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Research Article

Explanation of Behavioral Intentions to Mitigate Climate Change with Protection Motivation Theory

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ABSTRACT

Climate change, which refers to the radical climatic changes that occur as a result of factors such as the release of various gases into the atmosphere, fossil fuel consumption, and industrial activities, is serious global concern. Food and water shortages, increased flooding, extreme temperatures, new epidemics, and economic losses are all threats posed by climate change. To mitigate the adverse effects of this phenomenon, some measures can be taken by all individuals. The study aims to investigate people's attitudes toward climate change by determining their behavioral intentions with a model based on Protection Motivation Theory (PMT). The behavioral intentions of individuals to prevent climate change were analyzed with the Structural Equation Model (SEM). The source of data is a questionnaire conducted in Türkiye with 526 people over the age of 18. The results reveal that people's threat and coping appraisals are effective in the formation of behavioral intentions to combat climate change and thus contribute significantly to protection motivation. Higher response efficiency and self-efficacy lead to higher levels of protection motivation. Threat and coping appraisal account for 65.3% of the total change in behavioral intentions.

Keywords: Climate Change, Protection Motivation Theory, Behavioral Intention, Environment, Structural Equation Model

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1. Introduction

Climate change is one of the most important factors that influence the future of humanity, with effects that are already being felt. Climate change, according to the World Health Organization, is the greatest threat to global health in the 21st century (World Health Organization, 2015). Food and water shortages, increased flooding, extreme temperatures, new epidemics, and economic losses are all threats posed by climate change. It has the potential to cause mass migrations and lead to wars over resources (Cattaneo et al., 2019).

Although there have been previous periods that caused climate change, the current developments are progressing faster and are not due to natural causes (Masson-Delmotte et al., 2019). To mitigate the adverse effects of this danger, some measures can be taken by all individuals. With the Paris Agreement in 2015, members of the United Nations have agreed to keep the average global warming below 2 °C as much as possible, and ultimately reach the target of 1.5 °C. Maintaining the average global warming that causes climate change at 1.5 °C depends on reducing carbon emissions by 2030 and achieving the zero-carbon condition by 2050 (Hilaire et al., 2019; Rogelj et al., 2015).

Studies would contribute to the efforts to mitigate the adverse effects of climate change by drawing attention to the issue. Regardless of the complexity of problems, in many cases, public awareness is the key to solving a problem. By guiding individuals to adopt environmentally friendly behaviors, great progress can be made to solve the problem.

The ability to measure adaptations of environmentally friendly behaviors of society and understand the dynamics that affect these adaptations would be a great advantage. Many different theories have been used to explain this phenomenon. One of them is Protection Motivation Theory (PMT). This theory proposes a mechanism to explain how fear and coping appraisals affect attitudes to health-related behaviors (Rogers, 1975). The perceived threat will trigger people's threat and coping appraisal processes (Maddux & Rogers, 1983). According to the theory, threat appraisal, which consists of perceived threat, perceived severity, and perceived vulnerability, along with coping appraisal, which consists of the response efficacy and self-efficacy variables, develop the protection motivation against the threat. The protection motivation, in turn, leads to the formation of behavioral intention.

Over time, the theory began to be used in many other fields besides the field of health. Related topics range from computer use safety to disaster preparedness (Chenoweth et al., 2009; Tang & Feng, 2018). PMT has also been used in studies explaining environmental behaviors (Rainear & Christensen 2017) and climate change mitigation behaviors (Bamberg & Möser, 2007; Bockarjova & Steg, 2014; Chen, 2020; Cismaru et al., 2011; Rainear & Christensen, 2017). The meta-analyses suggested that the increases in perceived severity, perceived vulnerability, response efficacy, and self-efficacy of PMT explain both the behavioral attitude and actual behavior (Floyd et al., 2000).

2. Protection Motivation Theory

The first version of the theory claimed that people's healthy behaviors and restraining themselves from bad habits depend on their appraisals related to the danger, and their perceived ability to cope develops the protection motivation, and thus, protection motivation initiates the behavior to protect themselves from dangerous habits (Rogers, 1975). Fear, according to this theory, does not cause behavior directly, but rather serves as a motivator to protect (Hagger et al., 2020). If the danger is not seen as severe, if the probability of being affected by the danger is low, or if the individual assumes that nothing can be done against this danger, the motivation to protect will not be felt; there will then be no change in behavioral intention (Rogers, 1975).

Fear assessment-based techniques have been employed in various situations, such as the utilization of nuclear attack shelters, tuberculosis prevention, dental health behaviors, and smoking cessation, to name a few (Higbee, 1969; Leventhal, 1970).

The theory has specific processes that explain the behavioral intention and the variables that create these processes. These processes are divided into two, as: Threat appraisal and coping appraisal. The coping appraisal is a mental representation of the "recommended" behavior towards the threat (Hagger et al., 2020). The combination of these two processes produces the protection motivation. Protection motivation here leads to behavioral intention. Intention is the most likely determinant of behavior (Hagger et al., 2020).

Structure of Protection Motivation Theory: Within the Protection Motivation Theory (PMT) scope, six different constructs, namely perceived severity, perceived vulnerability, rewards, response efficacy, self-efficacy, and response cost, are described below.

Perceived Severity: Perceived severity of danger is one of the factors that positively influence protection motivation. It refers to the severity that an individual assigns to the issue. If the subjective opinion is strong enough, it would lead to

the protection motivation. The opposite would contribute less to the protection motivation, reducing the individual's chance to develop the behavior.

Perceived Vulnerability: An individual may be aware of the consequences of the danger; however, they may assume that these consequences do not affect them severely. More perceived vulnerability leads to more protection motivation.

Perceived Rewards: In general, there are behaviors that are recommended to individuals. However, the number of individuals who do not practice these behaviors is quite high in many cases. Individuals may perceive that doing "recommended" behaviors are costly, time-consuming, or out of their reach. This leads to the "perceived reward" for not adopting these behaviors. In PMT, this variable negatively affects protection motivation.

Response Efficacy: According to the PMT, an individual's willingness to engage in recommended behaviors is also influenced by his or her belief that the recommended behaviors are useful in resolving the problem. This belief has an impact on protection motivation. The higher the response efficacy, the greater the individual's protection motivation.

Self-Efficacy: Acquiring recommended behaviors also depend on the individual's potential to adapt these behaviors. This variable relates to people's self-belief in their capacity to adapt these behaviors (Bandura, 1977). Higher self-efficacy leads to higher protection motivation.

Response Cost: An individual's performance of the suggested protective behavior also depends on the cost of the behavior. Lower response cost leads to more protection motivation.

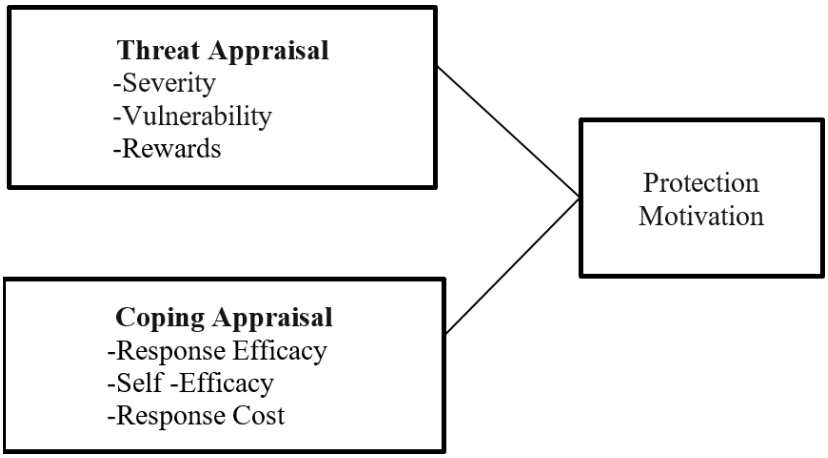

Figure 1. PMT Model

An individual generates protection motivation based on the above-mentioned variables. Protection motivation guides a person's intention to adopt the recommended behavior. Higher protection motivation leads to a higher likelihood of engaging in recommended behaviors. Protection motivation consists of a combination of threat appraisal and coping appraisal. It can direct a person toward healthy behavior, protection from disease, or protect an individual from a many potential threats (Hagger et al., 2020). Many PMT applications are based only on the main effects of perceived severity, perceived vulnerability, response efficacy, and self-efficacy (Chen, 2020; Kim et al., 2013; Plotnikoff & Higginbotham, 1995, 2002; Plotnikoff & Trinh, 2010).

In this study, behavioral intentions to prevent climate change have been explained based on the theory of protection motivation. The perceived severity of climate change and individuals' perceived vulnerability to this threat produce the threat appraisal process in individuals. Individuals' evaluations of the recommended behaviors' capacity to mitigate this threat and their ability to adapt to these behaviors develop response efficacy and self-efficacy, respectively. The coping appraisal process of an individual consists of response efficacy and self-efficacy. Coping and threat appraisal together lead to protection motivation, which in turn leads to behavioral intention. This mechanism was analyzed with a structural equation model. The study is the first of its kind in Türkiye to establish a structural equation model that considers environmental behavior within the framework of PMT. The conceptual structural equation model is shown in Figure 2.

The following two hypotheses were tested using the conceptual model.

H1: Threat appraisal positively affects behavioral intentions.

H2: Coping appraisal positively affects behavioral intentions.

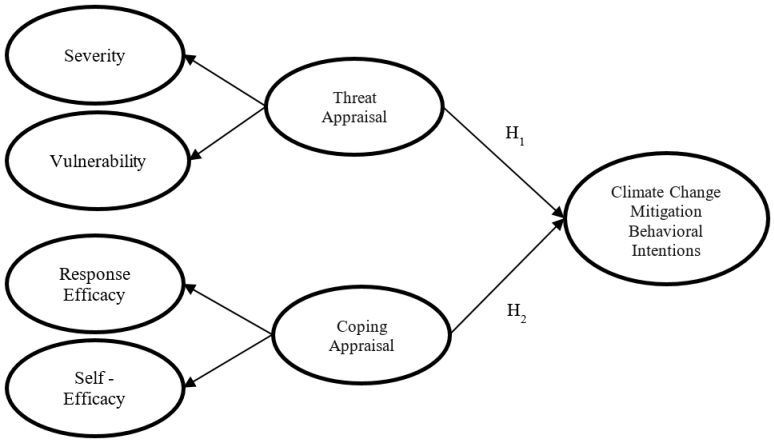

Figure 2. Conceptual Model

3. Literature Review

Many theories have been utilized to measure environmental behavior. The literature on PMT-based studies related to environmental behavior can be explored through various scopes, including different approaches to using PMT, integrating PMT with other behavior theories, and examining environmental behavior from a generalized or specific perspective. These approaches aim to address environmental sensitivity and can consider society as a whole or focus on different social groups. In this section, the review is organized based on the approach methods employed in these studies.

Some studies measured environmental behaviors with modified PMT. The study of Chen (2020) can be given as an example for such studies. In the study, two structural equation models based on PMT were established. The extended PMT model used the "Moral Obligation" variable. Adaptation of environmental behaviors was analyzed with these models (Chen, 2020).

There are PMT-based studies that approach environmental behaviors in general terms. Shafiei & Maleksaeidi (2020) developed a model based on PMT to measure the environmental behavior of the population. They concluded that the protection motivation variable explained a significant part of the variance of the environmental attitude and the environmental behavior. They also emphasize that the "self-efficacy" variable is very significant for the protection motivation. In a study, in which the environmental behaviors of people living in the cities of Hanoi and Ho Chi Minh were explained with a model based on PMT, it was concluded that the variables of self-efficacy and behavioral attitude were the variables that were significant for environmental behavior (Chi, 2021). Rainear & Christensen (2017) developed a model based on PMT and that the variables of perceived vulnerability, perceived severity, response efficacy, and self-efficacy positively affect the protection motivation. In another study, waste management behaviors in Thailand were analyzed with a model. It was concluded that the protection motivation is good at explaining low-cost and low-effort waste management behaviors, which could be explained with protection motivation variable (Janmaimool, 2017).

There are PMT-based studies that measure the environmental behaviors of individuals by comparing PMT with different behavioral theories that can measure environmental behaviors. PMT and Reasoned Action Theory were used to predict the environmental behavior of American and Korean students. As a result, the variables of self-efficacy, response-efficacy, and perceived severity have been shown as important in the prediction of environmental behavior (Kim et al., 2013).

Some PMT-based studies do not approach environmental behaviors in a generalized way, and instead focus on specific behaviors as representative of general environmental attitudes. Hunter & Röös (2016) conducted a study in Sweden on people's meat consumption in the scope of climate change mitigation behaviors. It was emphasized that people's meat consumption could be reduced by interventions that aimed to affect attitudes measured by the self-efficacy variable. In a study conducted in the Netherlands, a model based on PMT was used to analyze people's electric car demands in the scope of environmental behavior. Although the cost of using an electric car plays a decisive role, it has been concluded that the perceived severity and energy security risks play an important role in the demand of individuals for electric cars (Bockarjova & Steg, 2014).

Some studies have aimed to investigate environmental behaviors within a socio-economic context. The study conducted by Zhao et al. (2016) serves as an example, where they used a model based on the PMT to understand

the environmental purchasing behavior of consumers classified as "at the bottom of the pyramid" economically. As a result, it was concluded that individuals who have a high level of protection motivation, are willing to engage in low-cost environmental behaviors, and their willingness to engage in expensive environmental behaviors is related to the perceived threat. Adaptation of environmental behaviors can vary among social groups within a society. Some studies aim to investigate environmental behaviors using a social group-based approach. For example, Luu et al. (2019) and Bahahnan et al. (2019) conducted studies focused on measuring the adaptation of environmental behaviors among farmers. It was concluded that farmers would have a higher behavioral intention when they asses a high threat to their health, economy, production, social relationships, and psychology (Luu et al., 2019). In a study conducted in Gambia, it was emphasized that PMT variables were correlated with protection motivation, concluding that the response cost and perceived vulnerability variables were significant to understand the climate change mitigation behaviors of farmers in the region (Bagagnan et al., 2019).

The relationship between environmental pollution and the economy is a controversial issue. The tourism sector is particularly affected by environmental pollution. As a result, several studies have aimed to investigate the relationship between tourism and environmental behavior, a topic which has been receiving increased attention. In a study related to the relationship between tourist behaviors and environmental pollution, it was concluded that the perceived severity variable for the threat plays the largest role in the environmental behavior of tourists and their protection motivation (Ruan et al., 2020). In another study, the effects of climate change on the tourism sector were analyzed, with it being concluded that attitudes toward energy efficiency and carbon emissions could be explained by a model based on PMT (Horng et al., 2014).

4. Method

4.1. *Participants*

Participants consist of adults over the age of 18 living in Türkiye. The data used in the study were collected through online surveys conducted over the internet-based self-report survey, using the convenience sampling method, between April and May 2022. The study was approved by the Bursa Uludağ University Ethics Committee (4/25/2022). As is known, there is a direct correlation between the sample size and the reliability of the estimation. Considering the 95% confidence level and 5% margin of error for a population of one million or more, the sample size should be at least 384 (Bayram, 2018). This study was carried out with a total of 526 participants.

4.2. *Measures*

In the study, a questionnaire form containing questions related to socio-demographic information and scales related to PMT variables was used to collect the data. In the survey, four different constructs, namely perceived severity, perceived vulnerability, response efficacy, and self-efficacy, were discussed within the scope of the Protection Motivation Theory (PMT). These constructs were measured with the help of relevant scales. In addition to these four theoretical constructs, the questionnaire form included a scale of protection motivation and behavioral intentions to mitigate climate change. All of the scale items used in the study have a 5-point Likert-type rating, as "1-strongly disagree" and "5-strongly agree".

Climate Change Mitigation Behavioral Intentions: This variable aimed to measure individuals' behavioral intentions to mitigate the negative consequences of climate change. The nine-item scale was adapted from previous studies Brody et al. (2012), Kim et al. (2013), and Chen (2020). Some of the items used in the scale are as follows: "In order to reduce the negative consequences of climate change, I would like to replace old electrical appliances with energy-efficient ones" and "I would like to plant saplings in order to reduce the negative consequences of climate change." High scores on the scale indicate positive behavioral intentions to mitigate climate change.

Perceived Severity: In order to measure the perceived severity, a seven-item scale was used which has been adapted from previous studies (Champion, 1999; Rainear & Christensen, 2017, Shafiei & Maleksaeidi, 2020). The scale aimed to measure the individuals' perceived severity of environmental damage caused by climate change. Some of the items used in the scale are as follows: "Climate change is a serious problem for humanity," "Climate change is a serious problem for nature," and "The devastating impact of climate change for future generations is high." High scores on the scale indicate high perceived severity.

Perceived Vulnerability: This scale was used to measure perceived vulnerability. With the scale, the perceived vulnerability of individuals to the negative effects of climate change on the environment was measured with a total of eight items. The scale was adapted from previous studies (Rainear & Christensen, 2017, Shafiei & Maleksaeidi, 2020). Some of the items related to the scale used are as follows: "Climate change may affect me negatively," "I will

be exposed to the negative effects of climate change at some point in my life," and "I am vulnerable to the negative effects of climate change." High scores on the scale indicate a high perception of vulnerability.

Response Efficacy: This scale consists of five items in total. The scale was adapted from previous studies (Kim et al., 2013; Shafiei & Maleksaeidi, 2020, Rainear & Christensen, 2017). Some of the items used in the scale are as follows: "I can be protected from the devastating effects of climate change with the recommended measures," "Having environmental ethical values contributes to preventing environmental problems," and "Contributing to environmental activities increases the interest and contribution of other people." High scores on the scale indicate high response efficiency.

Self-Efficacy: The self-efficacy scale consists of a total of five items and was adapted from previous studies (Rainear & Christensen, 2017, Shafiei & Maleksaeidi, 2020). This scale was used to measure individuals' perceptions of their ability to successfully adapt recommended behaviors. Some of the items used in the scale are as follows: "There are simple things I can do to reduce the negative consequences of climate change" and "I can change my daily routines to combat climate change." High scores on the scale indicate high self-efficacy.

4.3. *Analysis*

In addition to descriptive statistics, Explanatory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), Reliability Analysis, and Structural Equation Modeling (SEM) were used to analyze the data. EFA and CFA were performed first, as all the scales were adapted by us. Furthermore, Cronbach's Alpha (CA) and Composite Reliability (CR) coefficients were calculated to examine the reliability, and Average Variance Extracted (AVE) values were calculated for the convergent validity of the scales. The evaluation of the results considered criteria such as CR and CA values above 0.70, AVE values above 0.50, and CR values greater than AVE (Fornell & Larcker, 1981; J. Hair et al., 2010).

The behavioral intentions of individuals to mitigate climate change were analyzed using Structural Equation Modeling (SEM) within the context of PMT. SEM analysis was used to analyze latent variables consisting of more than one item. SEM analysis is preferred because it considers the measurement errors for the variables. The goodness of fit of the CFA and SEM models in the study was evaluated using the following criteria: $\chi^2/df < 5$, Goodness of Fit Index (GFI) > .90, Tucker-Lewis Index (TLI) > .90, Bollen's Incremental Fit Index (IFI) > .90, Comparative Fit Index (CFI) > .90, Root Mean Square Error of Approximation (RMSEA) < .08, and Standardized Root Mean Square Residual (SRMR) < .10 (Kline, 2005; Raykov & Marcoulides, 2006).

IBM SPSS Statistics, AMOS version 26, and R Studio (RStudio Team, 2016) were used for analysis.

5. Findings

The study consisted of 526 people volunteers. The data were collected between April and May 2022 via an internet-based questionnaire in Turkish using the convenience sampling method. Participants were between the ages of 18-73 (Mean= 36.44 years, SD= 12.05).

Table 1. Descriptive statistics

Demographic	Frequency	Percentage
Gender		
Female	296	56
Male	230	44
Education level		
High school and below	83	16
University	320	61
Master's and doctorate	123	23
Marital Status		
Single	246	47
Married	280	53
Place of residence		
Urban	369	70
Rural	157	30
Economic status		
Low	104	20
Middle	396	75
High	26	5
Membership in environmental protection organization		
Yes	47	9
No	479	91
Talking about environmental issues in your family		
Yes	456	87
No	70	13

Among the participants, 56% were women, and 84% held a bachelor's degree or higher. Additionally, 47% of the participants were single, 70% resided in urban areas, and 75% belonged to the middle class. Although 91% of the participants were not members of an environmental organization, 87% stated that they discussed environmental problems with their family members. It is noteworthy to mention that the sample predominantly consisted of individuals with higher education.

The most severe environmental problems for participants are shown in Table 2. Unplanned urbanization was the most important environmental problem for participants. Air pollution is also one of the significant environmental problems.

Table 2. Environmental problems

Environmental Problems	**N**
Air Pollution	314
Water Pollution	247
Noise Pollution	115
Decline of Plant and Animal Species	181
Erosion	32
Unplanned Urbanization	387
Forest Fires	196
Environmental Pollution	33
Other	28

Validity and reliability tests were conducted. In order to accomplish this goal, EFA and CFA were applied. The EFA, CFA, goodness of fit indices, and reliability results are shown in Table 3 below.

Table 3. Exploratory and confirmatory factor analysis results of all scales

Scales	**Items**	**EFA**	**CFA**		**Scales**	**Items**	**EFA**	**CFA**
Vulnerability	Vul1	.851	.820		**Severity**	Sev1	.942	.904
	Vul2	.904	.874			Sev2	.943	.901
	Vul3	.927	.908			Sev3	.951	.916
	Vul4	.764	.727			Sev4	.809	.777
	Vul5	.920	.920			Sev5	.941	.946
	Vul6	.896	.894			Sev6	.949	.955
	Vul7	.830	.784			Sev7	.916	.907
	Vul8	.916	.893		**Response Efficacy**	Ref1	.756	.664
Behavioral Intentions	BInt1	.824	.763			Ref2	.854	.805
	BInt2	.892	.878			Ref3	.875	.856
	BInt3	.883	.900			Ref4	.894	.887
	BInt4	.934	.936			Ref5	.851	.803
	BInt5	.926	.941		**Self - Efficacy**	Sef1	.890	.882
	BInt6	.902	.922			Sef2	.912	.895
	BInt7	.716	.627			Sef3	.894	.882
	BInt8	.829	.761			Sef4	.790	.658
	BInt9	.750	.655			Sef5	.906	.855

Extraction Method: Principal Component Analysis.
Vulnerability scale: KMO=.936; Chi-Square: 4466.285; df:28; p<.000
Severity scale: KMO=.934; Chi-Square: 5283.555; df:21; p<.000
Response Efficacy scale: KMO=.880; Chi-Square: 1614.430; df:10; p<.000
Self-Efficacy scale: KMO=.881; Chi-Square: 2089.406; df:10; p<.000
Behavioral Intentions scale: KMO=.934; Chi-Square: 4837.535; df:36; p<.000

The perceived vulnerability scale ranged from 0.58 to 0.86, with a variance of 77%. The perceived severity scale ranged from 0.66 to 0.90, with a variance value of 85.14%. The response efficacy scale ranged from 0.57 to 0.79, with a variance value of 71.82%. The self-efficacy scale ranged from 0.62 to 0.83, with a variance value of 77.32%. The behavioral intentions scale ranged from 0.51 to 0.87, with a variance of 72.89%. The reported variance values are presented for one dimension. The goodness-of-fit indices for the scales are shown in Table 4. All scales were shown to have a perfect fit.

Table 4. The goodness of fit indices for scales for confirmatory factor analysis

Scales	X^2/df	df	p	GFI	TLI	IFI	CFI	RMSEA	SRMR
Severity	3.912	11	.00	.98	.99	.99	.99	.07	.00
Vulnerability	3.843	17	.00	.97	.98	.99	.99	.07	.01
Response Efficacy	3.753	5	00	.99	.98	.99	.99	.07	.01
Self-Efficacy	2.825	3	.04	.99	.99	.99	.99	.05	.00
Behavioral Intentions	4.183	22	.00	.96	.98	.99	.99	.07	.02
Acceptable level	≤ 5			≥ 0.90	≥ 0.90	≥ 0.90	≥ 0.90	≤0.08	≤0.10

Source: (Bayram, 2016; Byrne, 2010; J. F. Hair et al., 2010; Hu & Bentler, 1999)

Table 5. Values of reliability, convergent and discriminant validity

	Scales	Items	Mean	SD	CA	CR	AVE
Protection Motivation	Severity	7	30.48	6.16	.97	.97	.81
	Vulnerability	8	33.45	6.80	.96	.96	.73
	Response Efficacy	5	19.31	3.99	.90	.90	.65
	Self-Efficacy	5	19.59	4.25	.93	.92	.70
	Behavioral Intentions	9	37.03	7.57	.95	.95	.69

The results in Table 5 above indicate that all scales have good internal consistency. In addition, all the calculated AVE values were found to be above 0.50 and the CR>AVE condition was met. This result indicates that the scales provide convergent validity.

Table 6. Factor Loadings for SEM

						95% Confidence Interval		Standardized Estimate
Latent	Indicator	Estimate	Std. Error	z-value	p	Lower	Upper	
S	Sev1	1.000	0.000			1.000	1.000	0.935
	Sev2	0.960	0.024	40.273	< .001	0.913	1.007	0.925
	Sev3	0.979	0.023	42.716	< .001	0.934	1.024	0.940
	Sev4	0.949	0.038	24.707	< .001	0.874	1.024	0.769
	Sev5	1.011	0.024	41.556	< .001	0.963	1.058	0.933
	Sev6	1.036	0.024	43.742	< .001	0.990	1.082	0.945
	Sev7	0.994	0.027	36.813	< .001	0.941	1.047	0.901
V	Vul1	1.000	0.000		< .001	1.000	1.000	0.839
	Vul2	0.991	0.037	26.716		0.918	1.064	0.886
	Vul3	1.030	0.037	28.043	< .001	0.958	1.102	0.909
	Vul4	0.881	0.045	19.375	< .001	0.792	0.970	0.722
	Vul5	1.039	0.037	28.359	< .001	0.967	1.111	0.914
	Vul6	1.039	0.039	26.956	< .001	0.964	1.115	0.889
	Vul7	0.946	0.044	21.551	< .001	0.860	1.032	0.777
	Vul8	1.022	0.038	27.072	< .001	0.948	1.096	0.891
RE	Ref1	1.000	0.000		< .001	1.000	1.000	0.665
	Ref2	1.170	0.071	16.559		1.032	1.309	0.820
	Ref3	1.210	0.071	17.026	< .001	1.071	1.350	0.849
	Ref4	1.280	0.073	17.474	< .001	1.136	1.423	0.877
	Ref5	1.238	0.076	16.379	< .001	1.090	1.386	0.809
SE	Sef1	1.000	0.000		< .001	1.000	1.000	0.872
	Sef2	0.963	0.033	29.142		0.899	1.028	0.896
	Sef3	0.990	0.036	27.618	< .001	0.919	1.060	0.873
	Sef4	0.800	0.041	19.668	< .001	0.721	0.880	0.716
	Sef5	0.944	0.034	27.597	< .001	0.877	1.011	0.872
TA	S	1.000	0.000		< .001	1.000	1.000	0.907
	V	0.942	0.047	19.954		0.849	1.034	0.896
CA	RE	1.000	0.000		< .001	1.000	1.000	0.883
	SE	1.381	0.097	14.246		1.191	1.571	0.900
BI	BInt1	1.000	0.000		< .001	1.000	1.000	0.765
	BInt2	1.057	0.038	27.735		0.982	1.132	0.879
	BInt3	1.114	0.048	23.168	< .001	1.020	1.209	0.900
	BInt4	1.137	0.047	24.450	< .001	1.046	1.229	0.935
	BInt5	1.137	0.046	24.731	< .001	1.047	1.227	0.943
	BInt6	1.146	0.048	23.822	< .001	1.052	1.240	0.919
	BInt7	0.927	0.061	15.298	< .001	0.808	1.046	0.635
	BInt8	1.061	0.056	19.004	< .001	0.951	1.170	0.766
	BInt9	0.946	0.059	16.117	< .001	0.831	1.061	0.665

Table 7. Regression coefficients for SEM

						95% Confidence Interval		Standardized Estimate
Predictor	**Outcome**	**Estimate**	**Std. Error**	**z-value**	**P**	**Lower**	**Upper**	
TA	BI	0.416	0.071	5.872	< .001	0.277	0.554	0.431
CA	BI	0.557	0.103	5.414	< .001	0.356	0.759	0.415

Table 8. The goodness of fit indices for SEM

Index	Value
Goodness of fit index (GFI)	0.947
Tucker-Lewis Index (TLI)	0.950
Bollen's Incremental Fit Index (IFI)	0.954
Comparative Fit Index (CFI)	0.954
Root mean square error of approximation (RMSEA)	0.059
RMSEA 90% CI lower bound	0.056
RMSEA 90% CI upper bound	0.063
RMSEA p-value	0.000
Standardized root mean square residual (SRMR)	0.033

The factor loads of the whole model are provided in Table 6 above. The estimates for the regression coefficients as a result of the estimated structural equation model are also presented in Table 7. The Chi-square test statistic of the model was obtained as 1454.649 (df: 513; p<.001 and x^2/df=2.835). In terms of structural equation model, a value of R^2=0.653 for climate change mitigation behavioral intentions was obtained. On the other hand, 65.3% of the total change in behavioral intentions was explained by threat appraisal and coping appraisal. Behavioral intentions were significantly, directly, and positively associated with threat appraisal and coping appraisal (β=0.416; p<0.001 and β=0.557; p<0.001, respectively). The goodness of fit indices obtained for the structural equation model are summarized in Table 8. According to the results in this table, the model is a good fit.

6. Discussion

The PMT was used in this study to explain people's behavioral intentions to mitigate climate change. The theory has been shown to greatly explain behavioral intentions to mitigate climate change. The results were found to be statistically significant, with both of our hypotheses (H1 and H2) being confirmed. The results indicate that individuals' coping appraisal was most effective in explaining behavioral intentions to mitigate climate change. One single theory may not be sufficient to fully explain people's behaviors. However, the PMT model has been proven an effective tool for understanding people's environmental behaviors.

The SEM analysis results indicate that both the threat appraisal and coping appraisal contribute to the protection motivation, which initiates behavioral intentions. The potential of the theoretical framework of PMT as a tool to be used in environmental research has been demonstrated in studies approaching the subject from different perspectives. The statistical findings in this study reveal that PMT has the potential to be used as a theoretical foundation in environmental research. This finding is similar to findings found in the literature (Bockarjova & Steg, 2014; Chen, 2020; Regasa & Akirso, 2019; Zhao et al., 2016). The results of our study are also consistent with the results of various environmental studies (Bamberg et al., 2020; Chen, 2020; Rainear & Christensen, 2017). In the meta-analysis of Floyd et al. (2000), the explanatory power of the coping appraisal was found to be higher than the threat appraisal. This is consistent with this study. In several other studies on environmental behaviors, it has been found that the self-efficacy variable has high explanatory power (Almarshad, 2017; Chi, 2021; Hunter & Röös, 2016; Shafiei & Maleksaeidi, 2020; Thøgersen & Grønhøj, 2010). The findings of this study do not conflict with the findings of the related studies. If individuals have higher response efficacy and self-efficacy to perform recommended behaviors, a higher level of coping appraisal would enhance their protection motivation.

7. Conclusion

The PMT model provides a useful theoretical framework for explaining people's behavioral intentions to mitigate climate change. Recommended behaviors initiated by the protection motivation would occur with the threat appraisal and the coping appraisal. According to the research findings, individuals' coping appraisal was most effective in explaining behavioral intentions to mitigate climate change. Therefore, government and environmental organizations should provide people with relevant information to initiate threat assessments and explain the seriousness of the consequences of climate change and their vulnerability to this threat. They should also provide education on coping with climate change and convince individuals of the effectiveness of recommended behaviors. In this way, individuals' performance in coping with climate change will improve. PMT-based tools can be used to measure the effectiveness of processes aimed at promoting environmental behaviors. In conclusion, this paper has contributed to the existing literature. Therefore, it can be used to guide future research on understanding social factors that affect climate change mitigation efforts. It can also help academics to expand their research by including more potential elements. In future studies, measuring the effectiveness of PMT in explaining environmental behaviors in comparison with other theories will provide valuable contributions to the existing literature.

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

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