25	7.1
	VU, Vehari campus	64	18.3
	UAF, Burewala campus	34	9.7
	PMAS, Burewala campus	38	10.9

Fryxell and Lo (2003). The second independent variable, environmental consciousness, measured using a questionnaire with ten items, is adopted from Alsmadi (2007), and the third independent variable, biospheric values, is measured with four items taken from Steg et al. (2014). The dependent variable, an attitude toward the environment questionnaire with three items, is opted from Lee (2011). The social influence is measured with three items adopted from Armitage and Conner (1999). The participants' answer to each item is measured on a 5-point Likert scale. According to Zikmund et al. (2003), "1" is equal to strongly disagree and "5" is equal to strongly agree.

3.4 Data analysis

The quantitative technique for data analysis is used in this study. SPSS software is used for the descriptive statistics, whereas SmartPLS-3 is used for the structural equation model and analysis of the measurement model. The structural model has two sub-models, namely, the inner model, which describes the association between independent and dependent variables, while the outer model describes the association among variables and their items. SmartPLS in functional research is used for structural models when respondents are finite and the distribution of data is slanted (Wong, 2011). SmartPLS also represents an algorithm to calculate regression models and bootstrapping to calculate the statistical significance of data. All these features make SmartPLS the best fit for the current study.

4 Empirical results

4.1 Respondents' demographics

We contacted almost 420 respondents, out of which 378 answers were returned. After excluding missing and

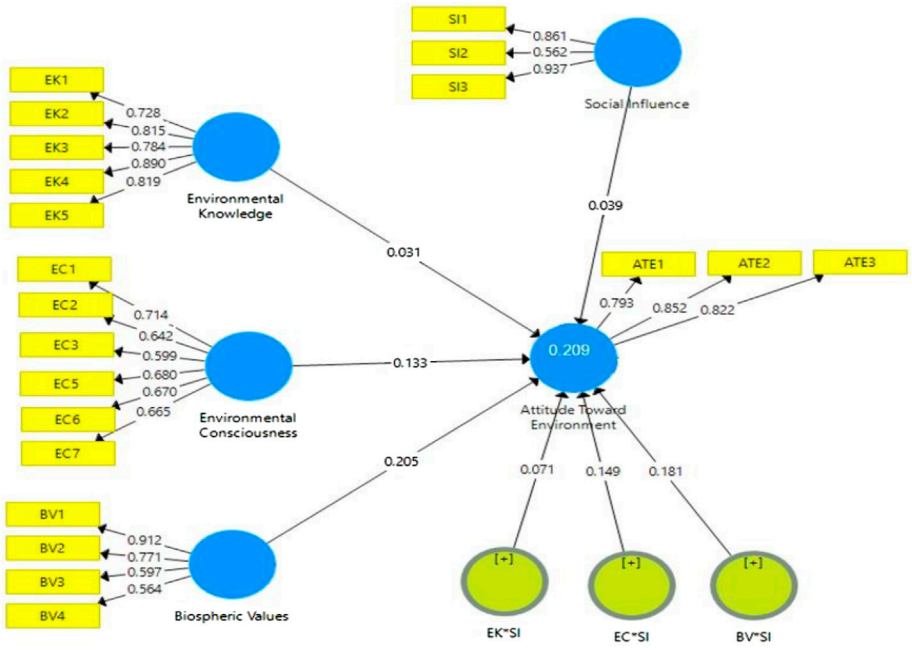

FIGURE 2
Measurement model.

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TABLE 2 Outer loadings, reliability analysis, and AVE.

Construct	Item	Loading	CR	Cronbach's alpha	AVE
Environmental knowledge	EK1	0.726	0.904	0.870	0.655
	EK2	0.816			
	EK3	0.784			
	EK4	0.889			
	EK5	0.821			
Environmental consciousness	EC1	0.715	0.824	0.784	0.523
	EC2	0.640			
	EC3	0.594			
	EC4	0.681			
	EC5	0.670			
	EC6	0.666			
Biospheric values	BV1	0.915	0.808	0.776	0.522
	BV2	0.768			
	BV3	0.590			
	BV4	0.560			
Attitude toward environment	ATE1	0.810	0.863	0.761	0.677
	ATE2	0.843			
	ATE3	0.815			
	GPI2	0.871			
	GPI3	0.802			
Social influence	SI1	0.860	0.840	0.766	0.646
	SI2	0.566			
	SI3	0.937			

TABLE 3 Fornell–larcker criterion.

	Attitude toward environment	Biospheric value	Environmental consciousness	Environmental knowledge	Social influence
Attitude toward environment	**0.823**				
Biospheric values	0.251	**0.723**			
Environmental consciousness	0.201	0.178	**0.662**		
Environmental knowledge	0.114	0.150	0.368	**0.809**	
Social influence	0.093	0.137	0.056	0.065	**0.804**

Note: The bold values represent the square root of average variance extracted.

outliers, the current study considered 350 valid responses. Demographic information provided in Table 1 shows that 198 respondents are male and 152 are female respondents. The ages of respondents were from 25 to 30 years for 59 respondents, which is (16.9%), 31–40 years for 197 respondents, which is (56.3%), 41–50 years for 75 respondents, which is (21.4%), and 50 or above years for 19 respondents, which is (5.4%). Approximately 58% of the respondents were qualified MS/M. Phil, 41% of the respondents were qualified for Ph.D., 60% of the respondents

TABLE 4 Multicollinearity (inner VIF) results.

	ATE
EK	1.169
EC	1.178
BV	1.058
ATE	1.000
SI	1.022

were lecturers, 35% of the respondents were assistant professors, and 4% were research associates. In total, 37% of the respondents were from CUI Vehari, 16% of the respondents were from the University of Education, Vehari, 7% of the respondents were from BZU Vehari, 18% of the respondents were from VU Vehari, 9% of the respondents were from UAF Burewala, and 10% of the respondents were from PMAS AAU Burewala.

4.2 Measurement model

As shown in Figure 2, the measurement model determines reflective and formative measurement. The reflective measurement evaluates construct reliability and validity. A validity test is used to check the correctness of items through SmartPLS. Convergent and discriminant validity are used to evaluate validity. Furthermore, unlike traditional regression techniques, the structural equation modeling (SEM) technique can examine direct, indirect, and mediating effects, making it ideal for testing intricate causal relationships. It is particularly useful when dealing with latent variables, such as attitudes or motivations, as it estimates their relationships with observed variables. Additionally, SEM provides a comprehensive approach by assessing both measurement and structural models together, ensuring robust results. Therefore, the current study employed SEM as its core statistical methodology to examine the proposed association.

4.2.1 Reliability analysis

The SmartPLS algorithm is used to evaluate the composite reliability (Holland & Light) of the construct. Cronbach's alpha value must be larger than 0.7 (Litwin, 1995), as must the CR of all constructs (Hair et al., 2011), so the result value of six variables shows high internal consistency and reliability. According to Nitzl (2010) and Fuchs (2011), Cronbach's alpha must be 0.7 or higher. According to Götz et al. (2010), the reliability of all indicators is checked through the factor loading of each item in the construct. The indicator reliability of individual items is represented via outer loading.

Table 2 represents that the outer loading value of all items is higher than 0.5, except for four items of environmental consciousness, because outer loading values are less than 0.5. Researchers concluded that items with a loading value of 0.5 are acceptable, while those less than 0.5 are not acceptable and should be removed (Chin, 1998; Hair et al., 2010b). SmartPLS is used to check the factor loading values of all indicators of the model. The factor loading value of 0.4 is acceptable (Holland and Light, 1999), and loading values between 0.4 and 0.7 of items must be assessed before removing (Ringle and Sinkovics, 2009).

4.2.2 Convergent validity

Convergent validity highlighted how intimately scale is related to other variables and measures of equivalent construct. The outer loading values of items and average variance extracted (Zafar et al., 2019) technique were used to assess the similarity of the construct. High outer loading values of declared indicators have high reliability. The outer loading values of all items are higher than 0.5, with the exception of four items of environmental consciousness, which have outer loading values less than 0.5. Convergent validity is represented by the AVE of variables (Fornell and Larcker, 1981). The average variance extracted value of the construct must be higher than 0.5. Table 2 presents all AVE values that are higher than 0.5.

4.2.3 Discriminant validity

Fornell and Larcker (1981) measured discriminant validity via associating the square root of AVE of construct correlation. The AVE square root of the construct should be high in construct correlation (Fornell and Larcker, 1981). Table 3 represents square root values in a diagonal way of construct that meets the requirement.

4.3 Structural equation model

The structural models illustrate the relationship between the independent and dependent variables. According to Urban and Mayerl (2013), it provides an opportunity to test the hypotheses and also illustrates fundamental apparatus if the model does not completely fail. It helps make a decision regarding the acceptance or

TABLE 5 Hypothesis testing.

Hypotheses of the study	Path coefficient	T-statistics (|O/STDEV|)	*P*-value	Decision
EK -> ATE	0.031	0.677	0.490	Not supported
EC-> ATE	0.133	2.322	0.014	Supported
BV ->ATE	0.205	4.615	0.000	Supported
EK*SI ->ATE	0.071	0.959	0.312	Not supported
EC*SI ->ATE	0.149	0.928	0.356	Not supported
BV*SI ->ATE	0.181	3.056	0.002	Supported

rejection of the hypotheses. The multicollinearity, t-value, *p*-values, and path coefficients were completed, and these results are presented in Tables 4, 5, respectively.

4.3.1 Multicollinearity

Multicollinearity is recognized through the assessment of VIF (Hair et al., 2010a). Multicollinearity occurs when independent variables are associated with the model. According to Hair et al. (2011), the value of VIF must be less than 5.0. Table 4 shows that the VIF values are less than 5.0, indicating that there is no evidence of multicollinearity among independent variables.

4.3.2 PLS measurement results for the inner model

Table 5 provides the results of all the hypotheses of the study. Path coefficient values were tested through the SmartPLS algorithm function, whereas t-values were tested through the SmartPLS bootstrapping function. The table signifies the assessment of SmartPLS results. Path coefficient has values between +1 and −1, with +1 indicating a strong positive relationship, −1 indicating a strong negative relationship, and 0 indicating a weaker relationship. *p*-values and t-statistics were evaluated for significant levels.

4.3.3 Hypothesis testing and results

The SmartPLS bootstrapping technique is used to estimate the t-values that conclude the significance of the relationship between the variables. Table 5 shows that environmental knowledge (t-value = 0.677, *p*-value = 0.490, and r = 0.031) does not have a significant impact on the attitude toward the environment. Environmental consciousness (t-value = 2.322, *p*-value = 0.014, and r = 0.133) has a positive and significant impact on the attitude toward the environment. Biospheric values ($p < 0.01$) have a positive and significant impact on the attitude toward the environment. Social influence (t- value = 0.959, *p*-value = 0.312, and r = 0.071) does not significantly moderate the association between EK and ATE. Social influence (t-value = 0.928, p-value = 0.356, and r = 0.149) also does not moderate the relationship between environmental consciousness and attitude toward the environment. However, SI ($p < 0.05$) positively and significantly moderates the relationship between BV and ATE. As a result, H2, H3, and H6 are supported at the 0.05 significant levels.

5 Conclusion

The current study aimed to investigate the factors influencing pro-environmental attitudes among faculty members in the higher education institutions (HEIs) of Pakistan, with a focus on environmental consciousness, environmental knowledge, biospheric values, and the moderating role of social influence. The findings indicate that environmental consciousness and biospheric values significantly shape faculty attitudes toward the environment, supporting H2 and H3. Additionally, the moderating effect of social influence was observed, specifically enhancing the relationship between biospheric values and attitudes toward the environment, supporting H6. These insights contribute to the literature on ESD, offering valuable recommendations for enhancing environmental education within HEIs. By highlighting the importance of raising environmental consciousness and integrating biospheric values into institutional practices, the study provides actionable guidance for policymakers and educational leaders to foster a pro-environmental culture among faculty members. Finally, the study achieved its objectives by identifying key factors influencing the pro-environmental attitude among faculty members in higher education institutions (HEIs) in Southern Pakistan.

6 Discussion

Education for Sustainable Development is mentioned in United Nation's Sustainable Development Goal (SDG) # 4, and Pakistan is among those nations that have adopted SDGs as their national agenda (Nousheen et al., 2020). However, the essential role of education in boosting productivity and creating job opportunities cannot be overlooked (Akbar et al., 2023). It is a well-established fact that teachers pass on their norms and beliefs to their students, who then apply these norms in their practical lives after graduation. Therefore, the present study explored the antecedents of HEI teachers' attitude toward the environment, with the moderating role of social influence. First, we analyzed the impact of environmental knowledge on ATE. Results show that the impact of EK on ATE is very weak and insignificant. In Pakistan, a significant portion of the population lacks sufficient environmental awareness. As noted by Levine and Strube (2012) and Fielding and Head (2012), meaningful efforts toward environmental protection are contingent on individuals possessing accurate and adequate knowledge; otherwise, such efforts remain ineffective. In the context of Pakistani higher education institutions (HEIs), sustainability is not deeply integrated into curricula or faculty development initiatives (Habib et al., 2021). Consequently, many individuals remain unaware of whether the products they use are environmentally friendly or recyclable. Additionally, faculty members in Pakistani HEIs exhibit limited knowledge of education for sustainable development (ESD), with minimal exposure to holistic or alternative learning approaches (Saqib et al., 2020). These factors may collectively explain why H1 is not supported in this study. Findings illustrate that the impact of environmental consciousness on the attitude toward the environment is significant. It implies that H2, which states that environmental consciousness has a positive impact on the attitude toward the environment, is supported. Previous studies suggest that environmental consciousness emerges from changes in beliefs, attitudes, and intentions, which collectively drive actions that contribute to environmental improvement (Jamanti, 2014). Mishal et al. (2017) found a positive connection between environmental consciousness and people's attitudes. Furthermore, the theory of planned behavior (TPB) posits that attitudes toward a behavior are shaped by beliefs about the outcomes of that behavior. Accordingly, higher levels of environmental consciousness are expected to foster positive beliefs about the benefits of pro-environmental actions, thereby promoting a more favorable attitude toward the environment. Empirical findings also demonstrate that biospheric values significantly influence attitudes toward the environment. TPB further emphasizes that attitudes are shaped by underlying beliefs and values; thus, individuals with strong biospheric values are more likely to hold positive beliefs about the benefits of environmental protection,

ultimately cultivating a positive attitude toward the environment (ATE). Notably, the younger generation, which upholds biospheric values, tends to be more inclined toward supporting a clean and sustainable society Schuitema and De Groot (2015) and is better informed about environmental issues (Ansar, 2013).

Here is an improved version of the paragraph:

The results indicate that social influence does not moderate the relationship between environmental knowledge and attitudes toward the environment. In Pakistan, where a substantial portion of the population has limited awareness of environmental issues, it is unlikely that individuals can effectively impart environmental knowledge to others or influence their decisions and attitudes toward the environment. Moreover, research suggests that even when people observe the impacts of climate change, their ability to adapt remains constrained if they lack access to critical resources such as land, financial means, or accurate information (Bryan et al., 2009; Bryan et al., 2013). Furthermore, households tend to adjust their lifestyles in response to a combination of economic, social, and environmental stressors rather than focusing solely on climate-related factors. As a result, perceptions of climate change may have a limited influence on their adaptation strategies (Burnham and Ma, 2018; Erwin et al., 2021; Galappaththi et al., 2020; Hoque et al., 2018; Lenaiyasa et al., 2020). The results reveal that social influence (SI) positively moderates the relationship between biospheric values (BV) and attitudes toward the environment (ATE). This moderation occurs because societal norms and interactions significantly shape individuals' beliefs and behaviors regarding environmental protection, reducing pollution, respecting nature, and recognizing the benefits of preserving the environment and natural resources. Furthermore, it is essential to highlight that curricula play a critical role in addressing sustainability challenges in the emerging world, fostering awareness and equipping individuals with the knowledge needed to tackle these issues effectively (Abbas et al., 2019). Academicians play a pivotal role in developing curricula for HEIs. Therefore, any goal to achieve a sustainable environment without considering teachers will remain a dream.

6.1 Practical implications

The current study has important implications for incorporating the ESD framework in developing countries like Pakistan. The government, regulators, and educators can get a deeper insight into how to positively influence the attitude of the teachers toward the environment, which will have transformational effects on the pro-environmental behavior of the students (Liang et al., 2022). To boost teachers' eco-friendly attitude, policymakers should formulate policies that support environmental consciousness and biospheric values in educational institutions. Higher environmental consciousness and biospheric values among HEI faculty can lead to increased adoption of sustainable practices, reduced resource consumption, and potentially lower operational costs. This could also foster a culture of research and innovation in green technologies, which could attract funding and partnerships, boosting economic competitiveness in the education sector.

Moreover, to encourage students toward environmental protection, teachers can incorporate increasing amounts of content related to environmental issues into their course outlines. Meanwhile, the government's initiatives supporting ESD will help protect natural resources, leading to the creation of a green society that serves as a symbol of sustainable growth. These initiatives will raise a high level consciousness in the society at large, and as people's extent of social awareness increases, more and more people will become conscious of the value of living environmentally. From a business perspective, the first step in convincing customers to express their intention to buy green products is education. As part of their corporate social responsibility (CSR) strategy, managers can create marketing campaigns and educate the community about the benefits of being green. This may promote companies by increasing consumer demand for eco-friendly goods and benefit society at large by encouraging greater consciousness and environmentally friendly behavior.

6.2 Limitations and future recommendation

Despite its important implications, the study has certain limitations, which will be discussed below to suggest guidelines for future study. The present study focuses only on the antecedents of the ATE of teachers; future studies could explore the impact of socioeconomic, cultural, and psychological factors on the attitude and intentions of the students of HEIs. Results are limited due to the time and resource constraints, as the survey was conducted only in the district Vehari of South Punjab, Pakistan. Future studies can be executed at the country or regional level. This study sample was limited to university staff members of district Vehari. Future studies should use different samples to verify the validity of the results.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for this study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the patients/participants OR patients/participants legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

AS: conceptualization, data curation, formal analysis, investigation, methodology, and Writing–original draft. Orangzab: conceptualization, formal analysis, methodology, supervision, and writing–original draft. MA: project administration, validation, writing–original draft, and writing–review and editing. PP: funding acquisition, validation, visualization, and writing–review and editing. AV: funding acquisition, project administration, validation,

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Publisher's note

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fenvs.2024.1458698/full#supplementary-material

References

Abbas, J., Aman, J., Nurunnabi, M., and Bano, S. (2019). The impact of social media on learning behavior for sustainable education: evidence of students from selected universities in Pakistan. *Sustainability* 11 (6), 1683. doi:10.3390/su11061683

Acosta-Castellanos, P. M., Queiruga-Dios, A., and Camargo-Mariño, J. A. (2024). "Environmental education for sustainable development in engineering education in Colombia," in *Paper presented at the Frontiers in Education*.

Ajzen, I., and Fishbein, M. (2001). Attitudes and the attitude-behavior relation: reasoned and automatic processes. *Eur. Rev. Soc. Psychol.* 11 (1), 1–33. doi:10.1080/14792779943000116

Akbar, M., Akbar, A., Yaqoob, H. S., Hussain, A., Svobodová, L., and Yasmin, F. (2023). Islamic finance education: current state and challenges for Pakistan. *Cogent Econ. and Finance* 11 (1), 2164665. doi:10.1080/23322039.2022.2164665

Alibeli, M. A., and Johnson, C. (2009). Environmental concern: a cross national analysis. *J. Int. Cross-Cultural Stud.* 3 (1), 1–10.

Alsmadi, S. (2007). Green marketing and the concern over the environment: measuring environmental consciousness of Jordanian consumers. *J. Promot. Manag.* 13 (3-4), 339–361. doi:10.1080/10496490802306905

Ansar, N. (2013). Impact of green marketing on consumer purchase intention. *Mediterr. J. Soc. Sci.* 4 (11), 650–655. doi:10.5901/mjss.2013.v4n11p650

Armitage, C. J., and Conner, M. (1999). Predictive validity of the theory of planned behaviour: the role of questionnaire format and social desirability. *J. Community and Appl. Soc. Psychol.* 9 (4), 261–272. doi:10.1002/(sici)1099-1298(199907/08)9:4<261::aid-casp503>3.0.co;2-5

Ateş, H. (2020). Merging theory of planned behavior and value identity personal norm model to explain pro-environmental behaviors. *Sustain. Prod. Consum.* 24, 169–180. doi:10.1016/j.spc.2020.07.006

Bamberg, S., Ajzen, I., and Schmidt, P. (2003). Choice of travel mode in the theory of planned behavior: the roles of past behavior, habit, and reasoned action. *Basic Appl. Soc. Psychol.* 25 (3), 175–187. doi:10.1207/s15324834basp2503_01

Barber, N., Taylor, C., and Strick, S. (2009). Wine consumers' environmental knowledge and attitudes: influence on willingness to purchase. *Int. J. Wine Res.* 1 (1), 59–72. doi:10.2147/ijwr.s4649

Bertossi, A., and Marangon, F. (2022). A literature review on the strategies implemented by higher education institutions from 2010 to 2020 to foster pro-environmental behavior of students. *Int. J. Sustain. High. Educ.* 23 (3), 522–547. doi:10.1108/ijshe-11-2020-0459

Bhattacharyya, A., and Rahman, M. L. (2020). Values, gender and attitudes towards environmental policy: a study of future managers. *Bus. Strategy Environ.* 29 (6), 2514–2527. doi:10.1002/bse.2517

Biasi, P., Ferrini, S., Borghesi, S., Rocchi, B., and Di Matteo, M. (2019). Enriching the Italian Genuine Saving with water and soil depletion: national trends and regional differences. *Ecol. Indic.* 107, 105573. doi:10.1016/j.ecolind.2019.105573

Blackwell, R. D., Miniard, P. W., and Engel, J. F. (2006). *Consumer behavior*. 10th edn. Cengage.

Bryan, E., Deressa, T. T., Gbetibouo, G. A., and Ringler, C. (2009). Adaptation to climate change in Ethiopia and South Africa: options and constraints. *Environ. Sci. Policy* 12 (4), 413–426. doi:10.1016/j.envsci.2008.11.002

Bryan, E., Ringler, C., Okoba, B., Roncoli, C., Silvestri, S., and Herrero, M. (2013). Adapting agriculture to climate change in Kenya: household strategies and determinants. *J. Environ. Manag.* 114, 26–35. doi:10.1016/j.jenvman.2012.10.036

Burnham, M., and Ma, Z. (2018). Multi-scalar pathways to smallholder adaptation. *World Dev.* 108, 249–262. doi:10.1016/j.worlddev.2017.08.005

Chanda, R. C., Isa, S. M., and Ahmed, T. (2024). Factors influencing customers' green purchasing intention: evidence from developing country. *J. Sci. Technol. Policy Manag.* 15 (5), 1056–1084. doi:10.1108/jstpm-03-2022-0044

Chen, A., and Peng, N. (2012). Green hotel knowledge and tourists' staying behavior. *Ann. Tour. Res.* 39 (4), 2211–2216. doi:10.1016/j.annals.2012.07.003

Chen-Yu, J. H., and Seock, Y. K. (2002). Adolescents' clothing purchase motivations, information sources, and store selection criteria: a comparison of male/female and impulse/nonimpulse shoppers. *Fam. Consumer Sci. Res. J.* 31 (1), 50–77. doi:10.1177/1077727x02031001003

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Mod. methods Bus. Res.* 295 (2), 295–336.

Choi, H., Jang, J., and Kandampully, J. (2015). Application of the extended VBN theory to understand consumers' decisions about green hotels. *Int. J. Hosp. Manag.* 51, 87–95. doi:10.1016/j.ijhm.2015.08.004

Costa, S., Zepeda, L., and Sirieix, L. (2014). Exploring the social value of organic food: a qualitative study in F rance. *Int. J. Consumer Stud.* 38 (3), 228–237. doi:10.1111/ijcs.12100

Cox, M. J. (2008). Sustainable communication: a study of green advertising and audience reception within the growing arena of corporate social responsibility. Case study: British Petroleum. *Earth Environ.* 3 (1), 32–51.

Davies, J., Foxall, G. R., and Pallister, J. (2002). Beyond the intention–behaviour mythology: an integrated model of recycling. *Mark. Theory* 2 (1), 29–113. doi:10.1177/1470593102002001645

Delamater, J. D., and Myers, D. J. (2010). *Social Psychology*. United States.

Dhandra, T. K. (2019). Achieving triple dividend through mindfulness: more sustainable consumption, less unsustainable consumption and more life satisfaction. *Ecol. Econ.* 161, 83–90. doi:10.1016/j.ecolecon.2019.03.021

Dietz, T., Stern, P. C., and Guagnano, G. A. (1998). Social structural and social psychological bases of environmental concern. *Environ. Behav.* 30 (4), 450–471. doi:10.1177/001391659803000402

DiPietro, R., and Gregory, S. (2012). Customer perceptions regarding green restaurant practices: a comparison between fast food and upscale casual restaurants. *FIU Hosp. Rev.* 30 (1), 1–22.

D'Souza, C., Taghian, M., and Lamb, P. (2006). An empirical study on the influence of environmental labels on consumers. *Corp. Commun. Int. J.* 11 (2), 162–173. doi:10.1108/13563280610661697

Elmassah, S., Biltagy, M., and Gamal, D. (2022). Framing the role of higher education in sustainable development: a case study analysis. *Int. J. Sustain. High. Educ.* 23 (2), 320–355. doi:10.1108/ijshe-05-2020-0164

Erwin, A., Ma, Z., Popovici, R., O'Brien, E. P. S., Zanotti, L., Zeballos, E. Z., et al. (2021). Intersectionality shapes adaptation to social-ecological change. *World Dev.* 138, 105282. doi:10.1016/j.worlddev.2020.105282

Esa, N. (2010). Environmental knowledge, attitude and practices of student teachers. *Int. Res. Geogr. Environ. Educ.* 19 (1), 39–50. doi:10.1080/10382040903545534

Feather, N. T. (1995). Values, valences, and choice: the influences of values on the perceived attractiveness and choice of alternatives. *J. Personality Soc. Psychol.* 68 (6), 1135–1151. doi:10.1037/0022-3514.68.6.1135

Fielding, K. S., and Head, B. W. (2012). Determinants of young Australians' environmental actions: the role of responsibility attributions, locus of control, knowledge and attitudes. *Environ. Educ. Res.* 18 (2), 171–186. doi:10.1080/13504622.2011.592936

Fornell, C., and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* 18 (1), 39–50. doi:10.2307/3151312

Fortner, R. W., and Teates, T. G. (1980). Baseline studies for marine education: experiences related to marine knowledge and attitudes. *J. Environ. Educ.* 11 (4), 11–19. doi:10.1080/00958964.1980.9941385

Fryxell, G. E., and Lo, C. W. (2003). The influence of environmental knowledge and values on managerial behaviours on behalf of the environment: an empirical examination of managers in China. *J. Bus. Ethics* 46 (1), 45–69. doi:10.1023/a:1024773012398

Fuchs, A. (2011). "Methodische aspekte linearer strukturgleichungsmodelle," in *Ein vergleich von kovarianz-und varianzbasierten kausalanalyseverfahren: research papers on marketing strategy*.

Galappaththi, E. K., Ford, J. D., and Bennett, E. M. (2020). Climate change and adaptation to social-ecological change: the case of indigenous people and culture-based fisheries in Sri Lanka. *Clim. Change* 162, 279–300. doi:10.1007/s10584-020-02716-3

García-Salirrosas, E. E., Escobar-Farfán, M., Gómez-Bayona, L., Moreno-López, G., Valencia-Arias, A., and Gallardo-Canales, R. (2024). Influence of environmental awareness on the willingness to pay for green products: an analysis under the application of the theory of planned behavior in the Peruvian market. *Front. Psychol.* 14, 1282383. doi:10.3389/fpsyg.2023.1282383

Gkargkavouzi, A., Halkos, G., and Matsiori, S. (2019). A multi-dimensional measure of environmental behavior: exploring the predictive power of connectedness to nature, ecological worldview and environmental concern. *Soc. Indic. Res.* 143 (2), 859–879. doi:10.1007/s11205-018-1999-8

Götz, O., Liehr-Gobbers, K., and Krafft, M. (2010). "Evaluation of structural equation models using the partial least squares (PLS) approach," in *Handbook of partial least squares*. Berlin: Springer, 691–711.

Guthrie, G. (2010). *Basic research methods: an entry to social science research*. India: SAGE Publications.

Ha, H. Y., and Janda, S. (2012). Predicting consumer intentions to purchase energy-efficient products. *J. Consumer Mark.* 29 (7), 461–469. doi:10.1108/07363761211274974

Habib, M. N., Khalil, U., Khan, Z., and Zahid, M. (2021). Sustainability in higher education: what is happening in Pakistan? *Int. J. Sustain. High. Educ.* 22 (3), 681–706. doi:10.1108/ijshe-06-2020-0207

Hair, J. F., Anderson, R. E., Babin, B. J., and Black, W. C. (2010a) *Multivariate data analysis: a global perspective*, 7. Upper Saddle River, NJ: Pearson.

Hair, J. F., Black, W. C., and Babin, B. J. (2010b). *RE Anderson Multivariate data analysis: a global perspective*. 7th Edn. Englewood Cliffs, NJ: Pearson Prentice Hall.

Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sartedt, M. (2014). *A primer on partial least squares structural equation modeling*. Thousand Oaks, CA: Sage.

Hair, J. F., Ringle, C. M., and Sarstedt, M. (2011). PLS-SEM: indeed a silver bullet. *J. Mark. theory Pract.* 19 (2), 139–152. doi:10.2753/mtp1069-6679190202

Hameed, I., Waris, I., and Amin ul Haq, M. (2019). Predicting eco-conscious consumer behavior using theory of planned behavior in Pakistan. *Environ. Sci. Pollut. Res.* 26, 15535–15547. doi:10.1007/s11356-019-04967-9

Han, H., Hsu, L.-T. J., and Sheu, C. (2010). Application of the theory of planned behavior to green hotel choice: testing the effect of environmental friendly activities. *Tour. Manag.* 31 (3), 325–334. doi:10.1016/j.tourman.2009.03.013

Hansla, A., Gamble, A., Juliusson, A., and Gärling, T. (2008). The relationships between awareness of consequences, environmental concern, and value orientations. *J. Environ. Psychol.* 28 (1), 1–9. doi:10.1016/j.jenvp.2007.08.004

Holland, C., and Light, B. (1999). A critical success factors model for ERP implementation. *IEEE Softw.* 16 (3), 30–36. doi:10.1109/52.765784

Hoque, S. F., Quinn, C., and Sallu, S. (2018). Differential livelihood adaptation to social-ecological change in coastal Bangladesh. *Reg. Environ. Change* 18, 451–463. doi:10.1007/s10113-017-1213-6

Howell, R. A., and Allen, S. (2019). Significant life experiences, motivations and values of climate change educators. *Environ. Educ. Res.* 25 (6), 813–831. doi:10.1080/13504622.2016.1158242

Hoyer, W. D., and MacInnis, D. J. (2004). *Consumer behavior*. Boston, MA.F: Houghton Miffin.

Hu, H.-H., Parsa, H., and Self, J. (2010). The dynamics of green restaurant patronage. *Cornell Hosp. Q.* 51 (3), 344–362. doi:10.1177/1938965510370564

Huang, Y.-C., Yang, M., and Wang, Y.-C. (2014). Effects of green brand on green purchase intention. *Mark. Intell. and Plan.* 32 (3), 250–268. doi:10.1108/mip-10-2012-0105

Hughner, R. S., McDonagh, P., Prothero, A., Shultz, C. J., and Stanton, J. (2007). Who are organic food consumers? A compilation and review of why people purchase organic food. *J. Consumer Behav. An Int. Res. Rev.* 6 (2-3), 94–110. doi:10.1002/cb.210

Huysamen, G. (1994). *Methodology for the social and behavioural sciences*. 1st edn. Halfway House: Southern Book Publishers.

Ikeme, J. (2003). Climate change daaptational deficiencies in developing countries: the case of Sub-Saharan Africa. *Mitig. Adapt. Strategies Glob. Change* 8, 29–52. doi:10.1023/a:1025838610473

Irawan, R., and Darmayanti, D. (2012). "The influence factors of green purchasing behavior: a study of university students in Jakarta," in *Paper presented at the proc. 6th asian business research conference*.

Jamanti, R. (2014). Pengaruh berita banjir Di Koran Kaltim Terhadap kesadaran lingkungan masyarakat kelurahan temindung permai samarinda. *J. Ilmu Komunikasi* 2 (1), 17–33.

Kaiser, F. G., and Gutscher, H. (2003). The proposition of a general version of the theory of planned behavior: predicting ecological behavior 1. *J. Appl. Soc. Psychol.* 33 (3), 586–603. doi:10.1111/j.1559-1816.2003.tb01914.x

Kalsoom, Q., Khanam, A., and Quraishi, U. (2017). Sustainability consciousness of pre-service teachers in Pakistan. *Int. J. Sustain. High. Educ.* 18 (7), 1090–1107. doi:10.1108/ijshe-11-2016-0218

Kempton, W., Boster, J. S., and Hartley, J. A. (1996). *Environmental values in American culture*. Cambridge, Massachusetts: MIT Press.

Khare, A. (2015). Antecedents to green buying behaviour: a study on consumers in an emerging economy. *Mark. Intell. Plan.* 30 (3), 2–20.

Kim, M., and Koo, D.-W. (2020). Visitors' pro-environmental behavior and the underlying motivations for natural environment: merging dual concern theory and attachment theory. *J. Retail. Consumer Serv.* 56, 102147. doi:10.1016/j.jretconser.2020.102147

Kim, S., and Seock, Y. K. (2009). Impacts of health and environmental consciousness on young female consumers' attitude towards and purchase of natural beauty products. *Int. J. Consumer Stud.* 33 (6), 627–638. doi:10.1111/j.1470-6431.2009.00817.x

Ko, S. B., and Jin, B. (2017). Predictors of purchase intention toward green apparel products: a cross-cultural investigation in the USA and China. *J. Fash. Mark. Manag. An Int. J.* 21, 70–87. doi:10.1108/jfmm-07-2014-0057

Law, M. M. S., Hills, P., and Hau, B. C. H. (2017). Engaging employees in sustainable development–a case study of environmental education and awareness training in Hong Kong. *Bus. Strategy Environ.* 26 (1), 84–97. doi:10.1002/bse.1903

Lee, E., Park, N.-K., and Han, J. H. (2013). Gender difference in environmental attitude and behaviors in adoption of energy-efficient lighting at home. *J. Sustain. Dev.* 6 (9), 36. doi:10.5539/jsd.v6n9p36

Lee, K. (2008a). Opportunities for green marketing: young consumers. *Mark. Intell. Plan.* 26, 573–586. doi:10.1108/02634500810902839

Lee, K. (2008b). Opportunities for green marketing: young consumers. *Mark. Intell. Plan.* 26 (6), 573–586. doi:10.1108/02634500810902839

Lee, K. (2011). The role of media exposure, social exposure and biospheric value orientation in the environmental attitude-intention-behavior model in adolescents. *J. Environ. Psychol.* 31 (4), 301–308. doi:10.1016/j.jenvp.2011.08.004

Lee, T. H., and Jan, F.-H. (2015). The effects of recreation experience, environmental attitude, and biospheric value on the environmentally responsible behavior of nature-based tourists. *Environ. Manag.* 56 (1), 193–208. doi:10.1007/s00267-015-0488-y

Lenaiyasa, M. L., Bruyere, B. L., Salerno, J., and Pickering, T. (2020). Pastoralists' use of income diversification as a strategy for adapting to social-ecological change in Samburu, Kenya. *Reg. Environ. Change* 20, 21–11. doi:10.1007/s10113-020-01612-x

Levine, D. S., and Strube, M. J. (2012). Environmental attitudes, knowledge, intentions and behaviors among college students. *J. Soc. Psychol.* 152 (3), 308–326. doi:10.1080/00224545.2011.604363

Li, G., Yang, L., Zhang, B., Li, X., and Chen, F. (2021). How do environmental values impact green product purchase intention? The moderating role of green trust. *Environ. Sci. Pollut. Res.* 28, 46020–46034. doi:10.1007/s11356-021-13946-y

Liang, M., Chen, Q., and Zhou, Y. (2022). The influence of various role models on children's pro-environmental behaviours. *Front. Psychol.* 13, 873078. doi:10.3389/fpsyg.2022.873078

Litwin, M. S. (1995). "Scaling and scoring," in *How to measure survey reliability and validity*. Thousand Oaks, CA, USA: SAGE Publications Inc, 47–52.

Liu, W., and Chen, J. (2020). Modified Two Major Environmental Values scale for measuring Chinese children's environmental attitudes. *Environ. Educ. Res.* 26 (1), 130–147. doi:10.1080/13504622.2019.1697431

Longhurst, J., Bellingham, L., Cotton, D., Isaac, V., Kemp, S., Martin, S., et al. (2014). Education for sustainable development: guidance for UK higher education providers.

Maichum, K., Parichatnon, S., and Peng, K.-C. (2016). Application of the extended theory of planned behavior model to investigate purchase intention of green products among Thai consumers. *Sustainability* 8 (10), 1077. doi:10.3390/su8101077

Marouli, C., and Duroy, Q. (2019). Reflections on the transformative power of environmental education in contemporary societies: experience from two college courses in Greece and the USA. *Sustainability* 11 (22), 6465. doi:10.3390/su11226465

Martin, C., and Czellar, S. (2017). Where do biospheric values come from? A connectedness to nature perspective. *J. Environ. Psychol.* 52, 56–68. doi:10.1016/j.jenvp.2017.04.009

Menon, S., and Suresh, M. (2022). Development of assessment framework for environmental sustainability in higher education institutions. *Int. J. Sustain. High. Educ.* 23 (7), 1445–1468. doi:10.1108/ijshe-07-2021-0310

Michelsen, G., and Fischer, D. (2017). *Sustainability and education 1* Sustainable development policy. Routledge, 135–158.

Mishal, A., Dubey, R., Gupta, O. K., and Luo, Z. (2017). Dynamics of environmental consciousness and green purchase behaviour: an empirical study. *Int. J. Clim. Change Strategies Manag.* 9 (5), 682–706. doi:10.1108/ijccsm-11-2016-0168

Nguyen, T. N., Lobo, A., and Greenland, S. (2016). Pro-environmental purchase behaviour: the role of consumers' biospheric values. *J. Retail. Consumer Serv.* 33, 98–108. doi:10.1016/j.jretconser.2016.08.010

Nitzl, C. (2010). *Eine anwenderorientierte Einführung in partial Least Square (PLS)-Methode (a user-oriented introduction to partial least squares (PLS) method)*. SSRN.

Nordlund, A. M., and Garvill, J. (2003). Effects of values, problem awareness, and personal norm on willingness to reduce personal car use. *J. Environ. Psychol.* 23 (4), 339–347. doi:10.1016/s0272-4944(03)00037-9

Nousheen, A., Zai, S. A. Y., Waseem, M., and Khan, S. A. (2020). Education for sustainable development (ESD): effects of sustainability education on pre-service teachers' attitude towards sustainable development (SD). *J. Clean. Prod.* 250, 119537. doi:10.1016/j.jclepro.2019.119537

Nozari, H., Szmelter-Jarosz, A., and Ghahremani-Nahr, J. (2021). The ideas of sustainable and green marketing based on the internet of everything—the case of the dairy industry. *Future Internet* 13 (10), 266. doi:10.3390/fi13100266

Paul, J., Modi, A., and Patel, J. (2016). Predicting green product consumption using theory of planned behavior and reasoned action. *J. Retail. consumer Serv.* 29, 123–134. doi:10.1016/j.jretconser.2015.11.006

Peer, V., and Stoeglehner, G. (2013). Universities as change agents for sustainability–framing the role of knowledge transfer and generation in regional development processes. *J. Clean. Prod.* 44, 85–95. doi:10.1016/j.jclepro.2012.12.003

Polonsky, M. J., Vocino, A., Grau, S. L., Garma, R., and Ferdous, A. S. (2012). The impact of general and carbon-related environmental knowledge on attitudes and behaviour of US consumers. *J. Mark. Manag.* 28 (3-4), 238–263. doi:10.1080/0267257x.2012.659279

Rahman, I., and Reynolds, D. (2019). The influence of values and attitudes on green consumer behavior: a conceptual model of green hotel patronage. *Int. J. Hosp. Tour. Adm.* 20 (1), 47–74. doi:10.1080/15256480.2017.1359729

Rasool, S., Rehman, A., Cerchione, R., and Centobelli, P. (2021). Evaluating consumer environmental behavior for sustainable development: a confirmatory factor analysis. *Sustain. Dev.* 29 (2), 318–326. doi:10.1002/sd.2147

Rendón López, L. M., Escobar Londoño, J. V., Arango Ruiz, Á. d. J., Molina Benítez, J. A., Villamil Parodi, T., and Valencia Montaña, D. F. (2018). Educación para el desarrollo sostenible: acercamientos desde una perspectiva colombiana. *Producción+ Limpia* 13 (2), 133–149. doi:10.22507/pml.v13n2a7

Ringle, C. M., and Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Adv. Int. Mark.* 20, 277–319. doi:10.1108/s1474-7979(2009)0000020014

Rios, F. J. M., Martinez, T. L., Moreno, F. F., and Soriano, P. C. (2006). Improving attitudes toward brands with environmental associations: an experimental approach. *J. Consumer Mark.* 23 (1), 26–33. doi:10.1108/07363760610641136

Roberts, J. A., and Bacon, D. R. (1997). Exploring the subtle relationships between environmental concern and ecologically conscious consumer behavior. *J. Bus. Res.* 40 (1), 79–89. doi:10.1016/s0148-2963(96)00280-9

Salam, M. T., Smith, K. T., and Mehboob, F. (2021). Purchase intention for green brands among Pakistani millennials. *Soc. Responsib. J.* 18, 469–483. doi:10.1108/srj-08-2020-0341

Salazar, H. A., Oerlemans, L., and van Stroe-Biezen, S. (2013). Social influence on sustainable consumption: evidence from a behavioural experiment. *Int. J. Consumer Stud.* 37 (2), 172–180. doi:10.1111/j.1470-6431.2012.01110.x

Saqib, Z. A., Zhang, Q., Ou, J., Saqib, K. A., Majeed, S., and Razzaq, A. (2020). Education for sustainable development in Pakistani higher education institutions: an exploratory study of students' and teachers' perceptions. *Int. J. Sustain. High. Educ.* 21 (6), 1249–1267. doi:10.1108/ijshe-01-2020-0036

Scalco, A., Noventa, S., Sartori, R., and Ceschi, A. (2017). Predicting organic food consumption: a meta-analytic structural equation model based on the theory of planned behavior. *Appetite* 112, 235–248. doi:10.1016/j.appet.2017.02.007

Schiffman, L. G., Kanuk, L. L., Kumar, S. R., and Wisenblit, J. (2010). *Consumer behavior*. London, England: Pearson Education.

Schneiderhan-Opel, J., and Bogner, F. X. (2020). The relation between knowledge acquisition and environmental values within the scope of a biodiversity learning module. *Sustainability* 12 (5), 2036. doi:10.3390/su12052036

Schuitema, G., and De Groot, J. I. (2015). Green consumerism: the influence of product attributes and values on purchasing intentions. *J. Consumer Behav.* 14 (1), 57–69. doi:10.1002/cb.1501

Schwepker Jr, C. H., and Cornwell, T. B. (1991). An examination of ecologically concerned consumers and their intention to purchase ecologically packaged products. *J. Public Policy Mark.* 10 (2), 77–101. doi:10.1177/074391569101000205

Shagun, G., Pavlov, V., and Ryzhenkov, P. (1994). Issledovaniie ekologicheskogo soznaniia detei i podrostkov [an exploration of environmental consciousness in adolescents and children]. *Psikhologicheskii zhurnal Psychol. J.* 15 (1).

Sherwani, S., Sherwani, M., Iqbal, Z., Ain, N. U., and Alvi, A. A. (2021). Determinants of consumers' green purchase intension a study of Pakistani consumers. *Asian J. Econ. Bus. Account.*, 53–68. doi:10.9734/ajeba/2021/v21i230350

Siddiqui, J. (2022). *Pakistan's climate challenges pose a national security emergency*. Washington, D.C.: United States Institute of Peace, Jul.

Sparks, P., and Shepherd, R. (1992). Self-identity and the theory of planned behavior: assessing the role of identification with green consumerism. *Soc. Psychol. Q.* 55 (4), 388–399. doi:10.2307/2786955

Steg, L., and De Groot, J. I. M. (2012). *Environmental values*. Oxford University Press.

Steg, L., Perlaviciute, G., Van der Werff, E., and Lurvink, J. (2014). The significance of hedonic values for environmentally relevant attitudes, preferences, and actions. *Environ. Behav.* 46 (2), 163–192. doi:10.1177/0013916512454730

Stephens, J. C., Hernandez, M. E., Román, M., Graham, A. C., and Scholz, R. W. (2008). Higher education as a change agent for sustainability in different cultures and contexts. *Int. J. Sustain. High. Educ.* 9 (3), 317–338. doi:10.1108/14676370810885916

Stern, P. (2000a). New environmental theories: toward a coherent theory of environmentally significant behavior. *J. Soc. issues* 56 (3), 407–424. doi:10.1111/0022-4537.00175

Stern, P. C. (2000b). New environmental theories: toward a coherent theory of environmentally significant behavior. *J. Soc. issues* 56 (3), 407–424. doi:10.1111/0022-4537.00175

Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., and Kalof, L. (1999). A value-belief-norm theory of support for social movements: the case of environmentalism. *Hum. Ecol. Rev.*, 81–97.

Stern, P. C., Dietz, T., and Guagnano, G. A. (1998). A brief inventory of values. *Educ. Psychol. Meas.* 58 (6), 984–1001. doi:10.1177/0013164498058006008

Stern, P. C., Dietz, T., and Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environ. Behav.* 25 (5), 322–348. doi:10.1177/0013916593255002

Trencher, G., Yarime, M., McCormick, K. B., Doll, C. N., and Kraines, S. B. (2014). Beyond the third mission: exploring the emerging university function of co-creation for sustainability. *Sci. Public Policy* 41 (2), 151–179. doi:10.1093/scipol/sct044

Turner, J. C. (1991). *Social influence*. Bristol: Thomson Brooks/Cole Publishing Co.

Urban, D., and Mayerl, J. (2013). *Strukturgleichungsmodellierung*. Wiesbaden: Springer Berlin Heidelberg.

Van Liere, K. D., and Dunlap, R. E. (1981). Environmental concern: does it make a difference how it's measured? *Environ. Behav.* 13 (6), 651–676. doi:10.1177/0013916581136001

Verplanken, B. (2018). Promoting sustainability: towards a segmentation model of individual and household behaviour and behaviour change. *Sustain. Dev.* 26 (3), 193–205. doi:10.1002/sd.1694

Vicente-Molina, M. A., Fernández-Sáinz, A., and Izagirre-Olaizola, J. (2013). Environmental knowledge and other variables affecting pro-environmental behaviour: comparison of university students from emerging and advanced countries. *J. Clean. Prod.* 61, 130–138. doi:10.1016/j.jclepro.2013.05.015

Wahid, N. A., Rahbar, E., and Shyan, T. S. (2011). Actors influencing the green purchase behavior of penang environmental volunteers. *Int. Bus. Manag.* 5 (1), 38–49. doi:10.3923/ibm.2011.38.49

Walker, M. (2013). Does green management matter for donation intentions? The influence of environmental consciousness and environmental importance. *Manag. Decis.* 51 (8), 1716–1732. doi:10.1108/md-10-2012-0732

Wang, P., Liu, Q., and Qi, Y. (2014). Factors influencing sustainable consumption behaviors: a survey of the rural residents in China. *J. Clean. Prod.* 63, 152–165. doi:10.1016/j.jclepro.2013.05.007

Wong, K. K.-k. (2011). *Book review: handbook of partial least squares: concepts, methods and applications*. Editors V. Esposito Vinzi, W. W. Chin, J. Henseler, and H. Wang (Singapore: Springer).

Yadav, R., and Pathak, G. S. (2016). Intention to purchase organic food among young consumers: evidences from a developing nation. *Appetite* 96, 122–128. doi:10.1016/j.appet.2015.09.017

Yadav, R., and Pathak, G. S. (2016a). Intention to purchase organic food among young consumers: evidences from a developing nation. *Appetite* 96, 122–128. doi:10.1016/j.appet.2015.09.017

Yadav, R., and Pathak, G. S. (2017). Determinants of consumers' green purchase behavior in a developing nation: applying and extending the theory of planned behavior. *Ecol. Econ.* 134, 114–122. doi:10.1016/j.ecolecon.2016.12.019

Zafar, M. W., Zaidi, S. A. H., Khan, N. R., Mirza, F. M., Hou, F., and Kirmani, S. A. A. (2019). The impact of natural resources, human capital, and foreign direct investment on the ecological footprint: the case of the United States. *Resour. Policy* 63, 101428. doi:10.1016/j.resourpol.2019.101428

Zaremohzzabieh, Z., Ismail, N., Ahrari, S., and Samah, A. A. (2021). The effects of consumer attitude on green purchase intention: a meta-analytic path analysis. *J. Bus. Res.* 132, 732–743. doi:10.1016/j.jbusres.2020.10.053

Zikmund, W. G., Babin, B. J., Carr, J. C., and Griffin, M. (2003). *Business research methods*. 7th ed. Thomson/South-Western.

Zsóka, Á., Szerényi, Z. M., Széchy, A., and Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *J. Clean. Prod.* 48, 126–138. doi:10.1016/j.jclepro.2012.11.030