Pol. J. Environ. Stud. Vol. XX, No. X (XXXX), 1-13
DOI: *10.15244/pjoes/200223* ONLINE PUBLICATION DATE:

Original Research

Decarbonizing Transport Sector: Exploring the Environmental Drivers of New Energy Vehicle Adoption for Cleaner Ecosystems

Xinyue Zhang[1], Xintong Guo[2]*, Bader Alhafi Alotaibi[3], Mohsin Riaz[4]**

[1]Business School, Hohai University, Nanjing 211100, Jiangsu, China
[2]College of Materials Science and Engineering, Nanjing Tech University, Nanjing 211816, Jiangsu, China
[3]Department of Agricultural Extension and Rural Society, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia
[4]Institue of Agricultural and Resource Economics, University of Agriculture, Faisalabad, Pakistan

Received: 26 October 2024
Accepted: 17 January 2025

Abstract

Environmental pollution is a serious threat to human existence, and the prime objective of governments is to decrease carbon emissions in each sector of the economy. New energy vehicles (NEVs) have the potential to alleviate the severity of significant environmental pollution and climate change concerns. However, despite government efforts, the market share of NEVs is still in the nascent stage compared to that of traditional vehicles. This study empirically investigates the role of environmental concerns (ENC), green purchasing behavior (GPB), and environmental attitudes (ENT) in NEV adoption intentions to decrease environmental pollution in the transportation sector. For this purpose, data were collected from 465 NEV consumers through face-to-face surveys in ten Chinese cities through purposive sampling. The PLS-SEM econometric approach was used to analyze the collected data. The findings revealed the significant positive impact of ENC, GPB, and EAT on the adoption intentions of NEVs. The EAT and GPB also have a strong mediating role in the relationship between ENC and the adoption intentions of NEVs, demonstrating that the ENC strongly enhances the adoption intentions of NEVs through EAT and GPB. Moreover, the study also found a strong positive impact of perceived knowledge, risk, and value of NEVs on the adoption intentions of NEVs. Educating people about the usefulness of improving environmental quality can enhance the adoption of NEVs in China. Moreover, TV shows and social media reports on the environmental benefits of NEVs can also encourage their adoption.

Keywords: new energy vehicles, carbon emission, environmental sustainability, environmental pollution, environmental concerns

*e-mail: xtg@njtech.edu.cn
**e-mail: balhafi@ksu.edu.sa

Introduction

The transportation sector is one of the largest consumers of unsustainable energy sources, resulting in large volumes of carbon emissions and other atmospheric pollutants. Transport is estimated to contribute 25% of global carbon dioxide (CO_2) emissions, which is expected to increase two-fold by 2035 if no measures are instituted [1]. Therefore, global environmental sustainability depends largely on reducing carbon emissions in the transport sector [2]. Most environmental pollution emissions come from light-duty vehicles, including passenger cars and small pickup trucks [1]. New energy vehicles (NEVs) can be viewed as a solution to transport decarbonization and achieving carbon neutrality targets, as they significantly decrease the emissions of CO_2 [3]. An increase in NEV ownership influences global CO_2 mitigation goals [4]. Global NEV ownership is expected to reach 150 million by 2030 [5].

Safer, cleaner, and more efficient transport sectors are vital for environmental sustainability and sustainable economic development. The transition to NEVs through decarbonization, supported by renewable energy, will complement the government's sustainable development plans. Environmentally friendly transport sectors such as NEVs are economical because they demand a small amount of energy for movement relativity. This reduces air pollution, thereby improving the environmental quality of the air in the surroundings. If the power used to recharge NEVs comes from renewable sources instead of fossil-based sources, this could help to reduce carbon emissions, which forms a solution to global warming [6]. The addition of each NEV contributes to reducing the demand for fossil resources and decreasing environmental pollution.

Compared to traditional vehicles, the various benefits of NEVs include carbon credits, energy security, and clean energy benefits [7]. Realizing these advantages, governments from across the globe have come up with incentives as well as subsidy programs for the adoption of NEVs. For example, the UK government intends to finance the construction of charging points for NEVs and fund consumers and NEV auto manufacturers [8]. The US government has also implemented monetary incentive policies such as federal income tax credits for endorsing NEVs, in addition to exempting sales tax and reducing licensing fees to popularize the use of NEVs [9]. The Japanese government has also used a free-charging policy to encourage more consumers to consider using NEVs to reduce carbon emissions and environmental sustainability [10].

NEVs have become critical for addressing China's current environmental and energy issues. Moreover, it has been revealed that the NEV industry is one of the strategic emerging industries in China [11]. Currently, the NEV manufacturing industry is growing rapidly, with China at the forefront of research on NEVs, followed by America and the United Kingdom [12]. NEV production and sales in China have increased more than twofold, but their share in the automobile industry is still very low. Despite representing a small portion of the market, the shifting of a large market share to NEVs resonates with the great development prospects of this industry in China, indicating that NEVs will also form a base for the automotive industry, thus displacing traditional vehicles [13].

Existing literature indicates that consumers' perceptions and individual characteristics significantly influence NEV adoption [14]. Despite the plethora of studies analyzing the factors affecting NEV adoption, the literature has often overlooked the diverse and heterogeneous characteristics of the NEV market. Few studies have investigated the extensive range of factors associated with NEV adoption that vary from nation to nation and across cultures [15]. For example, Rezvani et al. studied the psychological factors affecting NEV adoption, while Coffman et al. explored technological, financial, and social influences. Li et al. [16] examined various situational, demographic, and psychological factors affecting NEV adoption. Alberini et al. [17] stated that consumer willingness to transact for NEVs could attract different motivating factors, including economic factors. However, McLeay et al. [18] opined that knowledge of NEV vehicles may improve consumption trends.

However, significant questions remain: Why do consumers decide to purchase NEVs? What factors are involved in consumer behavior, and how do they impact consumers' purchase behavior of NEVs? Moreover, how can appropriate intervention policies be formulated to encourage NEV consumption and reduce environmental pollutants? To date, these issues have not been adequately explained in the theoretical and empirical literature. Multiple interventions are essential here because overlooking the tactics' connection with both consumer psychological processes and the external environment would be counterproductive, given the inherently oppositional nature of promotions. Even though consumers may point towards such technical deficiencies when it comes to NEVs, such deficiencies have been overcome by research and development [19]. Therefore, new research should focus on the psychological characteristics of consumers' NEV purchasing decisions to control environmental degradation [20]. Psychological attributes are different sets of constructs that may be employed to account for this green behavior [19].

This study covers a theoretical model established from a questionnaire survey of the factors affecting decisions concerning NEVs to protect the environment. It primarily aims to establish a link between environmental concerns (ENC) and green purchasing behavior (GPB), which may affect NEV adoption intentions (AIN). Moreover, the study also aimed to investigate the mediating role of GPB between ENC and NEV adoption intentions. This study provides a

reference for policymakers in planning environmental sustainability and green development strategies.

Theoretical Background and Hypotheses Development

Several studies have been conducted on the factors affecting adoption intentions. This section summarizes the relevant literature and presents the hypotheses. This section is divided into six subsections discussing the relationships between ENC, GPB, PKN, PRI, EAT, PVA, and AIN of NEVs.

Environmental Concerns (ENC)

Environmental degradation seriously threatens human existence; therefore, global awareness is also increasing [21]. ENC can be defined simply as the state of public awareness regarding environmental matters, which may comprise attitude, recognition, and response towards environmental matters [22]. Previous studies have considered that ENC are directly related to people's environmentally friendly attitudes and behaviors [23]. A high level of ENC is expressed through a positive attitude toward purchasing green products and participation in environmental protection activities [24]. Maniatis [25] showed that consumers' pro-environmental behavior improves their intention to expand other products. Numerous studies have established that ENC affects consumer attitudes and purchase intention regarding products in the spheres of the green economy, such as NEVs [26]. NEVs have numerous economic, social, and environmental benefits, such as maintaining the future transport economy, shifting the present oil-based transposition technique, enhancing traffic flow, limiting the use of personal cars, and reducing pollution [27]. Consequently, people with ENC have a positive attitude and a high willingness to use NEVs. Public ENC can affect environmental actions by enhancing environmentally friendly purchases [28]. ENCs are considered the most important factor motivating people to buy green products. Thus, we propose the following hypotheses:

H1: ENC positively affects consumers' AIN.

Green Purchasing Behavior (GPB)

GPB refers to the purchase of environmentally friendly goods and the rejection of those that are damaging to the environment. GPB intentions may be defined as consumers' propensity to buy green products. Perceived intention relates to consumers' willingness to engage in GPB [29]. GPB, in fact, is a form of ethical decision-making behavior and is referred to as a form of proper social behavior. This consumer 'engages in sustainable consumption and looks at the social impact of consumption as a consumer and openly aims at using his/her power as a consumer towards other social change' [30]. A green product aims to reduce environmental degradation compared with its traditional competitors [31]. In general, green product materials are safer for the environment, can be recycled, and require less packaging. Examples of green products include organic foods, energy-saving lamps, and NEVs.

Environmental pollution is a multi-faceted problem. The green behavior of individuals indicates a shift towards environmental preservation [32]. The growth of environmental awareness has been shown to improve behavior towards green purchasing, such as recycling, saving energy, and using environmentally friendly products [33]. However, there is a potential for green behavior to generate even more impact on demonstration and collective actions. Thus, realizing that an increasing number of people are highly involved in environmental problems, the total scale of environmental consciousness and protection in society will grow undeniably. Consumers who possess a favorable perception of green products will believe that the benefits of purchasing a particular product will make it worthy of their time. They will likely be content with what they have bought [34]. Similarly, previous studies have also indicated that people generally hold positive perceptions about the ownership of NEVs [35]. Consumers who perceive green behavior in general are also more likely to buy these vehicles [36]; therefore, it is hypothesized that consumers' green purchase behavior influences their green purchase intention. Based on these arguments, the following hypothesis is proposed.

H2: GPB in daily life is likely to affect consumers' AIN.

H2a: GPB in daily life is likely to mediate the relationship between ENC and consumers' AIN

Environmental Attitude (EAT)

Individuals' attitudinal predisposition refers to the overall assessment, either affirmative or negative, of emotions and regards towards an idea or thing [37]. There are two types of attitudes: explicit and implicit. Self-reported measures of EAT are also very easy to obtain, can be self-administered, and are conveniently measured by questionnaire surveys [34]. However, there are ways of thinking outside of conscious awareness that only require an immediate response to a stimulus. This needs to be measured by experimental research design [38]. Through the positive effect of products, consumers' attitudes influence them to develop their ecological purchase intentions [39]. Literature in the area of environmental analysis has revealed a pluralistic, positively held attitude towards the environment and environmentally friendly products [34]. Scientific research has established that EAT positively affects GPB, which is determined by the level of intention [40-41]. Therefore, this study assumes:

H3: EAT significantly affects consumers' AIN.

H3a: EAT significantly mediates the relationship between ENC and consumers' AIN.

Perceived Knowledge (PKN)

The major challenge for the low use of NEVs is ignorance of the technology [42]. Potential NEV users may be aware of these vehicles' main characteristics and related technologies. Furthermore, a reduction in carbon emissions without introducing additional costs has been confirmed in the literature [43]. Further, scholars have claimed that environmentally conscious individuals are likelier to adopt NEVs and always express a willingness to pay more for these vehicles to reduce environmental pollution [44]. However, the overarching knowledge of consumers is not as much regarding NEVs, which could have been the reason for consumers' choice of this particular NEV. Thus, the misunderstandings would most definitely persist [45]. Earlier research highlighted that general awareness about environmental goods and services is a significant variable that captures their specific interest [46-47]. Consequently, they influence people's pro-environmental behavior either directly or indirectly [48]. Thus, to comprehend various elements associated with using NEVs, information about this technology and its attributes may be critical to determine its NEV adoption among consumers. Based on the above discussion, the following hypothesis was postulated:

H4: Consumers' PKN of NEVs can significantly affect their AIN.

Perceived Risk (PRI)

PRI is individuals' self-perception of accepting new technology, which is consumers' subjective feelings with their purchase intention regarding NEVs [49]. However, low consumer adoption of recent products or services occurs due to objective self-preservative motive consumer expectation cost [50]. The argument is that the higher the consumers' perception of risk concerning newer technology, the lower the perceived positive value from their perspective about innovative offerings [51]. Based on this perspective, the literature points to the fact that users' PRI of innovative technology is basically a kind of doubt or apprehension factor mainly associated with financial loss and utility risk factors when they decide to accept modern technology or when purchasing innovative goods like NEVs to meet mobility demands. Wang et al. [52] also state that PRI is also being highlighted as one of the key factors that will make people reject online banking or e-shopping behavior. Zhang et al. [53] found an indirect negative relationship between risk perception and attitude towards NEVs. From the above discussion, the present study postulates that higher PRI will decrease their preference for NEVs. Thus, the following hypothesis is proposed:

H5: PRI of NEVs has a significant relationship with AIN.

Perceived Value (PVA)

Consumer value acquisition is considered the most fundamental, along with the ultimate goal of transaction behavior [54]. From a marketing perspective, consumers' PVA is related to how much consumer value is the key determinant of organizational competitive advantage and consumer behavior [55]. Qualitative and quantitative studies of consumer behavior have supported consumers' positive PVA as one of the main antecedents of consumer purchasing behavior [56]. PVA, from a monetary angle, is the amount the consumer would be willing to pay on average minus the actual cost [57]. PVA is also defined as the additional belief of the social self that a product with special importance results from its purchase [58]. Further, from the benefit perspective, Zeithaml [59] categorically defined PVA as the consumer's total impression of what they receive as well as what they relinquish.

Accordingly, we define the PVA of adopting NEVs as consumers' overall evaluation of NEV adoption based on perceived returns and cost. Therefore, this study proposes the following hypothesis:

H6: PVA has a significant relationship with AIN.

H6a: PVA mediates the relationship between ENC and consumers' AIN.

Materials and Methods

This study uses a cross-sectional quantitative approach to collect data from NEV consumers. The intended population of this study was Chinese consumers who intended to buy an NEV or already had an NEV. This study uses a survey instrument to collect data from NEV consumers in China. The survey instrument was prepared by taking insights from relevant literature and field experts. The indicators of PKN of NEV were adapted from Jaiswal et al. [60] and Degirmenci and Breitner [61]. Similarly, constructed items for the PRI were adapted from Qian and Yin [62] and Li et al. [63]. The indicators of the PVA of NEVs were adapted from Kapser and Abdelrahman [64] and Venkatesh et al. [65]. The measurement items for the ENC construct were adapted from the study by Adnan et al. [66]. The measurement items for GPB and EAT were constructed with the assistance of experts in the field. Similarly, the adoption intention construct items were adapted from Han et al. [67].

All the above constructs were measured on a five-point Likert scale with answers "strongly agree = 5" and "strongly disagree = 1." To evaluate the content validity of the questionnaire, four academics and five industry

professionals working in the automobile sector were consulted prior to the survey. Subsequently, a face-to-face survey with respondents was conducted to check the face validity of the questionnaire. Feedback from the preliminary survey allowed for the adjustment of some of the items in the questionnaire. The findings were presented to field experts, and changes were made, such as deleting some items, changing the wording of items, and adjusting themes.

Owing to the unavailability of the vehicle owner list publicly, the data collection team, consisting of male and female enumerators, sought help from the Auto 4S shops in these 10 cities of China for data collection. The data collection team randomly selected six auto 4S shops from each city to obtain a representative sample for this research. The research team sent out the questionnaires to 60 auto 4S shops, introducing the purpose of the research and asking whether they could help us complete this survey. Altogether, 39 4S auto shops confirmed their willingness to respond to the survey. The research team posted 50 printed questionnaires to the agreed person of each Auto 4S shop, and then that person of the Auto 4S shop distributed these questionnaires to their customers. To ensure that data collection was timely and useful, respondents were encouraged to fill out the questionnaire at their earliest convenience after receiving it in the showroom and return it to the agreed person once they were completed within the given time. Thus, data from 534 NEV consumers were collected. After receiving the questionnaire, the filled questionnaires were thoroughly checked, and only complete questionnaires in all respects (465) were used for further data analysis. The collected data were analyzed using partial least squares structural equation modeling (PLS-SEM) as recommended in prior research [68-69].

Results

Validity Assessment of Measurement Model

Assessing the Internal Reliability of Items or Indicators

First, assessing the reliability of the items or indicators used to measure the respective construct is the most important, as it indicates how strongly the individual items are linked with the underlying construct. For this purpose, factor loadings (FL) were measured, and an FL score higher than the threshold level indicated the reliability of the items to be included in the measurement of the underlying construct. Cheung et al. [70] state that a reliable item of a construct must secure a value of FL greater than 0.70. A similar approach has been used by Su et al. [71]. It is necessary to remove those items with FL less than 0.70 [72]. Therefore, the values of FL for each item of all constructs are greater than 0.70, demonstrating that all items have a strong and reliable link with their underlying construct (Table 1).

Table 1. Reliability assessment of individual items.

Constructs and indicators	Factor loading
Perceived knowledge (PKN)	
PKN1	0.875
PKN2	0.844
PKN3	0.823
Perceived risk (PRI)	
PRI1	0.888
PRI2	0.876
PRI3	0.843
PRI4	0.829
PRI5	0.812
Perceived value (PVA)	
PVA1	0.921
PVA2	0.878
PVA3	0.856
PVA4	0.833
PVA5	0.829
Environmental concerns (ENC)	
ENC1	0.874
ENC2	0.859
ENC3	0.836
ENC4	0.828
ENC5	0.817
Environmental attitude (EAT)	
GT1	0.838
GT2	0.823
GT3	0.811
Green purchasing behavior (GPB)	
GPB1	0.854
GPB2	0.839
GPB3	0.825
GPB4	0.819
Adoption intention (AIN)	
AIN1	0.844
AIN2	0.837
AIN3	0.829

Reliability and Consistency Assessment of all Constructs

Table 2 provides the outcomes of Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), and FL; all these variables provide robust

Table 2. Outcomes of validity assessment.

Latent variables	CA*	CR	AVE
PKN	0.825	0.862	0.676
PRI	0.812	0.882	0.600
PVA	0.849	0.893	0.626
ENC	0.829	0.886	0.610
GPB	0.839	0.872	0.630
EAT	0.842	0.819	0.601
AIN	0.833	0.824	0.610

Note: *Cronbach's alpha

evidence of convergent validity (CV). The scores of Cronbach's alphas ranged from 0 to 1, and close to 1 indicated that the constructs were internally consistent [73]. Therefore, the values of Cronbach's alpha for each construct were greater than 0.80, ensuring that all constructs were internally consistent. The internal reliability of constructs is also assessed with CR, and a value greater than 0.60 indicates high internal reliability [74]. The CR values for each construct were greater than 0.80, confirming the measurement model's adequacy [73, 75]. Additionally, AVE values greater than the threshold level of 0.50 [76] also confirm the CV.

Discriminant Validity

Table 3 provides information about the outcomes of the Fornell-Larcker criterion (FLC) and heterotrait-monotrait ratios (HTMT). Both approaches demonstrate discriminant validity (DV), which signifies that all constructs are truly different. This implies that a specific construct must be distinct from other constructs. According to the FLC, the square root of AVE must be greater than the correlation scores of a construct with other constructs. Therefore, the square root of AVE is presented in the diagonal line, and the correlation scores of a specific construct with other constructs were lower than the diagonal values. This confirmed the DV of the

Table 3. Discriminant validity.

FLC							
	PKN	PRI	PVA	ENC	GPB	EAT	AIN
PKN	0.822						
PRI	0.253	0.775					
PVA	0.342	0.401	0.791				
ENC	0.453	0.205	0.218	0.781			
GPB	0.184	0.423	0.189	0.273	0.794		
EAT	0.284	0.333	0.312	0.164	0.263	0.775	
AIN	0.342	0.253	0.172	0.201	0.364	0.193	0.781
HTMT							
	PKN	PRI	PVA	ENC	GPB	EAT	AIN
PKN							
PRI	0.172						
PVA	0.532	0.375					
ENC	0.163	0.173	0.284				
GPB	0.288	0.403	0.194	0.255			
EAT	0.301	0.329	0.291	0.274	0.374		
AIN	0.264	0.335	0.204	0.174	0.277	0.255	

constructs. Similarly, the second approach, HTMT, also confirms the DV of each construct, as HTMT scores are lower than the threshold value of 0.90.

Assessment of the Structural Model

Goodness of Fit

The goodness-of-fit parameters, such as $\chi 2/df$ (=2.87), GFI (=0.916), AGFI (=0.947), CFI (=0.923), NFI (0.938), and RMSEA (0.068), indicated that these scores followed the threshold limits given in the second column of Table 4. Therefore, all these parameters confirm the goodness of fit of the structural model and allow us to conduct further analyses. Su et al. [71], Ma et al. [72], and Pan et al. [73] adopted these parameters to confirm the goodness of fit of the structural model.

Predictive Power, Predictive Relevance, and Effect on the Size of the Model

The value of R2 provides the predictive power of the structural model [77]. It demonstrates the degree of the relationship between variables, as R2 less than 0.25 indicates a weak relationship, R2 greater than 0.25 and less than 0.50 indicates a moderate relationship, and R2 greater than 0.50 indicates a substantial relationship [78]. All relationships in the structural model show an R2 greater than 0.50 (Table 5), which confirms that the variables have a substantial relationship, leading to the good predictive capacity of the model. Q2 highlights the predictive relevance of the structural model, and a value of Q2 greater than 0 highlights the predictive relevance of the path in the structural model for a particular dependent variable. Therefore, Q2 for all constructs greater than zero confirms the predictive relevance of the model. Effect size (f2) demonstrates how strongly the dependent variable is affected by the structural model. An f2 less than 0.02 means no effect, and greater than 0.02 means a small effect; greater than 0.15 shows a medium effect size, and greater than 0.35 indicates a large effect size, respectively. Therefore, the f2 values for all hypotheses are greater than 0.50, demonstrating a substantially large effect size.

Table 4. Goodness of fit.

Fitness tests	Computed values
$\chi 2/df$	2.87
GFI	0.916
CFI	0.923
AGFI	0.947
NFI	0.938
RMSEA	0.068

The non-parametric bootstrapping method of Wetzels et al. [79] provides the impact of the variables on the AIN of NEVs. The findings revealed significant positive impacts of PKN (β = 0.239, $p<0.01$), PVA (β = 0.466, $p<0.01$), ENC (β = 0.201, $p<0.01$), EAT (β = 0.407, $p<0.01$), and GPB (β = 0.478, $p<0.01$) on the AIN of NEVs (Table 6). This implies that respondents with high knowledge and value perception, more concern with the environment, an environmentally oriented attitude, and consistent green behavior are more likely to have high AIN of NEV_S. The negative sign of the coefficient of PRI (β = -0.302, $p<0.01$) indicates that the high-risk perception of respondents tends to have a low AIN of NEVs. The relationship between ENC, EAT, and GPB is also positive and significant, implying that highly concerned individuals may have a highly environmentally oriented attitude and are more likely to practice green practices.

Mediation Effect of EAT and GPB

The beta value of 0.277 in Table 7 with a t-value of 4.134 indicates that ENC also positively impacts AIN through the EAT of individuals. This finding implies that EAT strongly mediates the relationship between ENC and AIN. Similarly, GPB also significantly mediated the impact of ENC on AIN with a positive coefficient value of 0.312 and a t-value of 7.091. This indicates that

Table 5. Predictive power, predictive relevance, and effect size of model.

Direct effect	f2	Q2	R2
PKN -> AIN	0.552	0.352	0.603
PRI -> AIN	0.826	0.284	0.597
PVA -> AIN	1.657	0.275	0.732
ENC -> AIN	1.431	0.318	0.697
EAT -> AIN	1.133	0.256	0.655
GPB -> AIN	1.900	0.306	0.759
ENC -> EAT	0.957	0.184	0.675
ENC -> GPB	1.065	0.263	0.648

Table 6. Direct analysis.

Paths	Beta-value	Standard Error	t-scores	Decision
PKN -> AIN	0.239	0.069	3.464	Accepted
PRI -> AIN	-0.302	0.102	2.961	Accepted
PVA -> AIN	0.466	0.122	3.820	Accepted
ENC -> AIN	0.201	0.052	3.865	Accepted
EAT -> AIN	0.407	0.109	3.734	Accepted
GPB -> AIN	0.478	0.094	5.085	Accepted
ENC -> EAT	0.230	0.061	3.770	Accepted
ENC -> GPB	0.274	0.072	3.806	Accepted

Note: $p<0.01$ when t-value is greater than 2.32.

Table 7. Indirect (mediation) effect.

Mediation effect	Beta-value	Std. Err.	T-value	P-value	C.I.	Decision
ENC -> EAT -> AIN	0.277	0.067	4.134	0.000	0.014,0.389	accepted
ENC -> GPB -> AIN	0.312	0.044	7.091	0.000	0.003,0.409	accepted

the ENC substantially enhances the AIN of individuals through EAT and GPB.

Discussion

The increasing level of carbon in the atmosphere significantly causes climate change and causes serious concerns for different stakeholders worldwide. Researchers and policymakers have devoted their efforts to lowering carbon emissions to achieve sustainable development goals. In this regard, various initiatives have been initiated worldwide, and NEVs provide a sustainable transportation mode. However, adopting NEVs is also a major aspect that is highly affected by an individual's psychological factors. The current study analyzes the impact of PKN, PRI, PVA, ENC, EAT, and GPB of a potential consumer on AIN in the NEVs. PLS-SEM was applied after assessing the constructs' complete internal reliability, consistency, and validity.

The findings revealed that PKN positively affects AIN, implying that individuals with strong PKN are more likely to have AIN of NEVs. The positive impact of knowledge motivates individuals to adopt green technologies and influences their purchasing decisions. Our results are in line with those of Nguyen et al. [80] and Li et al. [81], who also found a positive impact of knowledge on the purchase of energy-efficient appliances. Therefore, creating awareness and knowledge among individuals leads to higher adoption of green energy technologies [82].

The research also indicates that the PRI of potential consumers is likely to have a weak AIN of NEVs. This signifies that a high PRI of technology negatively affects the intention of an individual to adopt green technologies. Wang et al. [83] also highlight the negative impact of PRI on the AIN. They also demonstrated that lack of knowledge and PRI are both psychological barriers to accepting technology. Risks, such as performance, time, financial, social, and convenience, can affect an individual's purchasing decisions. NEVs are regarded as innovative technologies, and their adoption is affected by the PRI [83-85].

The positive impact of PVA on the AIN of NEVs implies that an individual perceiving more value in technology is likelier to adopt that technology. Therefore, a high PVA value makes the technology more attractive and acceptable to consumers [83]. The value of an item is the utility perceived by the consumer while making a purchasing decision after a comprehensive analysis of the benefits and costs associated with a product [86]. Our findings regarding the impact of PVA on the AIN of NEVs are consistent with those of Asadi et al. [87]. Han et al. [88] demonstrated that consumption value perception in the form of functional and non-functional value also significantly affects the purchase intentions of individuals. Moreover, PVA is a crucial factor in purchasing behavior, which indicates the degree to which a consumer is satisfied with the product [87].

The ENC has a significant positive direct impact on the AIN of individuals, which implies that individuals are strongly concerned with the environment, whereas choosing vehicles is more likely to have strong NEV

adoption intentions. ENC enables individuals to evaluate environmental issues effectively, which leads them to make environmentally oriented purchasing decisions [89]. Our findings are consistent with those reported by Wu et al. [90]. Similarly, the ENC is a crucial factor in determining consumers' motives toward adopting a sustainable lifestyle, and it substantially impacts green purchase intentions [91]. Hao et al. [92] also demonstrate that ENC is a key determinant of sustainable food purchasing intentions. Taufique et al. [93] state that consumers with high ENC are more reluctant to buy products with low environmental impact.

Positive EAT also significantly affects AIN, which indicates that EAT is the most vital determinant of NEVs' adoption intentions. Similarly, Mohamed et al. [94] and Haustein and Jensen [95] also highlighted the importance of attitude in adopting battery electric vehicles. In addition, Higueras-Castillo et al. [96] and Molinillo et al. [97] also considered attitude as an important psychological factor mainly linked to adopting novel technologies. With a strong EAT, individuals are more likely to evaluate the negative effects of traditional vehicles on environmental sustainability, become familiar with the environmental benefits associated with NEVs, and feel more environmentally responsible. Therefore, EAT primarily shapes AIN among consumers who purchase NEVs.

The positive impact of GPB on AIN signifies that individuals who consistently adopt and practice green practices are more likely to have high AIN. The GPB indicates the active engagement of the individual with daily routing green practices, which demonstrates his commitment to environmental sustainability [98, 99]. Regular and consistently engaged individuals who perform green practices daily are likelier to have high AIN when purchasing NEVs. Moreover, a high GPB indicates that individuals are more familiar with environmental issues and may be more motivated to adopt NEVs. Therefore, the GPB also fosters the adoption of sustainable transportation methods, and NEVs are best suited for individuals who are highly aligned with their behavior and environmental commitments. Similarly, the GPB often generates a sustainable lifestyle, and NEVs are more compatible with this lifestyle, shaping their intentions to adopt NEVs. Individuals with high GPB are likelier to promote innovations that increase environmental sustainability.

Conclusion

Transportation is responsible for the deterioration of the environment due to the large consumption of fossil fuels, leading to high carbon emissions in the atmosphere. NEVs are the most important initiatives contributing to environmental sustainability through renewable energy. However, adopting NEVs also faces various major challenges, among which psychological factors are primarily responsible. Thus, the current study examined the dynamic relationships between PKN, PVA, PRI, ENC, EAT, GPB, and AIN. After ensuring the internal reliability and consistency of the constructs, the application of PLS-SEM provides information about the impact of variables on AIN.

The findings reveal the strong positive impact of PKN, PVA, ENC, EAT, and GPB on the persons' adoption intentions. This implies that people with good knowledge and value perceptions of NEVs are likelier to adopt NEVs. Similarly, a person who is highly concerned with the environment has a positive attitude toward sustainability, and actively engages with green daily practices is more likely to adopt NEVs. A negative impact of PRI on Ain was observed, which signifies that the high-risk perception of an individual lowers the chance of adopting a certain technology like NEVs in the current study.

Based on the findings, the consumers of vehicles must be educated about NEVs' usefulness and knowledge to increase the value of NEVs and lower the risk perception associated with NEVs. For this, the manufacturer and government can mutually play their roles and launch TV shows, social media engagements, and reports entailing the attributes, performance, and benefits of NEVS. Moreover, vehicle shows, free testing services, and vehicle-sharing activities can also majorly contribute toward lowering the risk perception of potential consumers. Financial incentives in the form of tax rebates, discounts, and waivers of registration fees can also contribute to shaping the favorable AIN of NEVs. Including information about NEVs in the academic curriculum may also develop a positive EAT and consciousness among young individuals, which can foster the adoption of sustainable transportation sources. Moreover, expanding charging stations and providing timely availability of technicians along the main highways can lower potential consumers' risk perception, leading to a strong AIN of NEVs.

Conflict of Interest

The authors declare no conflict of interest.

Funding

This research was funded by Researchers Supporting Project Number (RSP2025R443), King Saud University, Riyadh, Saudi Arabia.

References

1. MCCOLLUM D.L., WILSON C., BEVIONE M., CARRARA S., EDELENBOSCH O.Y., EMMERLING J., GUIVARCH C., KARKATSOULIS P., KEPPO I., KREY V., LIN Z., BROIN E.Ó., PAROUSSOS L., PETTIFOR H., RAMEA K., RIAHI K., SANO F., RODRIGUEZ B.S., VAN VUUREN D.P. Interaction of consumer preferences

and climate policies in the global transition to low-carbon vehicles. Nature Energy, **3** (8), 664, **2018**.
2. SPEIZER S., FUHRMAN J., ALDRETE LOPEZ L., GEORGE M., KYLE P., MONTEITH S., MCJEON H. Integrated assessment modeling of a zero-emissions global transportation sector. Nature Communications, **15** (1), 4439, **2024**.
3. GNANN T., STEPHENS T.S., LIN Z., PLÖTZ P., LIU C., BROKATE J., What drives the market for plug-in electric vehicles? A review of international PEV market diffusion models. Renewable Sustainable Energy Reviews, **93**, 158, **2018**.
4. ADNAN N., NORDIN S.M., AMINI M.H., LANGOVE N. What make consumer sign up to PHEVs? Predicting Malaysian consumer behavior in adoption of PHEVs. Transportation Research Part A: Policy and Practice, **113**, 259, **2018**.
5. CAZZOLA P., GORNER M., SCHUITMAKER R., MARONEY E. Global EV outlook 2016. International Energy Agency, France, **2016**.
6. GHOSH A. Possibilities and challenges for the inclusion of the electric vehicle (EV) to reduce the carbon footprint in the transport sector: A review. Energies, **13** (10), 2602, **2020**.
7. MORGANTI E., BROWNE M. Technical and operational obstacles to the adoption of electric vans in France and the UK: An operator perspective. Transport Policy, **63**, 90, **2018**.
8. GOV.UK. Tenfold expansion in charge points by 2030 as government drives EV revolution. Available online: https://www.gov.uk/government/news/tenfold-expansion-in-chargepoints-by-2030-as-government-drives-ev-revolution (accessed on 10 February 2024).
9. US ENERGY INFORMATION ADMINISTRATION. Renewable energy explained. Available online: https://www.eia.gov/energyexplained/renewable-sources/incentives.php (accessed on 11 February 2024).
10. REZVANI Z., JANSSON J., BODIN J. Advances in consumer electric vehicle adoption research: A review and research agenda. Transportation Research Part D: Transport and Environment, **34**, 122, **2015**.
11. LIU Z., HAO H., CHENG X., ZHAO F. Critical issues of energy efficient and new energy vehicles development in China. Energy Policy, **115**, 92, **2018**.
12. ULLAH I., SAFDAR M., ZHENG J., SEVERINO A., JAMAL A. Employing bibliometric analysis to identify the current state of the art and future prospects of electric vehicles. Energies, **16** (5), 2344, **2023**.
13. REN J. New energy vehicle in China for sustainable development: Analysis of success factors and strategic implications. Transportation Research Part D: Transport and Environment, **59**, 268, **2018**.
14. COFFMAN M., BERNSTEIN P., WEE S. Electric vehicles revisited: a review of factors that affect adoption. Transport Reviews, **37** (1), 79, **2017**.
15. GONG H., HANSEN T. The rise of China's new energy vehicle lithium-ion battery industry: The coevolution of battery technological innovation systems and policies. Environmental Innovation and Societal Transitions, **46**, 100689, **2023**.
16. LI S., TONG L., XING J., ZHOU Y. The market for electric vehicles: indirect network effects and policy design. Journal of the Association of Environmental and Resource Economists, **4** (1), 89, **2017**.
17. ALBERINI A., DI COSMO V., BIGANO A. How are fuel efficient cars priced? Evidence from eight EU countries. Energy Policy, **134**, 110978, **2019**.
18. MCLEAY F., YOGANATHAN V., OSBURG V.S., PANDIT A. Risks and drivers of hybrid car adoption: A cross-cultural segmentation analysis. Journal of Cleaner Production, **189**, 519, **2018**.
19. LI W., LONG R., CHEN H., YANG T., GENG J., YANG M. Effects of personal carbon trading on the decision to adopt battery electric vehicles: Analysis based on a choice experiment in Jiangsu, China. Applied Energy, **209**, 478, **2018**.
20. WANG S., WANG J., LI J., WANG J., LIANG L. Policy implications for promoting the adoption of electric vehicles: do consumer's knowledge, perceived risk and financial incentive policy matter? Transportation Research Part A: Policy and Practice, **117**, 58, **2018**.
21. WANG B., SHEN Y., JIN Y. Measurement of public awareness of climate change in China: based on a national survey with 4,025 samples. Chinese Journal of Population Resources and Environment, **15** (4), 285, **2017**.
22. WEIGEL R., WEIGEL J. Environmental concern: The development of a measure. Environment and Behavior, **10** (1), 3, **1978**.
23. PIAO X., MANAGI S. Determinants of pro-environmental behavior: effects of socioeconomic, subjective, and psychological well-being factors from 37 countries. Humanities and Social Sciences Communications, **11** (1), 1, **2024**.
24. GREAVES M., ZIBARRAS L.D., STRIDE C. Using the theory of planned behavior to explore environmental behavioral intentions in the workplace. Journal of Environmental Psychology, **34**, 109, **2013**.
25. MANIATIS P. Investigating factors influencing consumer decision-making while choosing green products. Journal of Cleaner Production, **132**, 215, **2016**.
26. WANG Z., ZHAO C., YIN J., ZHANG B. Purchasing intentions of Chinese citizens on new energy vehicles: How should one respond to current preferential policy? Journal of Cleaner Production, **161**, 1000, **2017**.
27. SU C.W., YUAN X., TAO R., UMAR M. Can new energy vehicles help to achieve carbon neutrality targets? Journal of Environmental Management, **297**, 113348, **2021**.
28. LIU N., LIU Y., YU X. The impact of public environmental concern on environmental pollution: The moderating effect of government environmental regulation. PLOS ONE, **18** (8), e0290255, **2023**.
29. KAMALANON P., CHEN J.S., LE T.T.Y. Why Do We Buy Green Products? An Extended Theory of the Planned Behavior Model for Green Product Purchase Behavior. Sustainability, **14**, 689, **2022**
30. KOUR M. Understanding the drivers of green consumption: a study on consumer behavior, environmental ethics, and sustainable choices for achieving SDG 12. SN Business and Economics, **4**, 97, **2024**.
31. WANG M., LI Y., LI J., WANG Z. Green process innovation, green product innovation and its economic performance improvement paths: A survey and structural model. Journal of Environmental Management, **297**, 113282, **2021**.
32. LIN B., GUAN C. Determinants of household food waste reduction intention in China: The role of perceived government control. Journal of Environmental Management, **299**, 113577, **2021**.
33. CHWIALKOWSKA A., BHATTI W.A., GLOWIK M. The influence of cultural values on pro-environmental behavior. Journal of Cleaner Production, **268**, 122305, **2020**.

34. LEVINE D.S., STRUBE M.J. Environmental attitudes, knowledge, intentions and behaviors among college students. The Journal of Social Psychology, **152** (3), 308, **2012**.
35. CERRI J., TESTA F., RIZZI F. The more I care, the less I will listen to you: How information, environmental concern and ethical production influence consumers' attitudes and the purchasing of sustainable products. Journal of Cleaner Production, **175**, 343, **2018**.
36. HIGUERAS-CASTILLO E., LIÉBANA-CABANILLAS F.J., MUÑOZ-LEIVA F., GARCÍA-MAROTO I. Evaluating consumer attitudes toward electromobility and the moderating effect of perceived consumer effectiveness. Journal of Retailing and Consumer Services, **51**, 387, **2019**.
37. HUAJIAN C. Attitude. In: The ECPH Encyclopedia of Psychology. Springer, Singapore, **2024**.
38. GREENWALD A.G., BANAJI M.R. Implicit social cognition: attitudes, self-esteem, and stereotypes. Psychological Review, **102** (1), 4, **1995**.
39. THØGERSEN J., DE BARCELLOS M.D., PERIN M.G., ZHOU Y. Consumer buying motives and attitudes towards organic food in two emerging markets: China and Brazil. International Marketing Review, **32** (3/4), 389, **2015**.
40. KHAN M.S., SAENGON P., ALGANAD A.M.N., CHONGCHAROEN D., FARRUKH M. Consumer green behavior: An approach towards environmental sustainability. Sustainable Development, **28** (5), 1168, **2020**.
41. JULINA D., POPY R., MARTHA F.C. Green purchase behavior: The role of religiosity, environmental attitude and environmental knowledge. Journal of Management and Marketing Review, **2** (3), 83, **2017**.
42. BERLINER R.M., HARDMAN S., TAL G. Uncovering early adopter's perceptions and purchase intentions of automated vehicles: Insights from early adopters of electric vehicles in California. Transportation Research Part F: Traffic Psychology and Behaviour, **60**, 712, **2019**.
43. POLICARPO M.C., AGUIAR E.C. How self-expressive benefits relate to buying a hybrid car as a green product. Journal of Cleaner Production, **252**, 119859, **2020**.
44. ZIEGLER A. Individual characteristics and stated preferences for alternative energy sources and propulsion technologies in vehicles: A discrete choice analysis for Germany. Transportation Research Part A: Policy and Practice, **46** (8), 1372, **2012**.
45. BARTON B., SCHÜTTE P. Electric vehicle law and policy: a comparative analysis. Journal of Energy and Natural Resources Law, **35** (2), 147, **2017**.
46. JAISWAL D., KAUSHAL V., SINGH P.K., BISWAS A. Green market segmentation and consumer profiling: a cluster approach to an emerging consumer market. Benchmarking: An International Journal, **28** (3), 792, **2021**.
47. UDDIN S.F., KHAN M.N. Young consumer's green purchasing behavior: Opportunities for green marketing. Journal of Global Marketing, **31** (4), 270, **2018**.
48. SHENG G., XIE F., GONG S., PAN H. The role of cultural values in green purchasing intention: Empirical evidence from Chinese consumers. International Journal of Consumer Studies, **43** (3), 315, **2019**.
49. FEATHERMAN M., JIA S.J., CALIFF C.B., HAJLI N. The impact of new technologies on consumers beliefs: Reducing the perceived risks of electric vehicle adoption. Technological Forecasting and Social Change, **169**, 120847, **2021**.
50. ROY S.K., BALAJI M.S., KESHARWANI A., SEKHON H. Predicting Internet banking adoption in India: A perceived risk perspective. Journal of Strategic Marketing, **25** (5-6), 418, **2017**.
51. KIM M.K., OH J., PARK J.H., JOO C. Perceived value and adoption intention for electric vehicles in Korea: Moderating effects of environmental traits and government supports. Energy, **159**, 799, **2018**.
52. WANG S., WANG J., LI J., WANG J., LIANG L. Policy implications for promoting the adoption of electric vehicles: do consumer's knowledge, perceived risk and financial incentive policy matter? Transportation Research Part A: Policy and Practice, **117**, 58, **2018**.
53. ZHANG T., TAO D., QU X., ZHANG X., LIN R., ZHANG W. The roles of initial trust and perceived risk in public's acceptance of automated vehicles. Transportation Research Part C: Emerging Technologies, **98**, 207, **2019**.
54. RIGOLI F. The psychology of ultimate values: A computational perspective. Journal for the Theory of Social Behaviour, **52** (1), 105, **2022**.
55. HSIAO C.H., CHANG J.J., TANG K.Y. Exploring the influential factors in continuance usage of mobile social Apps: Satisfaction, habit, and customer value perspectives. Telematics and Informatics, **33** (2), 342, **2016**.
56. PAZ M.D.R., VARGAS J.C.R. Main theoretical consumer behavioural models. A review from 1935 to 2021. Heliyon, 9 (3), **2023**.
57. BISHOP JR W.R. Competitive intelligence. Progressive Grocer, **63** (3), 19, 1984.
58. BLUT M., CHANEY D., LUNARDO R., MENCARELLI R., GREWAL D. Customer Perceived Value: A Comprehensive Meta-analysis. Journal of Service Research, 10946705231222295, **2023**.
59. ZEITHAML V.A. Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. Journal of Marketing, **52** (3), **1988**.
60. JAISWAL D., KANT R., SINGH P.K., YADAV R. Investigating the role of electric vehicle knowledge in consumer adoption: evidence from an emerging market. Benchmarking: An International Journal, **29** (3), 1027, **2022**.
61. DEGIRMENCI K., BREITNER M.H. Consumer purchase intentions for electric vehicles: Is green more important than price and range? Transportation Research Part D: Transport and Environment, **51**, 250, **2017**.
62. QIAN L., YIN J. Linking Chinese cultural values and the adoption of electric vehicles: The mediating role of ethical evaluation. Transportation Research Part D: Transport and Environment, **56**, 175, **2017**.
63. LI W., LONG R., CHEN H., GENG J. Household factors and adopting intention of battery electric vehicles: a multi-group structural equation model analysis among consumers in Jiangsu Province, China. Natural Hazards, **87**, 945, **2017**.
64. KAPSER S., ABDELRAHMAN M. Acceptance of autonomous delivery vehicles for last-mile delivery in Germany–Extending UTAUT2 with risk perceptions. Transportation Research Part C: Emerging Technologies, **111**, 210, **2020**.
65. VENKATESH V., THONG J.Y., XU X. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Quarterly, 157, **2012**.
66. ADNAN N., NORDIN S.M., RAHMAN I., RASLI A.M.

A new era of sustainable transport: An experimental examination on forecasting adoption behavior of EVs among Malaysian consumer. Transportation Research Part A: Policy and Practice, **103**, 279, **2017**.
67. HAN L., WANG S., ZHAO D., LI J. The intention to adopt electric vehicles: Driven by functional and non-functional values. Transportation Research Part A: Policy and Practice, **103**, 185, **2017**.
68. BYRNE B.M., STEWART S.M. Teacher's corner: The MACS approach to testing for multigroup invariance of a second-order structure: A walk through the process. Structural Equation Modeling, **13** (2), 287, **2006**.
69. HAIR J.F., SARSTEDT M., RINGLE C.M., MENA J.A. An assessment of the use of partial least squares structural equation modeling in marketing research. Journal of the Academy of Marketing Science, **40**, 414, **2012**.
70. CHEUNG G.W., RENSVOLD R.B. Evaluating goodness-of-fit indexes for testing measurement invariance. Structural Equation Modeling, **9** (2), 233, **2002**.
71. SU P., IMRAN M., NADEEM M., HAQ S.U. The Role of Environmental Law in Farmers' Environment-Protecting Intentions and Behavior Based on Their Legal Cognition: A Case Study of Jiangxi Province, China. Sustainability, **15** (11), 8571, **2023**.
72. MA L., SHAHBAZ P., HAQ S.U., BOZ I. Exploring the moderating role of environmental education in promoting a clean environment. Sustainability, **15** (10), 8127, **2023**.
73. PAN L., HAQ S.U., SHI X., NADEEM M. The Impact of Digital Competence and Personal Innovativeness on the Learning Behavior of Students: Exploring the Moderating Role of Digitalization in Higher Education Quality. SAGE Open, **14** (3), 21582440241265919, **2024**.
74. ZHANG T., HAQ S.U., XU X. NADEEM M. Greening ambitions: exploring factors influencing university students' intentions for sustainable entrepreneurship. International Entrepreneurship and Management Journal, 20, 2863, **2024**.
75. CHIN W.W. How to write up and report PLS analyses. In Handbook of Partial Least Squares; Springer: Berlin/ Heidelberg, Germany, 655, **2009**
76. TIAN H., IQBAL S., ANWAR F., AKHTAR S., KHAN M.A.S., WANG W. Network embeddedness and innovation performance: a mediation moderation analysis using PLS-SEM. Business Process Management Journal, **27** (5), 1590, **2021**.
77. SARSTEDT M., RINGLE C.M., SMITH D., REAMS R., HAIR JR J.F. Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. Journal of Family Business Strategy, **5** (1), 105, **2014**.
78. HENSELER J., RINGLE C.M., SINKOVICS R.R. The use of partial least squares path modeling in international marketing. In New challenges to international marketing. Emerald Group Publishing Limited, **2009**.
79. WETZELS M., ODEKERKEN-SCHRÖDER G., VAN OPPEN C. Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. MIS Quarterly, **2019**.
80. NGUYEN T.N., LOBO A., GREENLAND S. Energy efficient household appliances in emerging markets: the influence of consumers' values and knowledge on their attitudes and purchase behaviour. International Journal of Consumer Studies, **41** (2), 167, **2017**.
81. LI G., LI W., JIN Z., WANG Z. Influence of environmental concern and knowledge on households' willingness to purchase energy-efficient appliances: A case study in Shanxi, China. Sustainability, **11** (4), 1073, **2019**.
82. MOHIUDDIN M., AL MAMUN A., SYED F.A., MEHEDI MASUD M., SU Z. Environmental knowledge, awareness, and business school students' intentions to purchase green vehicles in emerging countries. Sustainability, **10** (5), 1534, **2018**.
83. WANG S., WANG J., LI J., WANG J., LIANG L. Policy implications for promoting the adoption of electric vehicles: do consumer's knowledge, perceived risk and financial incentive policy matter? Transportation Research Part A: Policy and Practice, **117**, 58, **2018**.
84. WHITE L.V., SINTOV N.D. You are what you drive: Environmentalist and social innovator symbolism drives electric vehicle adoption intentions. Transportation Research Part A: Policy and Practice, **99**, 94, **2017**.
85. LI W., LONG R., CHEN H., GENG J. Household factors and adopting intention of battery electric vehicles: a multi-group structural equation model analysis among consumers in Jiangsu Province, China. Natural Hazards, **87**, 945, **2017**.
86. KIM M.K., OH J., PARK J.H., JOO C. Perceived value and adoption intention for electric vehicles in Korea: Moderating effects of environmental traits and government supports. Energy, **159**, 799, **2018**.
87. ASADI S., NILASHI M., SAMAD S., ABDULLAH R., MAHMOUD M., ALKINANI M.H., YADEGARIDEHKORDI E. Factors impacting consumers' intention toward adoption of electric vehicles in Malaysia. Journal of Cleaner Production, **282**, 124474, **2021**.
88. HAN L., WANG S., ZHAO D., LI J. The intention to adopt electric vehicles: Driven by functional and non-functional values. Transportation Research Part A: Policy and Practice, **103**, 185, **2017**.
89. NEWTON J.D., TSARENKO Y., FERRARO C., SANDS S. Environmental concern and environmental purchase intentions: The mediating role of learning strategy. Journal of Business Research, **68** (9), 1974, **2015**.
90. WU J., LIAO H., WANG J.W., CHEN T. The role of environmental concern in the public acceptance of autonomous electric vehicles: A survey from China. Transportation Research Part F: Traffic Psychology and Behavior, **60**, 37, **2019**.
91. DE CANIO F., MARTINELLI E., ENDRIGHI E. Enhancing consumers' pro-environmental purchase intentions: the moderating role of environmental concern. International Journal of Retail & Distribution Management, **49** (9), 1312, **2021**.
92. HAO Y., LIU H., CHEN H., SHA Y., JI H., FAN J. What affect consumers' willingness to pay for green packaging? Evidence from China. Resources, Conservation and Recycling, **141**, 21, **2019**.
93. TAUFIQUE K.M.R., POLONSKY M.J., VOCINO A., SIWAR C. Measuring consumer understanding and perception of eco-labelling: Item selection and scale validation. International Journal of Consumer Studies, **43** (3), 298, **2019**.
94. MOHAMED M., HIGGINS C.D., FERGUSON M., RÉQUIA W.J. The influence of vehicle body type in shaping behavioral intention to acquire electric vehicles: A multi-group structural equation approach. Transportation Research Part A: Policy and Practice, **116**, 54, **2018**.
95. HAUSTEIN S., JENSEN A.F. Factors of electric vehicle adoption: A comparison of conventional and electric car users based on an extended theory of planned behavior. International Journal of Sustainable

Transportation, **12** (7), 484, **2018**.
96. HIGUERAS-CASTILLO E., MOLINILLO S., COCA-STEFANIAK J.A., LIÉBANA-CABANILLAS F. Perceived value and customer adoption of electric and hybrid vehicles. Sustainability, **11** (18), 4956, **2019**.
97. MOLINILLO S., MUÑOZ-LEIVA F., PÉREZ-GARCÍA F. The effects of human-game interaction, network externalities, and motivations on players' use of mobile casual games. Industrial Management and Data Systems, **118** (9), 1766, **2018**.
98. HAN H. Theory of green purchase behavior (TGPB): A new theory for sustainable consumption of green hotel and green restaurant products. Business Strategy and the Environment, **29** (6), 2815, **2020**.
99. AMOAKO G.K., DZOGBENUKU R.K., ABUBAKARI A. Do green knowledge and attitude influence the youth's green purchasing? Theory of planned behavior. International Journal of Productivity and Performance Management, **69** (8), 1609, **2020**.