Sustainable Energy Consumption in Developing Country

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Since energy consumption in developing countries has increased significantly, motivating energy-saving habits among citizens is an important issue both from the academic and industrial perspectives.

environmental marketing | sustainable energy consumption | purchase intention | purchase behavior | Green marketing | energy-efficient products

1. Introduction

Climate change is one of the major environmental concerns on the planet, broadly discussed in international forums and conferences. In the 1990s, ozone layer depletion and global warming increased the desire for green product consumption [1][2].

As a result, environmentally-friendly products are demanded by consumers as a new segment to protect against climate change [3]. One of the most important initiatives to combat climate change is to reduce energy consumption [4][5][6][7][8]. According to the Intergovernmental Panel on Climate Change (IPCC), current global warming results from human activities, mainly consumption patterns [9]. As a result, governments worldwide have highlighted the need for citizens to take responsibility for their local ecosystems. Human responsibilities include recycling [10][11], using energy-efficient items, purchasing green label products, and lowering electricity usage [12].

During the last few decades, electricity consumption has grown rapidly, mainly in the residential and service sectors. This rapid electricity consumption has led to increasing CO_2 emissions and ultimately impacts global warming [4][13]. Increasingly, household appliances are the primary source of energy consumption and CO_2 emissions. According to the International Energy Agency IEA (2017), the residential sector consumed approximately 21% of total global energy consumption in 2017. Consumer demand for energy will increase 32% by 2040 due to the growth of the worldwide population, with most of that demand coming from China, India, ASEAN, and the Middle East [14]. Energy efficiency can be improved significantly by accelerating the diffusion of energy-efficient appliances. In turn, lower fossil fuel use and fewer greenhouse gas emissions can be achieved [15]. The installation of energy-efficient appliances (EEAs) plays a significant role in reducing household energy consumption [4].

Moreover, consumers who engage in pro-environmental behavior (PEB) have a lower negative impact on the environment [1][16]. Pro-environmental consumer behavior research is conducted in developed markets but is still in its early stages in several emerging markets, including Asia. Energy conservation is therefore essential for developing countries to ensure a sustainable future.

Thus, household consumers must play an important role in energy conservation by using energy-efficient appliances (EEAs) [2][17]. Previously, several developed and developing countries explored the influencing factors of consumer purchase intention of energy-efficient appliances, such as India [18], Pakistan [2][19], South Africa [20], and China [21]. A study investigated the barriers to purchasing intentions of energy-efficient appliances in India. However, researchers focus on the fast-growing, developing country of Bangladesh. The major hurdle in Bangladesh is maintaining economic development after assuring commercial and residential energy for its people, who predominantly rely on fossil fuels [22]. Bangladesh has managed the energy sector poorly [23] and contributes very little to emitting greenhouse gas globally. Bangladesh's energy sector faces several challenges, including extreme system losses and a lack of infrastructure for installing new power plants quickly. This infrastructural development causes a big gap between energy supply and demand. Therefore, adapting consumer pro-environmental behavior to energy-efficient appliances is mandatory to solve the problems.

However, the previous empirical study extended current theories of green marketing by adding new variables that can be considered significant in behavioral and marketing research [24]. Regarding green products, scholars modify models of the theory of planned behavior (TPB) [9][25][26]. Recent studies have used the theory of consumption value (TCV) [27], integration of the theory of planned behavior [4] and technology readiness index [27], the theory of reasoned action (TRA), and the technology acceptance model (TAM) [28] on electronic products. Similarly, several studies applied TPB theories to predict consumer purchase intention of energy-efficient appliances in different countries, e.g., India, Pakistan, and South Africa [2][18][19][20]. Researchers applied the extension of TPB with added moral norms and environmental concern variables better to understand consumers' purchase behavior toward energy-efficient appliances. The TPB is considered the best theory to measure consumer pro-environmental behavior since it considers behavioral intention [29].

2. Sustainable Energy Consumption and Energy-Efficient Appliances (EEAs)

Sustainability of energy consumption is defined as reducing energy consumption and increasing energy efficiency [30]. Sustainable energy consumption involves purchasing energy-efficient products that reduce energy consumption and cost and enhance energy efficiency [31]. The use of energy-efficient household appliances (EEHA) involves utilizing sustainable energy sources within the home, as well as preventing energy waste more generally. Energy-saving appliances facilitate the development of low-carbon economies by saving energy resources [32][33][34]. A household can generate significant levels of GHG (greenhouse gas) emissions through the consumption of energy, goods, and services [35][36]. Purchasing energy-efficient products with less environmental impact are considered sustainable or green consumption [1][6][31][37]. Consumer energy-efficient products include:

- hybrid electric vehicles
- air-conditioning appliances, e.g., heaters, fans, humidifiers
- white goods (major household electrical appliances such as air conditioners, refrigeration, washing machines, and so on
- brown goods (household electrical entertainment appliances such as televisions, CD players)
- small appliances (kitchen appliances such as ovens, electric kettles, bread makers)
- computers and servers

3. Theory of Planned Behavior

The Theory of Planned Behavior (TPB) was used to predict purchase intentions for energy-efficient household appliances (EEHA) as the underpinning theory and added two context-wise variables, moral norms, and environmental concern, based on the massive literature review. TPB theory was developed as an extension of the reasoned theory of action (TRA), one of the most influential social psychology theories for predicting behavior [38]. According to the TPB framework, the behavior of individuals can be explained by determining behavioral intents, subjective norms, and perceptions of behavioral control [38][39][40]. The TPB is considered the best theory to measure consumer pro-environmental behavior since it considers behavioral intention [29]. Previous scholars applied the TPB to support their model and measure pro-environmental behaviors in particular products such as electricity savings behavior [41], energy savings behavior [42], and energy-efficient appliances [43]. **Table 1** presents the previous ten years (2012–2022) of research on consumer purchase behavior of energy-efficient appliances in different counties, whereas several researchers have employed the TPB to examine whether consumers intend to practice environmentally friendly behavior, e.g., [44][45][46][47]. Previous studies attempted to improve the explanatory power of the TPB by adding additional constructs such as environmental concern, moral obligation [45], moral norms [44][46][48], energy knowledge, energy information, living habits, and demographic variables [42].

Table 1. Previous ten years of research on consumer purchase behavior of energy-efficient appliances (EEAs).

Country Context and Valid Samples	Study Focus	Applying Theory	Methods	Factors with Significant Direct	Factors with Insignificant Effect	Years (Authors)
Bangladesh (1510)	measuring pro-environmental behavior for energy-efficient appliances (EEAs)	TRA and TPB	SEM	environmental knowledge, eco-label knowledge, attitude, and green trust→PEB		2022 [31]

Country Context and Valid Samples	Study Focus	Applying Theory	Methods	Factors with Significant Direct	Factors with Insignificant Effect	Years (Authors)
Pakistan (240)	predicting young consumer purchase behavior of EEAs	TPB	SEM	attitude, subjective norms, and perceived behavioral control→P.I.		2022 [49]
Pakistan (50)	antecedents of consumers' purchase intention towards EEAs	TPB	SEM	attitude, consumer social responsibility, functional value, knowledge of eco-labels, functional value, green trust→P.I.	personal norms→P.I.	2022 [50]
Pakistan (673)	investigating consumers' intentions in Pakistan to purchase EEAs	TPB	SEM	attitude, subjective norms, and perceived behavior control→P.I.		2021 [51]
Pakistan (289)	determinants of consumers' intentions towards the purchase of EEAs	TPB	SEM	attitude, perceived behavioral control, policyinformation campaigns, and past-purchase experiences→P.I.	subjective and moral norms→P.I.	2021 [52]
Pakistan (50)	evaluating consumers' purchase intention of EEAs	TPB	CB-SEM	knowledge of eco-labels, environmental concern, attitude, and consumer effectiveness-P.I.		2020 [53]
Pakistan (446)	developing a theoretical framework of consumers' purchase intention of EEAs	TPB	SEM	knowledge of eco-labels, environmental concern, and perceived consumer effectiveness→P.I.	green trust and functional value→P.I.	2020 [54]
Pakistan (446)	evaluating the antecedents of consumers' purchase	TPB	SEM	attitude, functional value, environmental concern, perceived effectiveness, age,		2020 [54]

Country Context and Valid Samples	Study Focus	Applying Theory	Methods	Factors with Significant Direct	Factors with Insignificant Effect	Years (Authors)
	intention of EEAs			income, gender, education→P.I.		
Pakistan (472)	predicting the antecedents of consumers' purchase intention of EEAs	TPB	SEM	subjective norms, green trust, attitude, perceived behavior control, demographic profile→P.I.		2020 [2]
South Africa (298)	identifying the influencing factors on purchase of EEAs	TPB	SEM	attitude, perceived behavior control, moral norms, environmental concern, perceived benefits, informational publicity→P.I.	subjective norms→P.I.	2020 [20]
China(369)	exploring the influencing factors of Chinese consumers' purchase of EEAs	NAM and TPB	SEM	personal norm, subjective norm and attitude→P.I.		2019 [21]
South Africa (440)	identifying the key drivers of consumers' attention to energy-efficiency labels affixed to EEAs	Signaling theory and attitude-to-behavior theory	SEM [39]	environmental concern, environmental attitude, social norms and product quality→P.I.	product price, environmental knowledge→P.I.	2018 [55]
India (300)	identifying the barriers topurchase intentions of EEAs			societal norms, price sensitivity, perceived product risk, skepticism about label claims, perceived personal inconvenience→P.I.		2018 [18]
Vietnam (682)	Measuring the EEAs in emerging markets	VKAB	SEM	attitude, environmental protection and		2016 [56]

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Country Context and Valid Samples	Study Focus	Applying Theory	Methods	Factors with Significant Direct	Factors with Insignificant Effect	Years (Authors)
				individual inconvenience→P.I.		

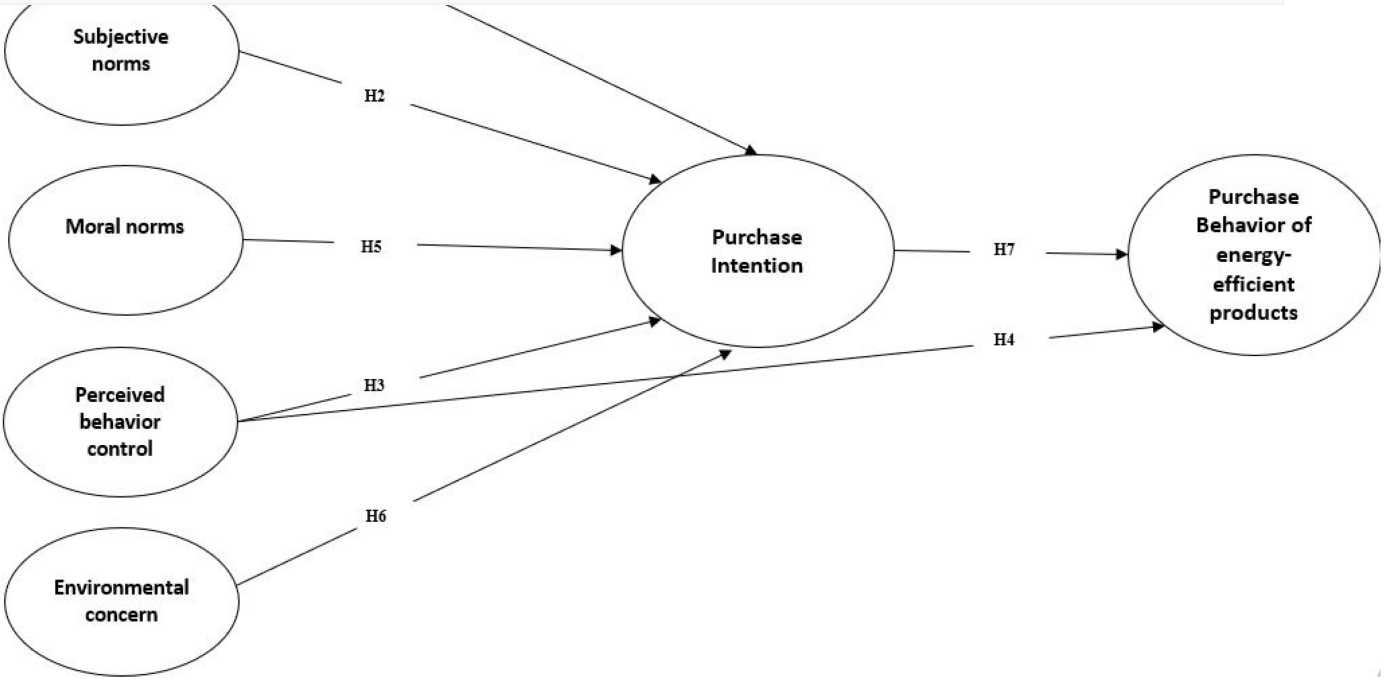

Figure 1. extended model of TPB for measuring consumer purchase intention of energy-efficient appliances (EEAs).

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