

# A model of sustainable consumer behavior in the insurance industry (Case study: Insurance Company Asia)

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## Abstract

Today, many companies strive to be more responsible and meet consumers' needs as much as possible. Sustainable consumption refers to consuming products, which are helpful, environmentally friendly, recyclable, and responsive to environmental concerns. Therefore, this study aimed to propose a model of sustainable consumer behavior in the insurance industry. This applied and exploratory research was conducted using a field method, questionnaire, and interview tools with quantitative and qualitative data. The research population was industry experts and professors in the insurance industry, who were selected by judgmental convenience sampling method (20 people) for localization of the model. The data were collected through a researcher-made questionnaire based on pairwise comparisons of research components. In addition, fuzzy DEMATEL methods and fuzzy analytic process network (FANP) were used to analyze the data in Excel software. First, the criteria were identified by reviewing scientific texts and confirmed by university professors. The reliability of the factors was confirmed by Cronbach's alpha greater than 0.7. Then, seven main factors and 18 important sub-factors were identified using the fuzzy Delphi technique. The effectiveness and impressiveness of each factor were determined using the fuzzy DEMATEL technique. Among the main factors, "consumer knowledge of sustainability" with an impact value of 0.8 was the most effective factor, and "perceived market impact factor" with a net impact factor of -0.085 was the most impressive factor. The identified factors were prioritized using the FANP technique. Finally, the highest weight was related to the criterion of the religious spirit. Moreover, perceived market impact factors, sustainable consumer purchasing behavior, implementation of environmental responsibility, consumer attitudes toward sustainable purchasing, and consumer knowledge of sustainability were important, respectively. Finally, suggestions were made for senior managers and experts in the insurance industry, especially Asia Insurance Company, based on the results.

Keywords: Industrial clusters, Export, fuzzy multi-index decision-making, Fuzzy DEMATEL, Fuzzy analytic process network

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## 1 Introduction

In recent years, industrial development has replaced sustainable development, and environmental consequences and the unresponsiveness of the planet's resources have become a major concern [12]. Sustainable consumption has been

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formed to reduce resource and energy consumption to achieve less waste generation and more recycling of consumables [66] and reflects the consumer's preference for greenness and healthiness [23]. The term refers to consuming products whose life cycle (from the production of raw materials to design, storage, and finally transportation and use) is based on reducing the harmful effects on the environment [45]. Sustainable consumption refers to consuming environmentally friendly, useful, recyclable, and protected products, which are sensitive and responsive to environmental concerns [49]. Institutionalizing sustainable consumption can lead to sustainable behavior among individuals in society in the long run, which analyzes the various economic and social effects and consequences [8]. Following the need to address this issue, the UN Board of Governors, in its latest report on climate change, states that changes in lifestyle, diet, and energy consumption significantly affect reducing environmental degradation. Today, global needs and the emergence of innovation opportunities are identified along with scientific attention to environmental issues and increasing market share of products in sustainability and greening. Factors affecting public and social opinion pressure, environmentally friendly is considered an active policy and stimulus to increase sustainable and environmentally friendly consumption. In addition, sustainable production and consumption due to high efficiency preserve natural resources, environmental diversity and human health [47]. Environmental concern is among the selected factors in sustainable consumption behavior, a belief, position, and level of concern that arises from consumer's lack of natural resources [62]. This concept refers to an emotional trait to indicate concern, love, affection, and not remembering an object or issue. In general, environmental concerns can also act as an active stimulus in the production process and consumption of healthy and sustainable products [40]. Environmental attitude is a context, inner state, talent, or desire to learn to respond to the favorable or unfavorable environmental behavior in mind [6]. Individual attitudes can be shaped by the punishment and rewards of others, both at the individual and organizational levels [50]. Environmental information and knowledge are the essential variables for predicting human behavior. Environmental knowledge is general knowledge about the facts, concepts, and relationships of the natural environment and its ecosystems [40]. Knowledge is a necessity for successful activities, and consumer knowledge of environmental issues leads to the formation of environmental behaviors [59]. New safety threats are emerging every day. Changes in production, distribution, and consumption of food, such as dense agriculture, trade globalization, environmental changes, new and emerging bacteria, and toxins, antimicrobial resistance, all increase the risk of contamination due to improper consumption [74]. Social responsibility is always used for sustainable consumer behavior, which is highlighted regarding human beings and their behavior. Excessive use of natural resources by some people has caused problems for the existing ecosystem. Neglecting and shirking responsibility for the environment has led to the extinction of many plant and animal species, disrupted the life cycle, and created major dangers for their fellow human beings. Part of the concept of social responsibility is to pay attention to environmental issues, so it is simple to believe that social responsibility only covers environmental issues. This concept considers the environment and ecosystem, as well as the mental and physical health of individuals in consumer behavior. Social responsibility means the relationship between environmental issues and the effect of consequences on individuals' physiological, financial, and social dimensions [20]. Social context refers to environmental factors, including values, norms, and beliefs about people's behavior. This concept considers the number of collective pressures to determine a collective and stable identity for the individual [55], which includes concepts such as culture, education, or the type of life of individuals and refers to environmental forces [68]. Sustainable behavior is a set of effective preventive and purposeful measures to protect natural resources, including the integrity of plant and animal life, and taking into account the individual and social well-being of current and future generations. This concept includes individual and group actions aimed at rationalizing natural resources to ensure the balance between the individual and nature using an inseparable approach to the past [10]. In other words, this concept includes energy-saving and balance in using natural resources to achieve high levels of economic, political, social, and environmental well-being [19]. Today, environmental issues and environmental protection are among the most important criteria consumer consider when purchasing. Environmental protection has caused consumers to rethink the products they purchase. Many consumers are ready to pay more for products, which meet environmental standards to protect the environment. Given that environmental and social issues are essential for customers, the observance of environmental issues in marketing activities will create a competitive advantage for the company and can create a good base in the market through these companies. Most organizations chose environmental advertising through the media or newspapers as a green technique for introducing their products to environmentally responsible consumers by improving global green movements and increasing public attention to environmental problems. The purpose of green advertising is to influence the purchasing behavior of consumers by encouraging them to buy products, which do not harm the environment [53]. Haanpää found that marketing involves producing and marketing products, which are less harmful to the environment than traditional products, positively affect the environment, and tie to an environmental organization or program. This type of marketing with green marketing elements can affect consumer behavior and encourage consumers to consider environmental aspects in their shopping behavior to reduce environmental concerns [27]. Studies have shown that consumers' environmental concerns have gradually changed their shopping habits to rethink purchasing. Evidence suggests that many consumers are willing to pay more for products that meet environmental standards to truly protect

the environment [14]. The cost of losing a customer in today's marketing equals the loss of service benefits that customers need for a lifetime. Therefore, it is important to meet the customers' needs by providing these services, and insurance is no exception to this rule. Insurance can be considered one of the vital economic arteries of any country, and insurance companies are trying to increase efficiency worldwide. Therefore, one of the management goals is to increase insurance resources, which can be considered one of the responsibilities of insurance marketing management. The task of insurance marketing management is to train sales marketing personnel, conduct research, plan, design, offer, and provide new services and formulate a strategy. The main goal of insurance marketing management is to attract new customers, retain previous customers and create awareness of insurance results. Consumers and producers alike have expressed growing concerns about the environmental impact of products in recent years. Sustainable consumer behavior requires time, commitment, and resources before significant results can be achieved. Considering the special position of the insurance industry, as one of the most important infrastructure industries of development in the country and the basis for creating economic revenues, research in this regard has a high priority and importance in promoting production and exports, increasing quality, and improving service delivery. Therefore, identifying an appropriate model of sustainable consumer behavior and providing insurance services to improve insurance services, providing an appropriate model show the importance of presenting an appropriate model of sustainable consumer behavior in the insurance industry, especially in Asia Insurance Company. Studies on models of sustainable consumer behavior in the insurance industry, especially Asia Insurance Company, are limited. The lack of accurate and comprehensive identification of factors affecting sustainable consumer behavior in the insurance industry and prioritization of these indicators in Asia Insurance Company and providing appropriate solutions highlights the importance of this research. The costs of ignoring a model of sustainable consumer behavior in the insurance industry, especially Asia Insurance Company, in the current competitive environment are irreparable. Therefore, it is necessary to study the model of sustainable consumer behavior in the insurance industry, especially in Asia Insurance Company.

Sustainable consumer behavior is also one of the commercial fields, which has been widely discussed in the press on environmental issues. Consumer perception reflects the information process and the effect on consumer behavior. Perception is how people create their attitudes towards the world. Each person's perceptions are unique and affect the purchasing behavior of different people in different ways. Companies gain a competitive advantage over irresponsible companies through marketing. There are many examples of companies trying to be more responsive to the environment to better meet the needs of consumers. Insurance companies have carried out these activities except Asia Insurance Company. In addition, insurance companies need to formulate a strategy of sustainable consumer behavior for their organization to create a competitive advantage, which has not received enough attention. Implementing the strategy is the next step in formulating and planning, and the lack of employee involvement and effective management makes the developed strategies ineffective. Competition in insurance companies can achieve sustainable progress in gaining a competitive advantage over competitors by using sustainable approaches due to the behavior of their sustainable consumers. The insurance industry in Iran has repeatedly increased consumer expectations in all areas related to consumer services. Therefore, the vital position and role of sustainable consumer behavior in the insurance industry are not considered by the experts of Asia Insurance Company. This lack of attention does not consider the important role of sustainable consumer behavior as a competitive advantage for organizations. Lack of attention to social networks, low attention to consumer knowledge, corona pandemic, and new health threats are among the problems faced by the insurance industry, especially Asia Insurance Company, which jeopardize the development of this vital industry and the provision of appropriate services to citizens. Managers and planners of the insurance industry, especially Asia Insurance Company, seek to identify factors affecting sustainable consumer behavior so that the development of the insurance industry fails and leads to a reduction in competitive advantage. Numerous and diverse decision-making indicators affecting sustainable consumer behavior in different organizations and multiple goals like sustainable consumer behavior led to the issue of sustainable consumer behavior in the insurance industry in decision theory as an essential and challenging issue. The main problem of this study is proposing a multi-criteria decision model with structural equations to prioritize the factors affecting sustainable consumer behavior in the insurance industry.

## 2 Research literature

The effects of social capital in society are related to the adoption of consumer-friendly behavior or environmentally sustainable consumer behavior. Research on behavioral perspective models (BPMs) uses the social capital theory to explain how consumer behavior and proponents' attitudes affect consumers' perceptions of an organization's environmentally friendly behavior [46]. [55] thought that the factors affecting the motivation to consume sustainable products, including information and knowledge, environmental attitudes, social context, and environmental awareness, are strongly associated with green consumption motivation [55]. [43] stated that price is one of the factors, which can significantly affect the intention to buy green products and sustainable behavior [43]. According to [20], consumers can

understand the environmental consequences of their behavior when they shift their consumption pattern toward sustainable consumption and put pressure on producers and the production process towards green production. Creating awareness campaigns can enhance consumers' environmental knowledge [20].

## 2.1 Consumer behavior

Today, Internet and virtual markets, which are entirely different from physical markets, are considered by marketers [52]. Therefore, organizations and companies should always be aware of and study consumer behavior to gain a competitive advantage. Since consumers are the turning point of all marketing activities, it is necessary to start successful marketing by understanding consumer behavior [39]. The advent of social networks, online communities, online videos and emails, and blogs has made the ability to distribute information faster than ever before [26]). Senecal and Nantel showed that online product and service recommendations influence consumers' online choices. Various websites have had a profound effect on consumer purchasing decisions by facilitating disseminating of consumer opinions and facilitating access to such opinions [32] Since the Internet has significantly changed the sources of information and marketing messages, the message axis is no longer effective [44]. Many researchers have found that a positive source of positive advertising is the consumer attitude towards advertising. Therefore, understanding the relationship between advertising and consumers is essential [54]. Utilizing the right kind of consumer behavior and attitude is critical to making the most of the opportunities available to marketers. The effectiveness of network marketing depends on the types of social interactions and identifying the most active media in marketing activities [26]. Consumer behavior is a set of activities performed directly to acquire, consume, and dispose of goods and services. These activities include the decision-making process before and after these actions [30]. Schiffman & Leslie believed that consumer behavior includes behaviors that the consumer exhibits before, during, and after purchasing a product. Consumer behavior is defined as behavior that shows when searching, buying, using, evaluating, and discarding products, services, and ideas that meet their needs [63] Research shows that brand equity significantly affects consumers' willingness to pay more [7]. Kim et al. showed that social marketing skepticism affects consumer behavior [22].

## 2.2 Sustainable consumer behavior

Global voices for solutions to address the dire state of the natural environment have grown louder and louder over the past 40 years. Since the 1970s, efforts have been made to develop policies and frameworks on a global scale to promote more sustainable economic growth to reduce resources in a rapidly declining natural environment. International meetings, agreements, protocols, and programs, such as the United Nations Conference on the Human Environment (known as the Stockholm Conference), the World Commission on Environment and Development, the Brontelan Commission, Agenda 21 of the Earth Summit and the World Summit on Sustainable Development have reiterated global concerns about the negative effects of economic development on the environment's capacity to sustain life for future generations. Their strategic goal is to promote sustainable development path that addresses current needs without depriving future generations of this opportunity and meets their needs (WCED, 1987). Elkington explained that sustainable development had become a common theme that significantly affects government economic development policies worldwide and the supply and demand aspects of economic and trade activities. On the supply side, businesses and industries are increasingly pushing for measures such as the bottom line triple approach [46]. At the core of sustainable consumption is understanding why and how consumers engage in behaviors that are considered environmentally sustainable. Previous studies on the effects of government regulations [60], industry standards and practices [69], marketing campaigns [11], environmental knowledge [18], financial ability [28], consumer attitudes and values [25] point to the acceptance of various forms of pro-environmental consumer behavior. The study on this issue is based external and internal factors cause sustainable environmental behavior. Social capital is broadly defined as the nature and quality of an individual's social relationships, relationships, and contributions to a community [70]. Putnam stated that environmentally friendly behavior refers to consumer decisions and actions directly related to consuming products and services in ways less harmful to the environment or the natural environment. According to the theory of social capital [46, 31], consumers increasingly use goods and services that are more environmentally friendly, which leads to sustainable consumption [31]. According to the Organization for Economic Cooperation and Development (OECD), sustainable consumption is a critical element of the global campaign for a fairer model of development to reverse the negative effects of human activities on earth. Optimal use of products and services to meet basic human needs and preserve life emphasizes less harmful methods to the natural environment [46]. Sustainable consumer behavior was developed by [18], which shows that consumer behavior is influenced by values, attitudes, personalities, other cognitive factors, and the context or situation consumers find themselves. This situation is considered the environment where the behavior occurs, and information and reinforcement of benefits are available or promised. The behavioral perspective model presents that the behavioral environment or social and physical environments in which

the consumer is located provide a wide range of stimuli or reinforcements that signal a state of choice [17]. These stimuli or reinforcement mechanisms are:

1. Enhancing the direct benefit of specific behaviors
2. Strengthening information or cognitive and symbolic benefits of behavior, such as social consequences (e.g., social acceptance, status, and self-esteem);
3. Monetary and non-monetary benefits of engaging in certain behaviors [46].

[17] showed that consumers participate in a learning process when exposed to this stimulus from different environments. After learning from these stimuli or reinforcements, people become involved in consumer behaviors and choices [17]. Numerous factors affect consumer behavior, and much research has been done. These factors range from cultural, social, and economic factors to psychological factors [13].

### 2.3 Multiple criteria decision-making

Human thinking is associated with uncertainty in many decisions, which influences decision-making. In such cases, it is better to use fuzzy decision-making methods [4]. According to [73], decision-making of fuzzy criteria, rates and weights are evaluated as uncertain, vague, and ambiguous and are usually expressed as speech variables and, consequently, fuzzy numbers [21]. Multi-criteria decision-making is one of the fields of research in operations and management sciences, which has rapidly developed during the last decade. When several criteria are considered in decision-making issues, decision-making issues are called multi-criteria [35], which is a descriptive approach because of its subjective criteria. Multi-criteria decision-making aims to determine the best option while creating the most satisfaction [29]. Multi-criteria decision-making is used to transfer the best option from the proposed options according to the evaluation indicators of each option [64]. In fuzzy multi-criteria decision-making, rates and weights are evaluated as uncertain, vague, and ambiguous and are usually expressed as speech variables and, consequently, fuzzy numbers [73]. A fuzzy multi-criteria decision-making approach has been proposed for ambiguity and uncertainty problems [3].

### 2.4 Fuzzy set

A fuzzy set contains elements with different degrees of membership [5]. Fuzzy sets in modern mathematics refer to sets that the membership of some or all members is not clear, and its elements are relatively part of that set [4]. Fuzzy sets include uncertain members, and a generalized fuzzy set is a classical set that allows any value to belong to the range. In fuzzy sets, unlike definite sets, elements are not divided into two categories of members and non-members. However, the membership of different elements in fuzzy sets varies between zero and one. Fuzzy numbers are a particular and relative type of fuzzy set [1]. In other words, the condition of membership or non-membership of an element in a collection does not depend on full membership or non-membership. An element in a set may have a higher membership rating or a lower membership rating than another because the membership of an individual or element in a fuzzy set may be uncertain. For example, a person is a set member (tall human beings). The degree of membership in a person or an element in a fuzzy set is a concept that exists in the above fuzzy set [37].

On the other hand, human diagnosis of quality indicators has always been subjective and inaccurate. Such an important issue can justify using fuzzy set theory in the multi-criteria decision approach [3]. Fuzzy set theory is a complete tool for modeling the uncertainty and inaccuracy of the human mind, neither accidental nor probabilistic. Fuzzy logic provides a systematic basis for dealing with situations that are ambiguous or not well defined [34].

### 2.5 Research literature

Sardana et al. examined the sustainability of corporate social responsibility and performance in India's emerging economy by understanding the impact of environmental corporate social responsibility (CSR) and supplier sustainability practices on firm performance in the manufacturing industry. According to this study, environmental sustainability directly affected firm performance, while it was found that supplier sustainability on firm performance is positively adjusted by firm capability [58]. Hallikas et al. examined the effects of sustainability practices on risk management and purchasing performance and showed that the use of sustainable purchasing methods improves the purchasing performance of businesses. Sustainable purchasing practices improve credit and operational risk management performance [24]. [28] discussed the implications of promoting sustainable consumerism at the Tokyo Olympics and Paralympics and found that environmental compatibility is important to get a higher price point when comparing



the main products when buying seafood. Consumers were increasingly willing to pay more for eco-labeled products, especially when they became aware of the sustainability of these products. [9] explained consumer purchasing behavior to predict attitudes and buying organic products from a psychological perspective and concluded that consumer purchasing behavior is a predictive model to explain the intention and purchasing behavior., which can be extended to personal identity and trust. Trust in different supply chain actors was considered among all dimensions [9]. [38] investigated human messengers and the mediating effect on consumer sustainability behavior. Based on this study, anthropological signs (especially sad faces) activate the savior's effect, occurring when an anthropological messenger is seen as a victim and evokes a sense of sympathy. Empathy leads to increased sustainable behavior to save the victim from harm. However, this effect is suppressed when optimal sustainability behavior costs the consumer. In such cases, the anthropological messenger shifts from the threat victim to the marketing agent, which reduces sympathy for the messenger. Therefore, companies that seek to promote sustainable behaviors and preferences for sustainable products can use anthropology, but this behavior does not lead to additional payments to the organization [38]. [33] investigated the psychological effect of predicting sustainable consumer behavior of young consumers and revealed that motivation for environmental responsibility, spirituality, and perceived consumer effectiveness are the main psychological factors of sustainable consumer purchasing decisions. [71] identified essential factors affecting sustainable consumer behavior and showed that attitude, skills, and knowledge affect the value of life, age, and gender. There is a relationship between knowledge and skills and attitudes, and the relationship between sustainable consumer attitudes and behaviors is influenced by external factors such as social norms. Sustainable consumption behaviors vary greatly according to different demographic factors such as age and gender [71]. [27] determined the effect of green marketing in creating the company image by examining the effect of green marketing on the intention to buy with the mediating role of the company's image to improve Shatel customers' productivity. In this study, green marketing has a positive and significant effect on social responsibility, product image, and company reputation. In addition, social responsibility, product image, and company reputation had a positive and significant effect on the intention to purchase the product [27]. [51] identified the effect of environmental attitude, knowledge, environmental information, environmental concern, health concern, social responsibility, social context, education, being in a city, Internet use, patient history, and sensitivity to Food on the trend of sustainable consumption behavior of the citizens of Khorramabad. According to this study, environmental attitude, environmental knowledge and information, environmental concern, health concern, and social responsibility directly and the variables of education, urbanity, Internet use, and patient history with food allergies indirectly explained 30% of the variance of the sustainable consumption behavior of Khorramabad residents. The variables of health concern and environmental attitude had the greatest impact on sustainable consumption behavior [51]. [2] ranked the main factors affecting the buying behavior of environmentally friendly products based on the AHP technique in urban households in Tehran. The results showed that buyers' concern, product price, and level of awareness had the highest weight as the highest priority among the effective criteria for purchasing environmentally friendly products [2].

[?] evaluated the effect of value, effectiveness, and perceived risk the effect of value, effectiveness and perceived risk and stated that the effect of conscious behavior, perceived value, as well as the perceived effectiveness of the consumer on the intention to buy green was confirmed, and perceived risk and environmental concern did not affect the intention to buy. Therefore, several factors affect the industrial clusters of exports, which individually, in combination, are critical preconditions and introductions for the insurance industry. Therefore, the indicators and sub-indices that affect insurance industry are listed in Table 1:

### 3 Method

This developmental-exploratory and cross-sectional study were conducted by insurance industry experts and sustainable consumer behavior professors. The statistical sample included experts in sustainable consumer behavior in determining the priority of the components in two groups. The first group consisted of 20 managers and senior experts of the study organization, who were screened to localize the model and evaluate the content validity of the model and factors using a mathematical model. According to Saaty, the second group was experts using research techniques in fuzzy DEMATEL operations and fuzzy analytic network processes [16]. A total of eight experts with master's and doctoral degrees and more than 12 years of experience related to the studies organization were selected by the judgmental sampling method. The research literature and consulting experts were used to identify the factors to collect information. In addition, two types of questionnaires (a screening questionnaire and a pairwise comparison questionnaire) were used to collect the necessary data during the research. Cronbach's alpha was used to assess the questionnaire validity of the first part, which was collected to measure the importance of the criteria and sub-criteria. According to this method, the reliability of all research variables was more than 0.7.

Table 1: Indicators and sub-indices affecting insurance industry

No.	Factors	Sub-indices	Resources
1	Consumer knowledge about sustainability issues	Purchasing environmentally friendly products	[41], [42], [61], [43], [67], [15], [56]
		Knowledge about recycling	
		Finding a product with less waste	
		Information about sustainability symbols	
		Awareness of environmental and social issues	
2	Attitudes towards sustainable purchasing	Sustainable purchases to help reduce pollution as well as improve the environment	[41], [42], [61], [43], [67], [15], [56]
		Sustainable purchases to help reduce the excessive use of natural resources	
		Sustainable purchases to help save natural resources	
		Sustainable purchases to have a good self-feeling	
3	Sustainable purchasing behavior	Checking products for harmful ingredients for the environment	[41], [42], [61], [43], [67], [15], [56]
		Product selection with environmentally friendly packaging	
		Purchasing sustainable products	
		Paying attention to environmental and fair trade labels	
4	Religious spirit	Feeling the presence of God	[41], [42], [61], [43], [67]
		Communication experience with all life	
		Feeling of self-sacrifice toward others	
		Feeling of peace and deep inner harmony	
5	Effectiveness of consumer perception	Investigate the effect on the environment and other consumers when purchasing products	[41], [42], [61]
		The positive impact of consumer behavior on the purchase of products sold by socially responsible companies	
6	Implement for environmental responsibility	Supporting environmental protection	[41], [42], [61], [43]
		Responsibility for environmental protection	
		Start protecting the environment with people	
7	Perceived market effect	Individual efforts for eco-friendly motivate others in the community to buy eco-friendly products	[41], [42], [61], [43], [67]
		The impact of people's choices on what companies do and sell in the marketplace	
		Companies are introducing themselves more by purchasing environmentally friendly products	

## 4 Data analysis method

In this research, the fuzzy method was used for pairwise comparisons of model factors to consider mental issues and uncertainties in decision-making, which is more capable than similar methods. The fuzzy Delphi technique has been used to screen while identifying the factors affecting the green supply chain to analyze the data collected from the questionnaire. F.DEMATTEL and F.ANP were used to determine the effect of factors and the intensity of their effect. [66] study was utilized to solve the problem.

### 4.1 Fuzzy DEMATEL method

The fuzzy DEMATEL method examines the structure of effects between criteria [65] and tries to solve the problem facing organizations using group decision-making in fuzzy conditions [2].

Step 1: Creating a fuzzy direct relationship matrix by determining the effect of criterion  $i$  on  $j$  according to Table 2.

Table 2: Linguistic scales for pair-wise comparisons [36]

Fuzzy numbers	Linguistic words for pair-wise comparisons	
(0.75, 0.75, 1)	$\tilde{4}$	Very high impact
(0.5, 0.75, 1)	$\tilde{3}$	High impact
(0.25, 0.5, 0.75)	$\tilde{2}$	Low impact
(0, 0.25, 0.5)	$\tilde{1}$	Very low impact
(0, 0, 0.25)	0	Effectless

Step 2: Normalizing the direct relationship matrix through Equations 1 and 2:

$$\bar{X} = k\bar{X} \tag{1}$$

$$k = \min\left[\frac{1}{\max_{1 \leq i \leq n} \sum_{j=1}^n A_{ij}}, \frac{1}{\max_{1 \leq j \leq n} \sum_{i=1}^n A_{ij}}\right] \quad i, j = 1, 2, \dots, n \tag{2}$$

Step 3: Calculating the general relationship matrix with Equation 3.

$$\bar{T} = \bar{X}(1 - \bar{X}) \tag{3}$$

Step 4: Determining and using Equations 4 to 6:

$$\bar{T} = [\bar{t}_{ij}]_{n \times n} \quad i, j = 1, 2, \dots, n \tag{4}$$

$$\bar{R} = \left[\sum_{j=1}^n \bar{t}_{ij}\right] = [\bar{r}_i]_{n \times 1} \tag{5}$$

$$\bar{D} = \left[\sum_{i=1}^n \bar{t}_{ij}\right] = [\bar{d}_j]_{1 \times n} \tag{6}$$

Step 5: calculating  $(\bar{R} + \bar{D})$  and  $(\bar{R} - \bar{D})$  and plotting the effects relationships in the coordinate axis.

Step 6: Forming a boundary supermatrix

The weighted supermatrix converges through relation  $\lim_{K \rightarrow \infty} (W^\alpha)^K$  to form a finite supermatrix, and finally, the final weights are determined by the D.ANP method [66].

### 4.2 Network analysis process (ANP)

The network analysis method was proposed by Saaty and Takizawa [48]. The network analysis process is the general state of AHP, which has all the positive features such as simplicity, flexibility, applying quantitative and qualitative criteria to examine the consistency of judgments, and making complex relationships (interdependencies and feedback) between decision elements by a network structure. The difference between a hierarchical structure and a network structure is presented in Figure 1. The Network Analysis Process (ANP) considers each problem as a network of criteria, sub-criteria, and options (called elements) grouped in clusters. All elements in a network can be related to each other. In other words, in a network, feedback and interaction in and between clusters are possible. Therefore, the network analysis process can be considered in two parts (control hierarchy and network communication). The control hierarchy includes the relationship between the goal, criteria, and sub-criteria and affects the internal communication of the system, and the network communication includes the dependence between elements and clusters. This feature of the network analysis process makes it possible to consider the interdependencies between the elements and thus provides a detailed approach to complex issues. The effect of an element on other elements in a network is considered by a supermatrix [57].

### 4.3 Fuzzy analytic network process (ANP)

The Fuzzy analytic network process is very appropriate where the dependence between the criteria for selecting possible options is very high and determines the relationships between criteria [? ]. The fuzzy ANP process includes the following steps:



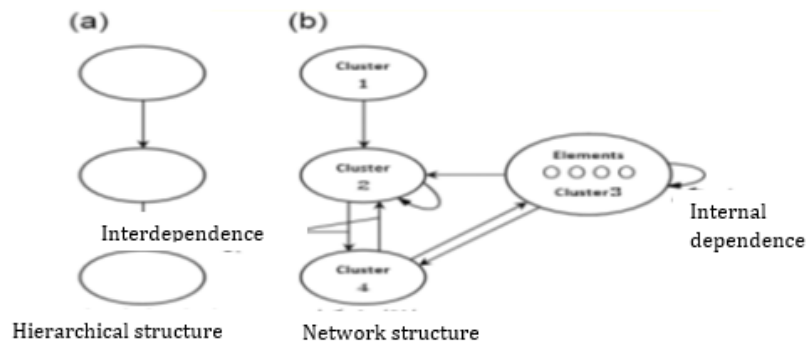


Figure 1: Structural differences between a "hierarchy" and a "network"

**1. Modeling and structuring the problem**

The problem should be clearly stated and broken down into a logical system, for example, a network. This structure can be obtained using the opinion of decision-makers and through methods such as brainstorming or other appropriate methods [72].

**2. Pair-wise comparison matrixes**

Establishing a pair-wise comparison of options (criteria) with the classical 1-9 hourly spectrum and construct a pair-wise comparison matrix using fuzzy triangular numbers (l, m, U) and a matrix as follows:

$$\tilde{A} = \begin{bmatrix} (a_{11}^l, a_{11}^m, a_{11}^u) & (a_{1r}^l, a_{1r}^m, a_{1r}^u) & \dots & (a_{1n}^l, a_{1n}^m, a_{1n}^u) \\ (a_{r1}^l, a_{r1}^m, a_{r1}^u) & (a_{rr}^l, a_{rr}^m, a_{rr}^u) & \dots & (a_{rn}^l, a_{rn}^m, a_{rn}^u) \\ \vdots & \vdots & \vdots & \vdots \\ (a_{m1}^l, a_{m1}^m, a_{m1}^u) & (a_{mr}^l, a_{mr}^m, a_{mr}^u) & \dots & (a_{mn}^l, a_{mn}^m, a_{mn}^u) \end{bmatrix}$$

$$\tilde{A} = \begin{bmatrix} (1, 1, 1) & (a_{1r}^l, a_{1r}^m, a_{1r}^u) & \dots & (a_{1n}^l, a_{1n}^m, a_{1n}^u) \\ \left(\frac{1}{a_{1r}^l}, \frac{1}{a_{1r}^m}, \frac{1}{a_{1r}^u}\right) & (1, 1, 1) & \dots & (a_{rn}^l, a_{rn}^m, a_{rn}^u) \\ \vdots & \vdots & \vdots & \vdots \\ \left(\frac{1}{a_{1n}^l}, \frac{1}{a_{1n}^m}, \frac{1}{a_{1n}^u}\right) & \left(\frac{1}{a_{rn}^l}, \frac{1}{a_{rn}^m}, \frac{1}{a_{rn}^u}\right) & \dots & (1, 1, 1) \end{bmatrix}$$

**5 Super matrix**

Logarithmic methods of least squares and Chang's developmental analysis method are used to obtain the weight of the indicators. In the following, the logarithm method of least squares is described.

The logarithmic method of least squares of fuzzy weights is presented below. The following steps were performed to calculate  $\bar{W}_1$ ,  $\bar{W}_1$ , and the corresponding weight to obtain the weight of the indices according to the supermatrix  $\bar{W}$ , which is as follows:

$$\bar{W} = \begin{bmatrix} 0 & 0 \\ \bar{W}_{21} & \bar{W}_{22} \end{bmatrix}$$

In  $\bar{W}$  matrix,  $\bar{W}_{21}$  is the opinion matrix of the decision team regarding the pair-wise comparison of the ranking indicators concerning the primary goal. The matrix  $\bar{W}_{22}$  is also calculated from the experts' opinions regarding the pair-wise comparisons of the other indicators and using the logarithm method of least squares to combine the criteria. The logarithmic method of least squares of fuzzy weights  $n$  and the  $n$  table are given in the following:

$$\bar{W} = (W_k^l, W_k^m, W_k^u) \quad k = 1, 2, 3, \dots, n.$$

So that

$$W_k^S = \frac{\left(\prod_{j=1}^n a_{kj}^s\right)^{\frac{1}{n}}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{kj}^m\right)^{\frac{1}{n}}} \quad S \in \{l, m, u\}.$$

Then  $\bar{W}_i$  matrix is calculated as  $\bar{W}_i = \bar{W}_{21} * \bar{W}_{21}$  and obtained using the logarithmic method, the least squares of the fuzzy weight of each prioritization indicator [72] .

### 6 Conclusion

Various articles were used, and the factors were extracted to identify the factors. Weight limitation was applied in the model because many identified factors were high to localize the indicators and reduce inputs, as well as to determine their importance to each other and evaluate their validity. For this purpose, a questionnaire with 25 questions was designed qualitatively based on 5 points from extremely important to not-important, and 20 questionnaires were distributed among the first sample group and collected comprehensively and completely. Then, the fuzzy Delphi method was used to determine the most critical factors. The results of weighting the criteria of 25 sub-factors and seven factors were removed from the final conceptual model of the research, and finally, six main indicators and 18 effective sub-indices were selected as essential and main factors for the final solution of the model. Then, the first research question was answered, which is identified in Table 3 as the most critical factor.

1. What are the indicators affecting sustainable consumer behavior in the insurance industry?

Table 3: Factors and sub-factors affecting sustainable consumer behavior in the insurance industry

Factor	Sub-factor	Code
Consumer knowledge C <sub>1</sub>	Product search with less waste	C <sub>11</sub>
	Information about sustainability symbols	C <sub>12</sub>
	Buy environmentally friendly products	C <sub>13</sub>
Religious spirit C <sub>2</sub>	Communication experience	C <sub>21</sub>
	Feeling of sacrifice	C <sub>22</sub>
	Sense of peace	C <sub>23</sub>
Attitude towards sustainable purchasing C <sub>3</sub>	Pleasant attitude toward purchasing	C <sub>31</sub>
	Environmental protection attitude	C <sub>32</sub>
	Resource-saving attitude	C <sub>33</sub>
Sustainable purchasing behavior C <sub>4</sub>	Paying attention to the trade label	C <sub>41</sub>
	Paying attention to compatible packaging	C <sub>42</sub>
	Paying attention to the ingredients	C <sub>43</sub>
Perceived market effect C <sub>5</sub>	Impact on people's choice	C <sub>51</sub>
	Impact on introducing new products	C <sub>52</sub>
	Encourage people to sustainable purchasing	C <sub>53</sub>
Implementation of environmental responsibility C <sub>6</sub>	Supporting environmental protection	C <sub>61</sub>
	Responsible for environmental protection	C <sub>62</sub>
	Start protecting the environment	C <sub>63</sub>

Finally, the decision model was formed according to the following factors listed in Table 5.

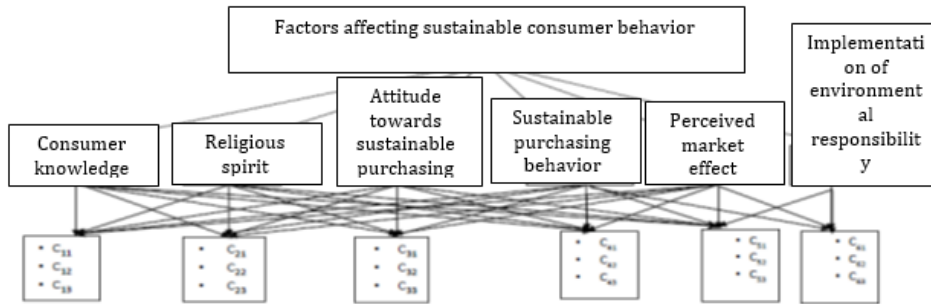


Figure 2: Research network structure

6.1 DEMATEL problem-solving

The sum of the elements of the columns and rows of  $\bar{T}$  matrix are calculated for the main factors and sub-factors, named (effective) and (influential)  $\bar{R}$  vectors. The calculations are given in Table 4 and 5:

Table 4:  $\bar{R}$ ,  $\bar{D}$ ,  $\bar{R} + \bar{D}$ ,  $\bar{R} - \bar{D}$  criteria values

Factor	$\bar{D}$	$\bar{R}$	$\bar{D} + \bar{R}$	$\bar{D} - \bar{R}$	Result
Consumer knowledge	7.12	6.32	13.4	0.8	Effective
Religious spirit	6.86	6.87	13.7	-0.008	Impressive
Attitude towards sustainable purchasing	6.63	6.28	12.9	0.349	Effective
Sustainable purchasing behavior	6.91	6.86	13.8	0.042	Effective
Perceived market effect	5.88	6.97	12.9	-1.085	Impressive
Implementation of environmental responsibility	6.63	6.73	13.4	-0.097	Impressive

Figure 3 illustrates the significance of effectiveness and impressiveness between criteria. The horizontal and vertical axes of the chart are related to criteria and effectiveness, respectively. Therefore, the importance and effectiveness/impressiveness of the criteria, respectively, are the attitude towards sustainable purchasing, consumer knowledge, and sustainable purchasing behavior. The indicators with positive  $\bar{R} - \bar{D}$  values in Table 6 show the definite effect of these factors and negative  $\bar{R} - \bar{D}$  value, such as religious spirit, implementation of environmental responsibility, and perceived market effect, indicate the definite impressiveness of these factors over other factors. Therefore, the attitude towards sustainable purchasing (0.349) is the most effective, and the perceived market effect (-1.085) is the most impressive factor among the main factors. In general, positive  $\bar{R} + \bar{D}$  and negative  $\bar{R} - \bar{D}$  are considered cause and effect, respectively, which responses to the second research question (How are the causal relationships (effectiveness/impressiveness) among the effective criteria on ex sustainable consumer behavior in the insurance industry?). Finally, the cause-and-effect relationships are plotted in a Cartesian coordinate system by drawing points with coordinates  $\bar{R} + \bar{D}$  and  $\bar{R} - \bar{D}$  based on the matrix. Accordingly, the cause-and-effect diagram and the network of factors are shown in Figure 3.

6.2 Weighting of factors by fuzzy analytic network process method

At this stage, the weighted supermatrix is calculated and then converges to the power of 7 to obtain the limit supermatrix using the T matrix to achieve the weight and priority of the factors. Finally, the weights of the factors and sub-factors are determined and obtained by biphasizing the weights by the center of gravity method (Table 6).

As shown in Table 6, the highest weight is related to the religious spirit factor with the first priority. In addition, start protecting the environment gained the highest weight and the first priority in sub-factors. Impact on introducing new products, feeling of peace, communication experience, attitude towards sustainable purchasing, and paying attention to the brand label were the second to sixth ranks, respectively, with approximately 36.48% of the total weight of the sub-factors, which shows the great importance of these sub-factors. Other factors also acquired the next priorities, as shown in Table 6. Figure 4 and 5 demonstrate the final priority of the main and sub-factors by the F.ANP method.

Table 5:  $\bar{R}$ ,  $\bar{D}$ ,  $\bar{R} + \bar{D}$ ,  $\bar{R} - \bar{D}$  sub-criteria values

Factors	Sub-Factors	Code	$\bar{D}$	$\bar{R}$	$\bar{D} + \bar{R}$	$\bar{D} - \bar{R}$
Consumer knowledge	Product search with less waste	C <sub>11</sub>	1.36	1.31	2.67	0.046
	Information about sustainability symbols	C <sub>12</sub>	1.35	1.37	2.72	-0.02
	Buy environmentally friendly products	C <sub>13</sub>	1.33	1.36	2.69	-0.02
Religious spirit	Communication experience	C <sub>21</sub>	1.38	1.41	2.8	-0.03
	Feeling of sacrifice	C <sub>22</sub>	1.37	1.32	2.69	0.056
	Sense of peace	C <sub>23</sub>	1.39	1.41	2.8	-0.03
Attitude towards sustainable purchasing	Pleasant attitude of purchasing	C <sub>31</sub>	1.34	1.39	2.73	-0.04
	Environmental protection attitude	C <sub>32</sub>	1.39	1.32	2.71	0.064
	Resource-saving attitude	C <sub>33</sub>	1.36	1.38	2.74	-0.02
Sustainable purchasing behavior	Paying attention to the trade label	C <sub>41</sub>	1.43	1.42	2.85	0.008
	Paying attention to compatible packaging	C <sub>42</sub>	1.37	1.39	2.76	-0.01
	Paying attention to the ingredients	C <sub>43</sub>	1.38	1.38	2.76	0.007
Perceived market effect	Impact on people's choice	C <sub>51</sub>	1.34	1.37	2.71	-0.02
	Impact on introducing new products	C <sub>52</sub>	1.37	1.41	2.78	-0.04
	Encourage people to sustainable purchasing	C <sub>53</sub>	1.37	1.3	2.67	0.065
Implementation of environmental responsibility	Supporting environmental protection	C <sub>61</sub>	1.3	1.28	2.59	0.018
	Responsible for environmental protection	C <sub>62</sub>	1.28	1.21	2.49	0.064
	Start protecting the environment	C <sub>63</sub>	1.28	1.36	2.63	-0.08

## 7 Discussions

This study was first aimed to identify the factors affecting sustainable consumer behavior in the insurance industry, especially in Asia insurance. According to the studies and following the screening, 18 important factors were identified, the main criteria of which were consumer knowledge about sustainability issues, attitudes toward sustainable purchasing, sustainable purchasing behavior, religious spirit, and implementation of environmental responsibility.

The study then aimed to determine the relationships and effects of factors on each other using the DEMATEL technique. According to this technique, the perceived market effect was the most effective factor affecting sustainable consumer behavior in the insurance industry, especially in Asia Insurance. In other words, this factor is the main problem and bottleneck of improvement in sustainable consumer behavior in the insurance industry, especially in Asia insurance, which is solved by effective factors. The success or failure of sustainable consumer behavior in the insurance industry depends on sustainable consumer behavior, especially in Asia insurance. Asia insurance company should pay attention to the factor of company structure to achieve productivity and competitive advantage. In addition, the attitude toward sustainable purchasing is the most effective factor in sustainable consumer behavior in the insurance industry, especially Asia insurance, as the essential criterion, which solves the problems and should be prioritized to improve the system. Therefore, attitude toward sustainable purchasing significantly affects sustainable consumer behavior. In addition, the attitude toward sustainable purchasing can be an effective factor in sustainable consumer behavior in the industry and its use in the organization by increasing efficiency and improving processes.

The third aim of the research was to calculate the relative weights of criteria and sub-criteria and determine their priority using the fuzzy analytic network process. The religious spirit factor, with a weight of 0.1759, is the most crucial in sustainable consumer behavior among the main factors based on experts' opinions. Therefore, religious spirit is one of the critical factors in sustainable consumer behavior in the insurance industry, and senior managers of the organization should pay close attention to this important factor. The start of protecting the environment, with

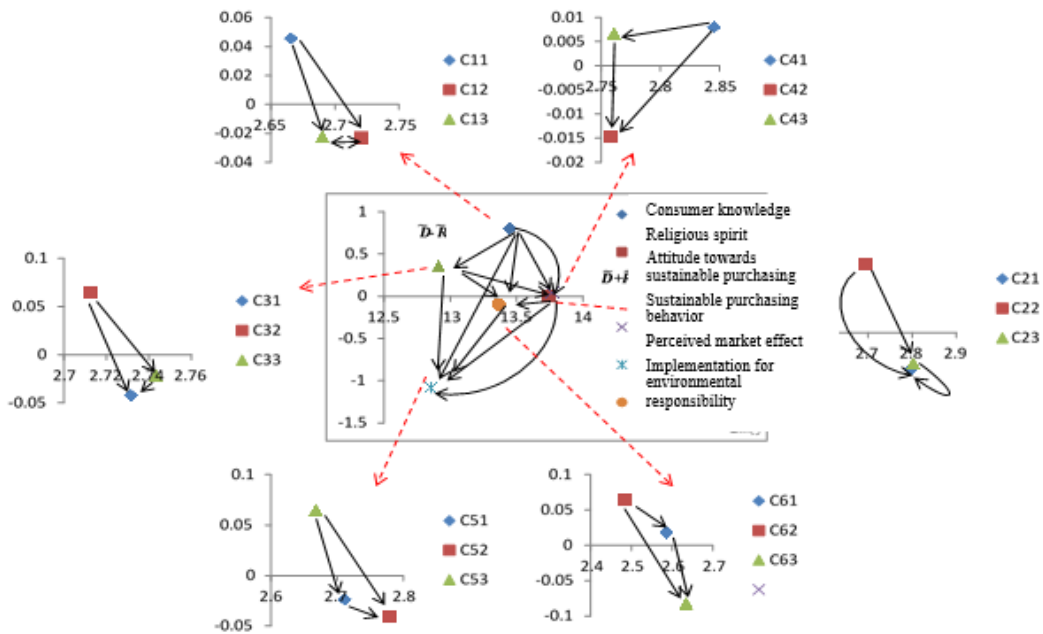


Figure 3: Relationship network between main criteria and sub-criteria

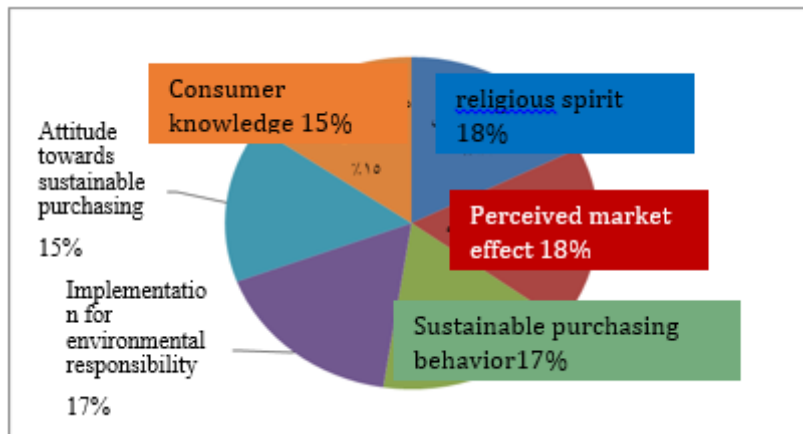


Figure 4: Relative priority of the main factors

a final weight of 0.0623 of the total weights, gained the first priority among the sub-factors in the implementation of environmental responsibility. Improving sustainable consumer behavior depends on the religious spirit factor, which always tries to play a role by improving the sense of calm in the organization. This study proposed some solutions according to the results.

According to F.DEMATEL results, the perceived market effect is the most effective factor in sustainable consumer behavior in the insurance industry, which should try to make the success of the study population with suggestions. The success or failure of the organization depends on this criterion (impressive), and this criterion's effect severity should be used to strengthen the system. Therefore, senior managers and decision-makers in the insurance industry, especially in Asia Insurance, are suggested to try to increase and maintain their competitive position by increasing the motivation of people for sustainable purchasing, enhancing the people's selection effect, and raising the effect of introducing new services and products. In addition, according to the results of F.DEMATEL, the attitude towards sustainable purchase is the most effective factor in sustainable consumer behavior in the insurance industry, which should try to make suggestions for the success of the studied company because the success or failure of the company is based on this criterion (the most effective) and the severity of the effect of this criterion should be used to strengthen



Table 6: Weight and priority of criteria and sub-criteria affecting sustainable consumer behavior in the insurance industry

Weight and priority of the main factor	Weight and priority of the sub-factor	Weight and priority of the sub-factors	code	Sub-factor	Weight and priority of the main factor
Consumer knowledge C <sub>1</sub>	0.1533 (6)	Product search with less waste	C <sub>11</sub>	0.314 (3 3 )	0.048 (18 2 )
		Information about sustainability symbols	C <sub>12</sub>	0.344 (1 7 )	0.052 (12 7 )
		Buy environmentally friendly products	C <sub>13</sub>	0.341 (2 7 )	0.052 (14 4 )
Religious spirit C <sub>2</sub>	0.1759 (1)	Communication experience	C <sub>21</sub>	0.344 (2 7 )	0.060 (4 6 )
		Feeling of sacrifice	C <sub>22</sub>	0.308 (3 4 )	0.054 (10 3 )
		Sense of peace	C <sub>23</sub>	0.346 (1 9 )	0.061 (3 3 )
Attitude towards sustainable purchasing C <sub>3</sub>	0.1539 (5)	Pleasant attitude of purchasing	C <sub>31</sub>	0.334 (3 2 )	0.051 (15 4 )
		Environmental protection attitude	C <sub>32</sub>	0.324 (2 3 )	0.049 (17 0 )
		Resource-saving attitude	C <sub>33</sub>	0.341 (1 5 )	0.052 (13 5 )
Sustainable purchasing behavior C <sub>4</sub>	0.1737 (3)	Paying attention to the trade label	C <sub>41</sub>	0.345 (1 9 )	0.059 (5 9 )
		Paying attention to compatible packaging	C <sub>42</sub>	0.331 (2 1 )	0.057 (7 5 )
		Paying attention to the ingredients	C <sub>43</sub>	0.323 (4 9 )	0.056 (8 3 )
Perceived market effect C <sub>5</sub>	0.1747 (2)	Impact on people's choice	C <sub>51</sub>	0.336 (2 9 )	0.058 (6 9 )
		Impact on introducing new products	C <sub>52</sub>	0.355 (1 2 )	0.062 (2 1 )
		Encourage people to sustainable purchasing	C <sub>53</sub>	0.308 (3 1 )	0.053 (11 8 )
Implementation of environmental responsibility C <sub>5</sub>	0.1685 (4)	Supporting environmental protection	C <sub>61</sub>	0.333 (2 4 )	0.056 (9 2 )
		Responsible for environmental protection	C <sub>62</sub>	0.296 (3 8 )	0.05 (16 3 )
		Start protecting the environment	C <sub>63</sub>	0.369 (1 8 )	0.062 (3 3 )

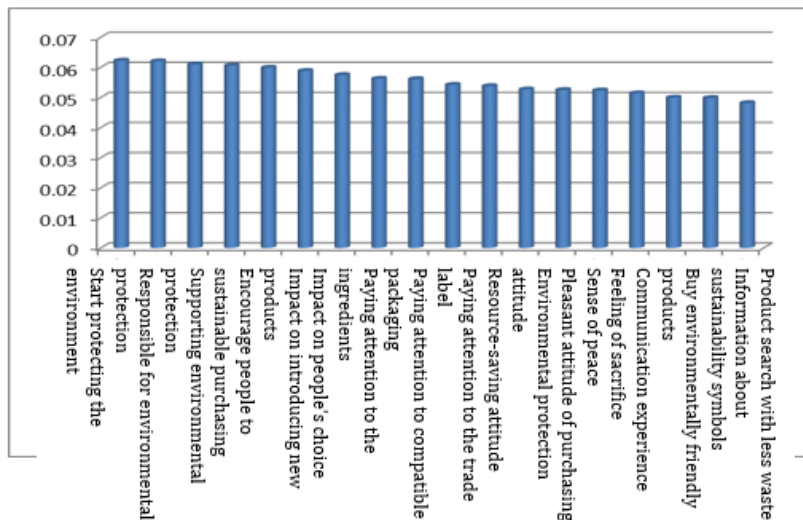


Figure 5: Final priority of sub-factors

the system. Therefore, senior managers and decision-makers in the insurance industry, especially Asia Insurance, are advised to increase and maintain their competitive position by improving their attitude toward environmental

protection, increasing their attitude toward saving resources, and raising their pleasant attitude toward purchasing.

According to the results of F.ANP, the company structure is the most critical factor among the main criteria, and the sales policy as its sub-index significantly affects sustainable consumer behavior in the insurance industry. Senior managers and decision-makers in the insurance industry, especially in Asia Insurance, are recommended to improve sustainable consumer behavior by increasing the perceived market effect, improving sustainable purchasing behavior, performance for environmental responsibility, attitudes toward sustainable purchasing, and consumer knowledge. In addition, product ingredients, support for environmental protection, and consumer self-sacrifice should be considered. Consumer encourage for sustainable purchasing, information about symbols of sustainability, attitude toward saving resources, increased environmentally friendly products purchases, consumer satisfaction with sustainable purchases, consumer responsibility for environmental protection, and consumer attitudes toward protecting the environment should be intended.

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