



Theoretical and Empirical Aspects of Pro-Environmental Behaviors Theory (PEBT)

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Abstract

Behavioral sciences have an important role to tackle environmental problems. Therefore, understanding this role is crucial to identify valid predictors and its complementarity role for technical and economic approaches. Several socio-psychological theories, such as the Theory of Planned Behavior (TPB), have been used to understand better the factors that explain water and resource consumption decisions. Although this theory is more frequently applied based on the interaction between people's attitudes, behavior, subjective norms, and personal control to undertake actions, it lacks non-cognitive components. To fill this gap, this study aims to develop a more comprehensive theory that includes all required determinant variables for pro-environmental behavior. So we attempt to develop a comprehensive theory by leveraging appropriate non-cognitive (habits and emotions) and cognitive (including subjective and moral norms, self-identity, attitude, risk perception, and trust) components considering the systematic relation between factors affecting environmental behavior and the socio-cultural context. TPB is significantly developed to Pro-Environmental Behavior Theory (PEBT) in this study. PEBT covers a range of scales from local to large scale and it includes different hydrological and political boundaries in the analysis and pathology of pro-environmental behavior reasons. Testing the model in some empirical studies, the authors claim that the model can increase the predictive capacity of environmental behavior and it is expected to be experimentally adequate.

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Introduction

In recent decades, increasing in greenhouse gas emissions have resulted in climate change and subsequent risks such as hydrological and meteorological hazards due to the rapid and exponential growth of industrial activities (Farzaneh et al., 2012). Consequently, there have been significant adverse effects on various industries such as agricultural, economic and environmental damages due to frequent extreme weather events worldwide (Rostamian et al., 2013). The technical, legal and economic aspect of climate change has been largely emphasized in the literature (Campbell et al., 2004, Farzaneh and Bani Mostafa Arab 2023a, Farzaneh and Bani Mostafa Arab 2023b), and there has been a lack of attention to the role of societal decisions and their behaviours and how these factors exacerbate the negative impacts of climate changes (Zamani Nuri et al., 2013). However, for effective water planning and management strategies, developing pro-environmental behaviour influenced by accurate decisions is crucial (Sou, 2012). Behavioural sciences have shown a strong potential to tackle environmental problems and offer appropriate resolutions (Rankine and Khosravi, 2021). Therefore, it is important to understand the role of behavioural sciences to identify valid predictors and seek how they play a complementarity role for technical and economic approaches.

Socio-ecological theories and different psychological models have been employed in previous studies to understand the factors that contribute to change environmental behaviour. These theories include Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977), Norm Activation Theory (NAT) (Schwartz, 1977), Theory of Planned Behaviour (TPB) (Ajzen, 1991; Yazarloo et al 2021), and Goal Framing Theory (GFT) TRA suggests that environmental consumer behavior is influenced by attitude and subjective norms as cognitive

factors. Either attitude or subjective norms based on decision-making play a significant role in creating a behavioral intention that leads to consumer behavior (Fishbein & Ajzen 1977; Farzaneh et al 2019b). However, it is argued that non-cognitive or extrinsic factors should also be considered key components (Joseph, 2019). These extrinsic factors can briefly be defined as forces out of consumer or actor rather than cognitive factors within him/her. Furthermore, although it is argued that behavior is influenced by perceived behavioral control, this model cannot adequately explain the amount of perceived control that people have on their behavior (Joseph, 2019).

Carrington et al. (2010) argued that individual preferences and internal human evaluation of pro-environmental behaviors, except for contextual factors, may not be strong predictors of pro-environmental behaviors. Furthermore, this theory focuses primarily on cognitive factors and tends to ignore non-cognitive variables. Non-cognitive variables, such as situational issues and consumer socio-economic-organizational circumstances and contexts, are important determinants of the intention and behavior of individuals on environmental issues (Wang et al., 2018. Russell et al., 2017). Contextual factors also influence the prediction of consumer behaviour. For example, in NAT defined by Schwartz (1977), three contextual factors, including awareness of the consequences, responsibility, and individual norms, contribute to the pro-environmental consumers. However, this model cannot clarify all the contextual factors that affect behaviour.

Another theory that considers factors is Goal Framing Theory (GFT), which includes social values, the presence of other people, and other people's behaviour as the most important factors that support the normative goal frame. (Lindenberg & Steg, 2014). However, this theory

focuses mainly on motivation and ignores some important extrinsic factors like organizational circumstances affecting consumer behavior. Protection Motivation Theory (PMT) can be seen as another cognitive approach to explain motivations of protective pro-environmental behavior. PMT proposes threat appraisal and coping appraisal as two cognitive mediating processes (Roger, 1975). This theory focuses on how people's acceptance and personalization of risk intersects with their beliefs about the effectiveness of their actions on preparedness and their ability to execute them (Paton, 2018). Though considering socio-cultural context generally, PMT does not differentiate between or analyze particular important factors forming this context.

Moreover, following TRA, TPB was developed as one of the theoretical frameworks in human behavior (Ajzen, 1985 ; Farzaneh et al 2016a). This theory represents a valuable tool in predicting behavioral intentions through the interaction of personal, social, and environmental variables. This theory assumes that behavior performance is explained by the people's attitude, beliefs of how much control they have over behavior, and the social norms perceived to prevail (Ajzen, 1991; Farzaneh et al 2017). Although some empirical evidence supports this theory, some critics have suggested that the TPB's potential to predict pro-environmental activity is limited. It has been argued that not only the conscious processes that drive [something] by internal morality but also unconscious processes govern pro-environmental behaviours (Primoradi et al., 2021; Hadi et al 2017; Farzaneh et al 2023).

As a result, we see that despite the obvious need to consider key non-cognitive and contextual variables which motivate and enable pro-environmental behaviors, limited research to date have addressed these variables adequately. To address

this gap, this study aims to develop a comprehensive theory integrating different theories of the literature to discuss non-cognitive and contextual variables, which motivate pro-environmental behaviors while considering effective cognitive factors. Another reason that justifies developing a new theory is that almost all mentioned theories and models assume a linear or one-way relation between the extrinsic factors and behavior and ignore the effects of environmental behaviors on the context. Thus, this study will look at this relationship systematically and consider the feedback between behavior and the general socio-cultural context.

Specific Scope of the Study

As discussed above, different combinations of causal determinants, such as cognitive and non-cognitive variables and internal and external factors, can represent different levels of behaviors associated with some specific environmental issue (Ertz et al, 2016; Nordlund et al, 2010; Shove, 2012; Sjern, 2000). Nevertheless, the change in people's behavior is influenced by different causal variables over time. For example, Dahlstrand and Beil (1997) demonstrated the changes of pro-environmental behavior from habitual non-environmentally friendly behavior to environmentally friendly behavior. In this case, the behaviors were shaped early on by value and the sense of responsibility; however, they were replaced by habits and beliefs over time.

Hence, to fill this gap, we propose a comprehensive model to understand the behaviors influenced by the integrated causal variables over time, which would be beneficial for representing adaptive capacities across current and future diverse environmental challenges. Exploring this also calls for a critical analysis of the explanatory constructs in models designed to predict environmental behaviours. This issue will become more

important in climate change as it creates new challenges for communities to adapt to and respond to, such as hazard events. Therefore, the integrated model enables to anticipate uncertain future behaviour in environmental issues influenced by climate change, encourages reducing the risk caused by climate change over time and increases people's ability to cope with the risks and cut down the costs of hazard events induced by climate change (Paton, 2018).

Different Types of Causal Factors

In the following section, different types of causal variables will be discussed.

Attitudinal Factors

The first major types of casual variables are attitudinal factors, including norms, beliefs, and values, which are the basics of the value-belief-norms theory. Other attitudinal factors influencing only specific environmental behaviors include behavior-specific tendencies (for example, specific moral norms and rules in norm-activation theory and attitude toward a behavior in the theory of planned behavior) and behavior-specific beliefs (e.g., beliefs about the feasibility of acting according to perceived personal capabilities and available opportunities and resources). Several social-psychological theories, including Cognitive Dissonance Theory (CDT), Norm Activation Theory (NAT) and TPB, are used to explain specific pro-environmental behaviors. Environmental behavior can also be affected by non-environmental attitudes, such as attitudes toward a product's characteristics that can affect the environment.

External or Contextual Forces

The second major types of causal variables are external or contextual forces, including interpersonal influences (e.g., community expectations and trust to other peoples); advertising; government

support and other legal rights; financial incentives and motivation; the physical difficulty of a specific action; technical and administrative constraints; justice; and various circumstances and features of context.

Personal Capabilities

Personal capabilities are the third major type of causal variable. They include personal knowledge and abilities required for particular pro-environmental actions (e.g. mechanical knowledge for rainwater extraction or gray-water reusing) and general capabilities and resources such as literacy, money, and social influence and relations.

Habits

Habits or routines are distinct types of causal variables in pro-environmental behaviors. We argue that these behaviors have a strong habitual aspect that unconscious processes can drive. Behavioral changes often require breaking old habits formed with the emergence of new ones (Dahlstrand and Beil, 1997). Various causal variables may be important for each particular pro-environmental behaviour (Gardner and Stern, 1996; stern, 2000). For example, financial factors tend to be more significant determinants for costly behaviours; challenging behaviours are likely to be strongly influenced by public policy and government funding (e.g., alternative forms of transport); behaviours requiring advanced skills are likely to be strongly influenced by people's abilities and what they think about them. Therefore, there is a need for a comprehensive and sound model that integrates ideas and solutions proposed by (e.g., Dahlstrand and Biel, 1997; Fransson and Garling, 1999; Gardner and Stern, 1996) to incorporate variables from all of the above categories, hypothesize a relationship between them, and use them to explain environmentally related

behaviours. In prior studies, models have been developed based on the theory of planned behavior (e.g., Ajzen, 1991), which emphasize attitudinal factors more than the other categorizes.

The TPB model will be introduced in the next part, followed by a proposal and discussion of a proposed development of a more comprehensive PBET.

Pro-Environmental Behavior Theory (PBET)

Several theoretical frameworks reviewed by PBET have been developed to utilize behavioral sciences in pro-environmental behaviors. In terms of water conservation, the majority of theoretical frameworks have been shaped based on TPB (Ajzen, 1991; Trumbo and O'Keefe, 2001; Lam, 2006; Russell and fielding, 2010). TPB is a socio-psychological theory that considers interactions between personal, environmental and social variables to predict intentions and behaviors in socio-psychological fields and in environmental themes (Bamberg et al., 2013; Hrubes et al., 2001; Lam, 2006; Tekkaya, 2001). The forerunner of TPB was the theory of reasoned action (TRA), the first model to predict and describe human behavior (Yazdanpanah et al., 2011). Charles Darwin started analyzing the behavioral consequences of attitude in 1872. In the early 1880s, psychologists began developing theories to explain how attitude affects behaviour. Because of these endeavours, many new theories have evolved to interpret attitude's behavioural effects. Between 1918 and 1925, Thomas and Zeninki were among the first researchers to define attitudes as an individual's mind process, determining their real and potential responses. In this regard, psychologists began to assess attitude variables as predictors of action. Following this progress, Fishben and Ajzen attempted to find a way to predict behavior and its consequences. They hypothesized

that people were rational and used their available information systematically, considering all aspects before undertaking a behavior. They suggested a theory called reasoned action (TRA) to clarify the relationship between actions and attitude. The theory of reasoned action claimed that behavior (conduct) is absolutely under intention control. As a result, this theory is limited to volitional behaviors, while behavior depends on other conditions like accessible resources, capabilities and skills. As a social-psychological model, TRA maintains that a people's actual (volitional) behavior is explicitly influenced by their behavioral intentions (Ajzen, 1991). This intention, in turn, is determined by subjective norms (i.e., the attitude of others toward the person's behavior) (Ajzen, 1991), assuming that behaviors are voluntary (Liao et al., 2007; Kaiser et al., 1999; king and Gribbins, 2002).

Nevertheless, a major criticism of TRA in the 1980s was the inadequacy of this theory to accept behaviors where individuals had incomplete volitional influence over them (Liao et al., 2007, Burton, 2004). In response to this criticism, Ajzen (1991) extended the theory of planned behavior (TPB). He considered the perceived behavioral control (PBC) construct to measure the extent to which people believe that the performance of their behavior is within their control. These controlling factors include internal and external aspects. Internal factors include abilities, skills, information, and feelings of a person, while external factors consist of environmental or occupational elements (Tavousi et al., 2009). According to the TPB, behavioral achievement can be directly predicted using perceived behavioral control and intention. Behavioral intention indicates the amount of a person's intention to perform the target behavior. Thus, the behavior follows the intention meaning the theory of behavior is just under the

control of behavioral intention (Conner and Armitage, 1998).

Kaiser (2006) argued that the more the behavior is influenced by external circumstances, the less it could be intentionally controlled. It means, because many behaviors pose difficulties on accomplishment that can constrain volitional control, it is useful to include perceived behavioral control as one of the model's components.

TPB was derived from the principle of reasoned action (Fishben and Ajzen, 1977), which argues that actual human behavior is directly guided by its behavioral purpose. However, the intentional control factor is neglected in previous models such as TRA. Therefore, the construct of perceived behavioral control was added in TBA to deal with situations in which people may lack complete volitional control.

Cognitive Components

Subjective Norms

Subjective norms indicate the social pressure perceived by an individual to perform or avoid the target behavior (Wauters et al., 2011). People normally behave based on their perception about the judgment of significant others and their intention to accept their behavior under the control of closely related others (Barati et al., 2011). From a sociological perspective, social impact refers to the influence of external social factors on individual behaviors, classified into the following categories: 1) normative social influence; and 2) informational social influence. Gifford and Anderson (2014) reviewed 18 personal and social factors influencing pro-environmental concern and behavior, in which norms were of those social factors, which affect the pro-environmental behaviors. Eriksson and Forward (2011) compared psychological predictors of the intention to travel in a pro-environmental manner. An expanded version of the TPB containing different

measures of social norms was employed. The results showed that subjective norms were an important factor, which means that the explained variance increased between 5% and 6% after adding social norms to the original predictors of TPB. Ghazali et al. (2019) explored six types of pro-environmental behaviors and investigated their attendance and interrelationship between two groups. The study extended the Value-Belief-Norm (VBN) theory by using social norms to predict pro-environmental behaviors. The results suggested that social norms predicted almost every type of pro-environmental behavior, in contrast to other constructs in VBN theory. The following hypothesis on social norms affecting behavioral intentions is formulated for this study, based on mentioned research.

Moral Norms

Although TPB has been successful for prediction of behavior, (Nigbur et al., 2010; Liao et al., 2007; Kaiser., 2006), its evolution continues, and numerous researchers have introduced different frameworks to match their field of study (Fielding et al., 2008; Burton, 2004). Moral norms are one of the fundamental socio-ecological factors generating behavioral intention (Bamberg, 2013), affecting how people make decisions (Bamberg and Moser, 2007) and contributing to people believe about rights and wrongs or DOs and DO NOTs (Simsekoglu and Lajunen, 2008). In this context, Kaiser (2006) claimed that behaviors aiming to conserve the environment are a form of moral action because being an environmentalist often means making decisions against one's self-interests. Adding moral norms to the model is crucial for understanding behaviors explained morally (Kaiser, 2006). Pro-environmental behaviors are moral behaviors; thus, the corporation of moral norms to TPB would be beneficial in this sense. This is why moral norms

were applied “moral norms to the TPB model in pro-environmental behaviors. Moral norms mediate people’s attitude, before it affects their intention. These are internal moral rules and values, motivated by anticipated self-administered, rewards or punishments (Arvola et al., 2009). Bissonnette and Contento (2001) have identified a link between moral norms and perceived responsibility, with the latter influencing both intention and behavior. Kaiser and Scheutle (2003) had previously found a moral norm to be a supplementary predictor of a person’s intention to act in support of conservation behavior (after attitudes, subjective norms, and perceived behavioral control).

Self-Identity

Self-identity is characterized as a label, used by people to identify themselves, and is expected to have a major impact on people’s behavioral intention (Cook et al., 2002). The concept of self-identity originated from Stryker’s identity theory; however, Sparks and Shepherd (1992) had confirmed before that self-identity influenced pro-environmental behavior. According to this theory, the self is a collection of social roles representing the extent to which people find themselves as necessary criteria for a particular social role. Stryker believes that the self is influenced by social structure leading to social behavior. Yazdanpanah (2011) argued that self-identity in TPB could be considered predictor variable of behavioral intentions associated with pro-environmental behaviors. The higher the value of pro-environmental actions is considered within an individual’s self-identity, the more likely it is to participate in such behaviours. For example, people who see themselves as traditional water conservationists are more likely to participate in a water management program than those who do not perceive themselves as such.

Attitude

Attitude towards behaviour is a positive or negative evaluation of behavioural performance consisting of two substructures: behavioural beliefs and the evaluation of behavioural outcomes triggering behavioural attitudes to be shaped (Sharma and Romas, 2011). It determines how people with certain behavior, assess the performance of their behavior from various perspectives reflecting as sustainable positive/negative emotions for certain individuals, things, and subjects (Newhouse, 1990; Dimara and Scuras, 1999; Berton, 2004; Kaffman, 2009). Stern et al. (1995) argue that behavior regarding the environment is significantly determined by particular environmental attitudes, which in turn, are based on people’s values, ideas, and worldviews about nature and environment. For example, in the context of water conservation behavior, consumers are likely to conserve more water in the future if they believe that water conservation matters.

Risk Perception

The variable of intention to risk was suggested in early 1940 when Night (1948) proposed it as an integral component of economic activities. Afterwards, risk has been used in several areas such as psychology (Kahn and Sarin, 1988), sociology (Douglas and Wildavsky, 1983), marketing (Bauer, 1960) and tourism (Kavter, 1998). Risk perception includes the mental processing of risk information and confronting mechanisms utilized by people in exposure to uncertain outcomes. There have been differences of opinion between experts on the seriousness of environmental problems, the need to manage environmental risks, and the (type of) measures that should be taken into account (Roe, 1996). Thus, both environmental policy and the perceived acceptability of environmental policy

are largely based on perceptions and risk judgments of society. Thus, risk perception has gained considerable importance, especially in pro-environmental issues (Beck, 1992; Stage and Sivers, 2000). These studies have shown that the individuals' intention and behavior concerning environmental behaviors, largely depends on their risk perceptions and judgments. Risk perception variables indirectly influence individuals' intentions and behavior by affecting their attitude (Kilic and Darvisoglu, 2013; Jeon et al., 2011; Siddique, 2013; Dumitrescu, 2011). This led us to incorporate risk perception as a component of our proposed model. Understanding the differences in risk perceptions and risk judgments could facilitate the design of effective environmental risk management strategies (Stege and Sievers, 2000).

Trust

Trust is a prominent determinant of the effectiveness of interpersonal relationships, group processes and societal relationships (Paton, 2008). Two aspects of trust are considered in terms of intentions to pro-environmental behaviour (Rousseau et al., 1998): 1) A desire to be exposed to other party's acts (i.e., water authority) and 2) positive views of someone else's behaviour (i.e., some are conserving water too). The first factor is the strength of a person's behavioural intention to hand over authority to another entity. However, the second facet is the degree to which one believes that another group can follow the widely agreed standard of environmentally sustainable conduct.

In terms of interpersonal trust, the more people feel that the other's behavior is aligned with friendly environmental action, the more they trust to do the same ((Lee, 1981; Lee and Warren, 1981); while institutional trust has relied on the level of individuals' trust to associated authority, which guides them how to behave (Lee,

1981; Lee and Warren, 1981). For example, Jorgensen et al. (2009) have developed an integrated social and economic household water consumption model, which places institutional trust as a central factor influencing household water-use decisions. The rationale behind the inclusion of trust into this model is that "trust in the water authority and others in the community (including different water user sectors, such as farmers, residents and industry), to take a step for environmental conservation, will increase the likelihood of taking action" (Jorgensen et al., 2009). Similarly, in 2005, according to an Australian study investigating trust in the water authority associated with consumption of drinking water quality, social bond, trust, and fairness were all interrelated predictors of acceptance, showing that social bond is important as the greatest predictor of consumer acceptance of drinking water quality (Ross, 2005). Alternatively, if the public considers the water utility to be untrustworthy, they are likely to be skeptical of and unreceptive to the utility of water conservation. Consequently, a general understanding of the public perception of the trustworthiness of environmental resources remains essential to the efficient and effective management of water conservation.

Non-Cognitive Components

It is criticized that these models cannot predict people's behaviour adequately due to the rationality of the TPB (and other reasoned action models) and their lack of considering non-cognitive variables. In other words, TPB cannot sufficiently predict behaviors of those who have incomplete volitional control over them (such as pro-environmental behaviors). This is because more automatic and unconscious processes, including habits or routines and emotions (Bamberg and Moser, 2007), govern many behaviors. TPB emphasizes the regulated aspects

of human information processing and the purpose of decision-making, driven by conscious self-regulatory processes. The following section addresses several non-cognitive determinants of pro-environmental behaviour, considering an involuntary aspect of behavior.

Habits

Although TPB has received substantial empirical support in explaining environmentally relevant behaviors, one of the key critiques is that it underrepresents the contribution of non-cognitive behavioral determinants (Russell and Fielding, 2010). One important non-cognitive determinant of pro-environmental behaviors is the resource using habits of consumers. Past behavior is the best predictor of future behavior, and more empirical evidence (Ajzen, 2011) has confirmed it. In the psychological literature, there is recognition that behavior is not always rational and reasoned yet is guided by automatic procedures (Abrahamse et al., 2009; Atkins, 2003; Sarabia-Sánchez et al., 2014; Marandu et al., 2010; Gregory and Di Leo, 2003), originating from continuous repetition of behavioral tendencies in similar situations (Ouellette and Wood, 1998). Many behaviors associated with environmental resources can be viewed as habitual actions due to their frequent performing. For example, people who have developed positive water-use habits in some particular activities (e.g., turning off taps while brushing teeth) may have negative habits in others (e.g., taking long showers), which can increase when repeated over time the amount of household water consumption. Han et al. (2015) integrated the role of green activity in the theoretical framework of the TPB. They concluded that this additional construct significantly influences guests' pro-environmental intentions. To pay more attention to unconscious mechanisms governing pro-environmental behaviors,

the habits have been added to the model as a representative of non-cognitive variables.

Emotions

Many studies have claimed that the less studied variable of emotions is an important determinant of participants' intention to pro-environmental behaviors. In these studies, the emotion variables have been introduced as complementary variables for the TPB model and are defined as reactions to an object or an event, including two aspects of feeling and a cognitive component (Forgas, 1994). We claim that the emotions are associated and already covered with the TPB model's attitude and subjective norms variables. Behavioral, normative and control beliefs (moral norms, subjective norms, perceived behavioral control and attitude) in the TPB are driven directly by emotions; they may be irrational and do not necessarily reflect reality. Beliefs reflect people's information concerning the performance of a given behavior, but this information can be false or incomplete, governed by their emotions. Although no matter how people acquire their behavioral normative and control beliefs, attitudes toward the behavior, and subjective norms and perception of behavioral control, people's behavior arises automatically and consistently from their beliefs (Geraerts et al., 2009). More so, their beliefs are shaped by the effect of their emotions.

Empirical Studies Supporting PEBT

In recent years, we have been developing PEBT by empirically studying the factors affecting pro-environmental behavior in various research related to water and the environment in different regions of Iran, applying the evolving perspective that underlies this theory (1). This research supports the adequacy of PEBT in explaining dimensions of behavioral logic in the water and environment sector. A summary of these research's characteristics

and relevant achievements is presented in Table 1. Our studies show the capability of the proposed theory in applying various issues related to water and the environment, along with the possibility of examining the impact of various components. The scale of PEBT is Another important aspect that

covers a range of scales from local (school, city, aquifer, etc.) to large scale (national and international), and it is possible to include different hydrological and political boundaries in the analysis and pathology of pro-environmental behavior reasons.

Table 1. Characteristics and main achievements of case studies using PEBT, adapted by the author

ID	Case study	Year	Scale	Subject	Result	Reference
1	Rafsanjan, Iran	2015	Local (Aquifer)	Rafsanjan farmers behaviors toward groundwater withdrawal	The ability of the proposed theory to evaluate the behavioral logic of farmers in groundwater withdrawal	(Hadi et al.,2017)
2	Qeshm Island, Iran	2016	Local (Island)	Rural community behavior toward wastewater reuse	High capability of the proposed theory in explaining the behavioral logic of people towards water reuse policies	(Farzaneh et al.,2016)
3	Toshan village, Golestan province, Iran	2017	Local (village)	Participatory management for surface water withdrawal	All components presented in Figure 1 affect water protection at the local level directly or indirectly.	(Yazarloo et al.,2021)
4	Aloboorz Province, Iran	2018	Medium (Province)	Students' behavior toward water consumption	Indirect and informal training programs designed to protect water have positively affected most components of behavioral logic such as attitudes toward water conservation, mental norms, perceived behavioral control, and moral norms.	(Farzaneh et al., 2023)
5	Aloboorz Province, Iran	2018	Medium (Province)	Students' behavior toward waste management	Indirect and informal training programs for waste management have positively affected most components of behavioral logic.	Authors' research
6	Arak aquifer, Iran	2019	Local (Aquifer)	Participatory management for groundwater withdrawal	The proposed theory had a high ability to explain the "lack of formation or failure of participatory organizations to manage groundwater resources" in the study area.	Authors' research
7	Shariar city, Tehran, Iran	2020	local (City)	Shahriar student's behavior toward water consumption	The proposed theory was highly capable of examining the behavioral logic of students towards the protection of water resources and evaluating the effect of age, gender and area of residence on water protection	Authors' research
8	Esmat school, Kermanshah, Iran	2021	Local (School)	Kermanshah-Esmat school students' behavior toward a green economy	Students had suitable behavioral logic concerning environmental technologies. Also, the proposed theory had a high ability to explain the level of behavioral logic and the roots of its formation.	Authors' research
9	Iran	2021	National (Iran)	Iranian students' behavior toward the green economy	The high level of students' behavioral logic towards green technologies and the roots of behavioral logic was explained using the proposed theory.	Authors' research

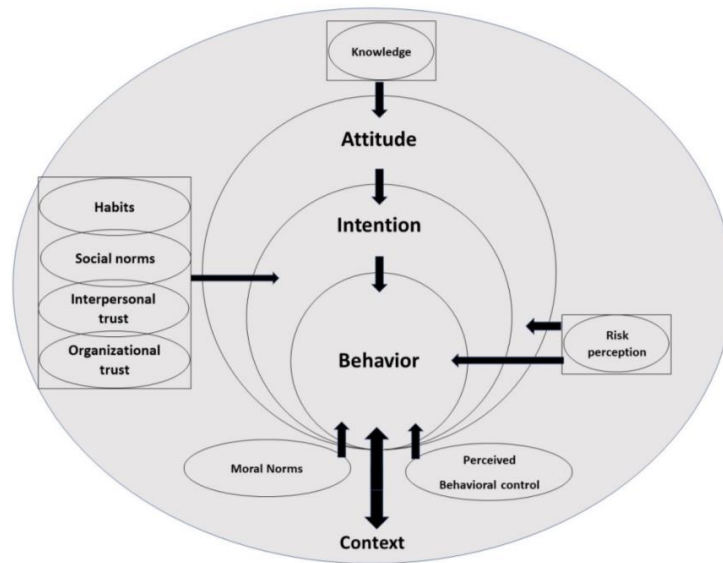


Fig 1. The proposed model for pro-environmental behaviors, adapted by the author

PEBT: Components and Interactions

The above-mentioned empirical field research achievements, along with the above-mentioned empirical field research achievements and our theoretical studies, have led to the formation of the theory presented in Fig. 1.

Conclusion

Efficient environmental conservation strategies require the identification of factors influencing consumers' behaviors leading to adverse environmental impacts. This study proposed a new comprehensive theory for predicting pro-environmental behaviors through developing PBET. Two general types of components affecting pro-environmental behaviors are proposed, including, 1) cognitive (including subjective and moral norms, self-identity, attitude, risk perception, and trust); and 2) non-cognitive (habits and emotions) in PBET. Attitude, moral norms, risk perception, and knowledge are included as representatives of attitudinal factors category to reflect norms, beliefs and values regulating people's behaviors about pro-environmental behaviors. Perceived behavioral control aspect is also considered

as representative of personal capabilities to represent how people think and believe about their personal abilities, constraints and limitations while undertaking/ or abandoning pro-environmental behaviors. Finally, trust (including interpersonal and organizational trust) and subjective norms are included as representatives of contextual or external forces reflecting how interpersonal influences can lead people to undertake pro-environmental behaviors. In addition to a comprehensive sight of components affecting pro-environmental behaviour, including intrinsic and extrinsic factors, PEBT has a systematic approach considering the feedback of pro-environmental behaviour into the general socio-cultural context.

We attempted to develop a more comprehensive theory that includes all required determinant variables for pro-environmental behavior. Being applied in future environmental behavior experiments, it is expected that this theory would prove to be experimentally adequate.

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