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The Role of Personality in the Adoption of Pro-Environmental Behaviors through the Lens of the Value-Belief-Norm Theory

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Abstract: The present study investigated citizens' self-reported pro-environmental behaviors by adopting a survey and bootstrapping via structural equation modeling for five different personality traits. Adopting one traditional psycho-social theory, this study investigates how motivations, values, intentions, norms, and behaviors are connected by using different constructs from the value-belief-norm theory extended with external influences and three different pro-environmental behaviors, namely, waste preventer, green consumer, and avoider, and how the connections change between different personality traits from the Big Five personality test, namely, openness, extroversion, neuroticism, agreeableness, and consciousness. According to this study, personal conscience may inspire environmentally beneficial behaviors like green purchasing and waste reduction when appealing to the emotions of the general public. As a result, strengthening the population's subjective norms requires interventions that concentrate on communication tactics to raise knowledge of penalties and obligations for communal advantages.

Keywords: value-belief-norm theory (VBN); Big Five personality traits; external influences; pro-environmental behaviors; environmental sustainability

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1. Introduction

One of the key topics of our time is how to solve environmental issues. The negative consequences of the sharply rising amount of trash being produced are a major worry for all nations and governments, whether they are in rich or emerging economies [1–4]. Due to the pollution of the air, soil, and water as well as the loss of biodiversity in both the flora and animals, all this trash is pushing the environment to the point where it cannot be repaired. These environmental issues have all become urgent concerns for various governments, businesses, and other stakeholders, including ordinary consumers.

The majority of environmental issues have their roots in human conduct, at least in part. In reality, contemporary literature highlights how humans are to blame for overusing resources, increasing contamination, accelerating global warming, and losing many forms of biodiversity [5,6].

According to studies, "pro-environmental behaviors (PEBs)", "green behaviors (GBs)", "environment-friendly behaviors (EFBs)", or "low-carbon behaviors (LCBs)" are all terms used to describe human actions that safeguard the environment [7]. Environmentally friendly actions are those that damage the environment as little as possible or even benefit

it [8]. These PEBs involve actions that can protect nature from the harmful impacts of human activity [9]. Recent years have seen a significant increase in public awareness of the need to promote environmental practices, including trash reduction, recycling, reusing, and composting, in order to reduce the amount of waste that ends up in landfills.

Trash reduction is possible through green consumerism, waste prevention, and preventing the final disposal of hazardous items. Additionally, it is widely accepted that human traits have an impact on waste minimization and reduction [10].

Numerous studies have also looked at the relationships between various psychological traits and pro-environmental behaviors, including feeling in control, internal attribution, adhering to social norms, and feeling guilty, ultimately pointing to a possible connection between personality traits and pro-environmental behaviors [11,12]. Recently, environmentalism has been investigated from the perspective of the Big Five Model's associations with personality traits [13]. The study of personalities looks at the actions that people consistently repeat over a long period of time in a variety of contexts [14].

The pattern of traits that could be measured by how one interacts with people and positions themselves around them is referred to as one's personality and includes how they influence other people as well as how they view and interpret themselves [15]. Extraversion, agreeableness, awareness, neuroticism (emotional stability), and openness to new experiences are the five qualities of personality [16].

According to research, having an agreeable personality is typically related to having high levels of empathy and compassion, which have been shown to be some of the key determinants of pro-environmental activities [17]. Additionally, those with high levels of consciousness frequently exhibit goal-directed conduct, including planning ahead, postponing pleasure, adhering to rules and norms, and scheduling work [18]. It is hypothesized that since both agreeableness and consciousness have been linked to a propensity to be good citizens [19], they will both be linked to pro-environmental activities [14]. Extraversion is frequently described as being very gregarious, energetic, and people-oriented [20]. The desire to interact with others may lead to more pro-environmental acts, such as joining environmental organizations or groups as an activist. However, they could also be agitated, tense, and depressed in many situations, making it harder for people to continue their pro-environmental actions. Neuroticism is characterized by a tendency toward fearlessness, detachment, and toughness [21]. Curiosity and a taste for novelty are associated with high degrees of openness to experience [19].

Existing research has utilized models based on knowledge and attitude [22], the norm activation model [23], the theory of planned behavior [24], and more recently the value-belief-norm theory (VBN) to examine the three proposed PEBs (green consumer, avoider, and waste preventer) [25]. From among these hypotheses, the VBN hypothesis stands out and is based on three elements that affect PEBs: values, beliefs, and norms. This theory (VBN) was developed by Stern and colleagues [25], and it has been widely used to study the impact of psychological factors on pro-environmental behaviors [26–31]. The VBN theory is considered to be one of the most influential theories in explaining pro-environmental intentions and behaviors, stressing the major importance of values and subjective norms in explaining and predicting behavior.

Studying pro-environmental behaviors and their relationship with personality traits in an emerging economy like Ecuador holds significant importance for four key reasons. (a) The country ranks number 8 on the list of countries with the largest population in Latin America, with more than 16 million inhabitants, which, added to its size and area, positions Ecuador as the most densely populated country in the region [32]. (b) Ecuador is classified as a developing nation, where a substantial segment of its populace faces notable socioeconomic inequalities [33]. Consequently, there is a call for socioeconomic progress, which frequently correlates with the issue of environmental degradation [34]. (c) In 2008, Ecuador marked a noteworthy achievement by being the first nation to enshrine the rights of nature and the indigenous concept of Buen Vivir in its constitution [35]. (d) Pro-environmental behaviors have been largely unexplored for the country, especially around

waste minimization, and for the general public. While there have been several notable studies published on the topic, such as those by [36–38], it is essential to note that none of these studies specifically focused on populations other than university students and company employees.

The current study is carried out in Guayaquil, a third-world developing city in Ecuador. In 2020, the city produced 4000 tons per day of municipal solid waste (MSW), or 1.47 kg per person, based on a population of about 2.7 million. Household solid waste (HSW), which accounts for 39% of municipal solid waste (MSW) and weighs 0.58 kg per person per day, contains 24% of traditional recyclable materials and roughly 70% biowaste [39]. Less than 4% of MSW is separated and recycled, with the remainder being disposed of at the nearby "Las Iguanas" landfill, posing a risk to the soil and possibly polluting groundwater. This is made worse by the fact that, in August 2020, information on the exports of plastic garbage from the United States showed that roughly a thousand tons had been sent to Ecuador [40]. These are merely testimony to all the issues the city's municipal waste management handlers have encountered. A wonderful example of a large developing-world metropolis is Guayaquil, where green habits are still essentially novel ideas to which residents have only recently begun to adapt.

To address this research gap, this study aims to investigate the impact of the Big Five personality traits on pro-environmental behaviors using the extended VBN theory. The study makes two significant contributions. Firstly, it empirically demonstrates that personality traits play a crucial role in explaining the variations in waste reduction behaviors among individuals, specifically in the categories of waste prevention, avoidance, and green consumption. Secondly, the study applies the extended VBN theory to elucidate how personality traits influence pro-environmental behaviors related to waste reduction, thus broadening the scope of research in pro-environmental behavior studies. These findings, along with future experiments, lay the foundation for developing a citizen typology. Moreover, the insights gained from this research can contribute not only to modeling the pro-environmental behaviors of urban residents in their daily lives but also to designing and implementing targeted information interventions to encourage waste reduction behaviors among citizens.

In summary, the research question for the present study establishes a relationship between the personality traits elaborated from the Big Five personality test and the validation of the VBN theory to examine three different pro-environmental behaviors, namely, avoider, waste preventer, and green consumer, in a South American metropolis. The effectiveness of the model will be evaluated for every personality trait with the help of its extended variance and model predictability. The theoretical background and research framework will be presented in the following section, followed by a detailed explanation of the methodology used in the study in Section 3. The validity and reliability tests, conducted using confirmatory factor analysis and structural equation modeling, respectively, will be discussed in Section 4. Section 5 will outline the implications and limitations of the study. Finally, Section 6 will conclude by summarizing the main ideas presented in the paper.

2. Theoretical Background and Research Framework

2.1. Personality Traits and Sustainability

Most environmental problems are, at least partly, rooted in human behaviors. It has been noted that all types of consumption deplete valuable resources [41], and consumer behaviors—primarily the consumption and disposal of products—affect natural resources [42], as what millions of consumers desire and wish would create unsustainable demands on these resources and have a significant impact on efforts to protect the environment. In order to build a harmonic and robust relationship between the human population and their natural environment, people's behaviors need to change, since humanity and its behaviors are the roots of most environmental problems [43].

How to leverage intrinsic personal traits like personality inclinations to encourage pro-environmental behavior has always been a matter of debate. In fact, although some

frameworks for understanding environmental behaviors [7,44] emphasize personality traits as early predictors in relation to values, ideology, and attitudes, research exploring factors linked to environmentalism has somewhat understated the role of personality. Nonetheless, personality, as a fundamental driver of individuals' motivations, beliefs, values, and consequently their attitudes and behavioral decisions, could serve as a potent precursor to the development of pro-environmental attitudes and behaviors [45].

Personality refers to a relatively enduring arrangement of an individual's psychophysical systems that influences, triggers, and elucidates human cognitions, beliefs, and behaviors [46,47]. Utilizing a trait-oriented approach for predicting environmentalism shows promise, as personality domains encapsulate the fundamental and enduring traits of individuals that serve as predictors for attitudes and behaviors [48].

However, only a few studies on how certain personality types approach various pro-environmental actions were uncovered throughout the preparation of this research [49] discovered that teenagers with various personality types approach recycling in various ways. People with more strongly expressed adaptive and optimistic personality qualities have more positive views toward recycling and recycle more frequently than people with less strongly expressed adaptive traits. Researching their behavioral intentions and the factors influencing them may prove useful in understanding which type of personality readily forms behavior-enforcing attitudes and what type of personality most readily forms beliefs, values, and social norms [50,51]. Additionally, it is most likely that individuals who differ in their personalities will also differ in the form they exhibit beliefs, values, and social norms.

The Big Five Model represents a modern variant of personality factor models, emerging from the framework of trait theory, as it encompasses the dimensions within human personality's structure that give rise to the qualities of human emotions, cognition, and conduct [52]. The Big Five model encompasses five labeled personality traits: agreeableness (A), openness (O), conscientiousness (C), extraversion (E), and neuroticism (N) [12].

Extroverted individuals exhibit a penchant for active engagement and derive energy from a wide array of activities. Compassion and empathy characterize agreeableness [53]. Those scoring high in agreeableness demonstrate heightened motivation for cooperation and lending assistance. Conscientious people are marked by elevated levels of self-discipline, a strong sense of duty, and aspirations for accomplishment [54]. They are considered individuals who are meticulous, responsible, and particularly punctual [54]. Neuroticism pertains to the inclination to undergo adverse emotional experiences, including anger, anxiety, and depression, signifying emotional instability [19]. Individuals with neurotic tendencies tend to be susceptible, impulsive, disheartened, and persistently entangled in inner turmoil and despondency. Openness gauges the extent of intellectual curiosity, abstract thinking, and a predilection for novelty and diversity [19] and is associated with adept cognitive adaptability [46]. Those scoring higher in openness tend to enthusiastically embrace novel ideas and experiences, potentially revolutionizing the world through innovative methodologies.

Several existing studies have examined the correlation between these Big Five personality traits and pro-environmental behaviors [4,10,11,13,43,45,48]. However, despite being at the core of human behavior, the Big Five personality traits seem to be somewhat understudied for VBN theory, with only one study in the literature [55], making this study worthwhile to investigate more thoroughly and with an emphasis on investigating specific behaviors.

The general hypothesis for the present research is that there are differences in the relationships between the different constructs of the extended VBN theory for the five personality traits. By knowing these differences, populations can be targeted more specifically for their personality traits.

2.2. Extended Value-Belief-Norm Theory

Stern and colleagues [26] created the value-belief-norm theory (VBN), which links the value orientation theory first created by Schwartz [51], the new environmental paradigm (NEP), and the norm activation model (NAM). The awareness of consequences (AOC), the ascription of responsibility (AOR), and personal norms are three key principles that the norm activation model uses to describe how various pro-environmental behaviors (PEBs) develop (PN).

According to the VBN theory, people's values influence their beliefs, which in turn influence the norms that directly influence their pro-environmental conduct. According to Schultz and Zelezny [56], the fundamental tenet is that norms and behaviors are based on values that are concerned with the welfare of others (altruistic values), one's own welfare (egoistic values), the welfare of the biosphere (biospheric values), and most recently, the focus on one's pleasure or sensual gratification (hedonic values) [57].

Since its inception, VBN has been widely used to explain a variety of specific pro-environmental behaviors in the private or public sphere, including green consumer behavior [26,27,29], avoider behavior [28,30,31], and waste prevention behavior [28].

Numerous studies have employed the VBN theory to forecast various PEBs, but few have claimed that outside factors also play a significant role in influencing such behavior [28]. In order to study the impact of exogenous stimuli on NEP, the model is expanded by their addition. The social pressures that people encounter from close friends, family members, or society at large to engage in a particular behavior are known as external influences [58].

This study examines the relationships between five different personality traits and four different types of values, including NEP, AOC, AOR, and PN, as well as three different pro-environmental behaviors, waste preventer, green consumer, and avoider, among residents of a significant South American city. Figure 1 illustrates the framework for empirical analysis in this study, which is based on the influences of personality traits through the use of an extended proposed VBN theory to measure pro-environmental behaviors.

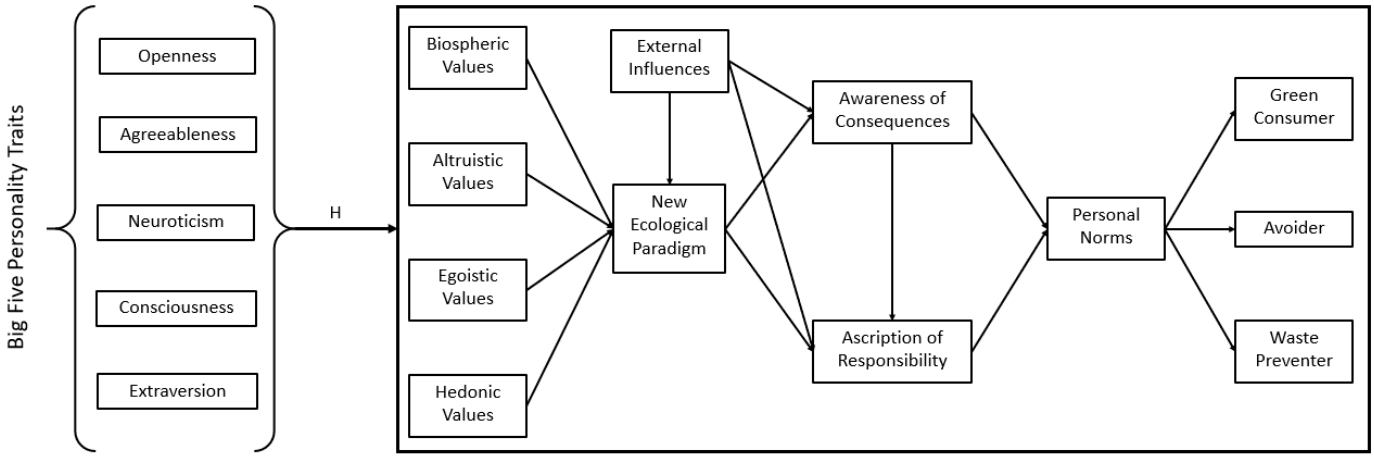

Figure 1. Research model. Note. H: Hypothesis.

2.2.1. Values

When thinking about the road map of a person´s life, values serve as important life goals or standards [59] for any individual. They are seen as important factors influencing beliefs, norms, and behaviors and play an important part in an individual´s internal organizational system, differentiating them from beliefs [60]. Schwartz created a comprehensive framework for categorizing the aspects of values [22,51]. Stern and his colleagues took three values from Schwartz's universal values, namely egoistic values (EV), altruistic values (AVA), and biospheric values, that could influence beliefs, norms, and recently, pro-environmental behaviors (BV). Strongly egoistic individuals will appreciate and consider

the effects on their personal resources. Strongly altruistic people, on the other hand, will concentrate more on the effects on other people. Those with high biospheric values will also be concerned with the effects on nature and the environment.

Selfless social and environmental ideals are associated with behavior that is environmentally friendly [30]. Altruistic or selfless people care about other people and the environment. In order to further the goals of society, they frequently sacrifice their claim to be more cooperative in favor of helping others. Hedonic values (HV), which cause people to concentrate on pleasure or sensual fulfillment for themselves, may be included, according to recent studies. HV are associated with pro-environmental acts in both a positive and negative way, especially when those behaviors are inconvenient or not enjoyable [61].

2.2.2. External Influences

External influences (EI) and personal internal principles influence people´s ethical attitudes when making decisions [62]. EI is concerned with the interactive social nature that decision-makers perceive and how it is affected by many circumstances, linked occurrences, and outsiders' viewpoints, such as stakeholder requests, national laws, social expectations or consensus, individual or group gains, and losses.

Interactions with external factors influence people´s perceptions, emotions, and opinions toward different subjects. The acceptance of different behaviors by an individual is affected by the level of acceptance of others over the same behaviors. Individuals first learn through observing others and tend to mimic behaviors when they are not sure about the right thing to do. Therefore, their behaviors are influenced by social pressure. This research intends to determine whether external influences stress all five proposed models.

2.2.3. New Ecological Paradigm, Awareness of Consequences, Ascription of Responsibility

NEP consists of three different dimensions: balance of nature, limits to growth, and human domination of nature. The conceptualization called NEP (New Ecological Paradigm) focuses on the belief in the human ability to disrupt the natural balance, the limited ability of society, and the human right to govern nature. A society, group, or individual behaves according to certain principles established by beliefs, interests, and essential priorities defined by their values [63]. Intrinsic environmental beliefs influence and contribute to the development of PEBs [64]. Human actions manifest in terms of norms derived from beliefs. A person´s self-structured nature of activities does not necessarily reflect their environmental beliefs. The meaning, well-being, and importance of an individual´s or conglomeration´s visualization of the environment and how it should be treated depend on their environmental beliefs, which shape their attitudes [65].

NEP influences individuals´ rightness to carry out specific behaviors. Ajzen (cited in [66]) suggested that its inclusion could enhance predictive validity. Environmentally friendly people are motivated by their responsibility and self-expectation and driven by their environmental beliefs. Additionally, attitudinal factors are influenced by value orientation and affect certain social behaviors, both directly and indirectly.

Personal norms (PN) are determined by two factors: the awareness of consequences (AOC) and the ascription of responsibility (AOR). One study conducted by De Groot and Steg [25] showed that before an individual can feel responsible for their behaviors, they must first be aware of their consequences. They also stated that the sentiment of responsibility activates the personal norms of an individual, finally inducing behavior. According to them, personal norms are activated when a person believes that environmental conditions have consequences, which refers to an individual's perception of the adverse effects when not performing a PEB [25], and that they become the ascription of responsibility and take action to reduce those consequences. Personal norms believe that individuals and other social actors must alleviate environmental problems. AOC was found to be a significant driver for waste prevention attitudes, while PN was not [67].

2.2.4. Pro-Environmental Behaviors

According to Stern [8], PEBs are behaviors that favorably "change the structure and dynamics of ecosystems or the biosphere," actions that positively "affect the availability of materials or energy," and activities that positively "influence the availability of materials or energy." The present study has chosen three pro-environmental behaviors—waste preventer, waste avoider, and green consumer—from a wide range of options because they have the greatest potential to reduce the quantity of waste that ends up at the neighborhood landfill [68].

- Avoider: It refers to lobbying against products harmful to all living species and nature, such as avoiding purchasing environmentally harmful packaging containers and suppressing the use of products that threaten animal species [68].
- Green consumer: This profile describes an individual who keeps in mind sustainable development and has a genuine concern for environmental degradation [68]. Their strong moral ethics and need to make a difference guide them to acquire eco-friendly goods or services [69]. Depending on the potential advantages for the environment and society, a person may engage in this conduct.
- Waste Preventer: It refers to the individual who prevents waste by limiting unnecessary consumption and designing and consuming products that generate less waste. Because it entails some level of personal expense or sacrifice and has a more immediate impact on environmental preservation or protection, it is purer and more active than green consumer behavior. The idea of waste prevention takes into account doing something when buying new things and mending or reusing them instead of replacing them when they are no longer useful [70].

3. Methodology

The research employs a three-step approach for data analysis. Figure 2 illustrates the detailed stages of the data analysis. The first step focuses on acquisition of the data, measurement instruments, and sample characteristics. The second step is to cluster the respondents according to their personality traits using the Big Five personality test. The third step focuses on group analysis to compare the psychological and behavioral characteristics as well as predictability and expected variance to better understand the psychological patterns that affect the three studied pro-environmental behaviors. More detail is shown in the following subsections.

3.1. Measurement Instruments

The measurement tools utilized in this investigation were adapted from earlier studies that applied the VBN theory in a variety of scenarios [61,71,72]. The factors in the current study were measured using a five-point Likert scale. The scale of the other variables ranged from never (1) to always, whereas the scale of the nine constructs ranged from strongly disagree (a) to strongly agree (e) (5). Four items were used to measure the egoistic and biospheric values; five items for the altruistic values; and seven items for the hedonic values to measure the four values (biospheric, altruistic, and hedonic).

With the use of six, three, and five items, respectively, it was possible to gauge one's awareness of consequences, acceptance of responsibility, and personal norms. The avoider, waste preventer, and green consumer behaviors were measured using six, nine, and twelve items, respectively, while NEP was measured using eleven items.

Three sections made up the questionnaire (see Supplementary Material): a first portion asks questions about expanded VBN theory constructs and pro-environmental behaviors, a second section asks questions about respondents' pro-environmental activities, and a third and final section asks questions about the Big Five personality test. The questionnaire was previously validated by conducting 20 pre-tests. Twenty randomly chosen respondents gave their feedback, enabling us to clarify and reformulate any critical question and eliminate any discrepancies found. Potential weaknesses, misspellings, or conductive questions were looked for and, when found, reformulated or corrected.

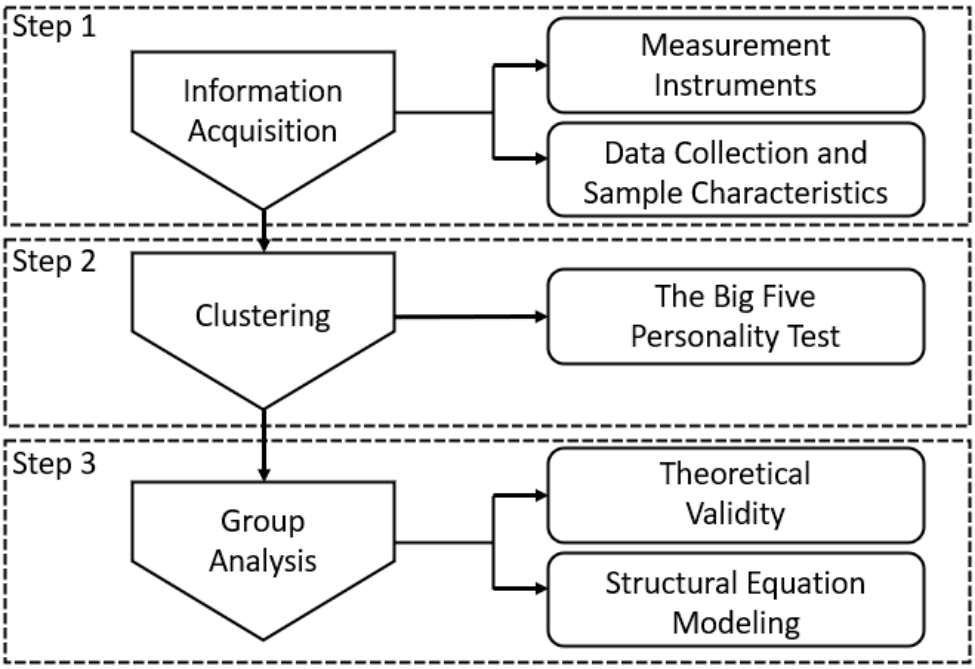

Figure 2. Flow of data analysis.

3.2. Data Collection and Sample Characteristics

A total of 100 students from two local universities in Guayaquil participated in the study through their involvement in classroom projects. The projects were informed to each classroom, and those students willing to participate registered. Two trainings were given to the registered students: one on the contents of the survey and another on how to approach people on the streets of the city.

To obtain heterogeneous data, people from the city were approached in the streets surrounding transited public places, such as commercial centers, parks, markets, and bays, between May and June 2021. Printed questionnaires were distributed to willing participants, who completed them in 20 to 30 min. The respondent population was made aware of the purpose of the study and that their private information would be kept confidential before completing the surveys. The researchers verified the data after the participating students registered it on an online Excel form.

To mitigate the potential bias from a single source, the questionnaire was crafted to eliminate questions that hinted at a correct response. This was confirmed during the 20 pre-tests conducted. Additionally, the printed questionnaires were distributed to respondents with a request for honest responses, aiming to minimize any personal influences stemming from the interviewer's voice tone. Lastly, the questionnaire was strategically designed to be completed within an average of 25 min, preventing respondent fatigue or distraction that could potentially compromise data quality.

A total of 1210 surveys were validated for this research (55% from commercial centers, 31% from parks, 12% from markets, and 2% from bays). Of the surveyed population, 53% were male, 56% were aged between 18 and 30 years old, 58% were single, and 52% had at least a high school level of education. Most of the sample population was employed (46%), followed by students (21%). Additionally, 50% of the people interviewed gained less than $400.00, and the other 35% gained between $401.00 and $700.00.

3.3. The Big 5 Personality Test

Fifty items made up the Big Five personality inventory exam, which was designed to evaluate extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. Examples of these items include "I am the life of the party" and "I am not really interested in others" [73]. Items were rated on a Likert scale of 1 (strongly agree) to

5 on a five-point scale (strongly agree). The values for each personality trait will depend on the answers given to each item and can go between zero and forty. Higher values in one category indicate attachment to that particular personality trait, and on the other hand, lower values indicate rejection of the same trait. The Big Five personality test is simply worded and has been used for assessing the personality traits of different types of populations [49].

Participants were clustered using the results from the Big Five personality test. The number of clusters was five (one per personality trait). As the calculations were made between 0 and 40 for every trait, the highest value among the five was chosen as the main personality for everyone, and the population who had the same type of strongest personality was clustered together. The measures of extraversion (N = 140, AVG = 25.31, SD = 4.83, Min = 19, Max = 38, Mode = 20), agreeableness (N = 358, AVG = 28.73, SD = 5.47, Min = 19, Max = 40, Mode = 23), neuroticism (N = 93, AVG = 27.11, SD = 6.02, Min = 19, Max = 36, Mode = 20), openness (N = 190, AVG = 27.71, SD = 4.93, Min = 19, Max = 40, Mode = 22), and consciousness (N = 429, AVG = 29.57, SD = 5.85, Min = 18, Max = 40, Mode = 23) was sufficient for after structural equation modeling.

3.4. Theoretical Validity

Analyzing the convergent and discriminant validity of the indicators, as well as the reliability of the constructs, was important before assessing the construct validity and reliability of the PLS-SEM measurement model. Relations between indicators that compose the same construct were tested for convergent validity and composite reliability. All items belonging to the same construct needed to be highly related to each other [74].

To guarantee that the different constructs remain unrelated, the questionnaire items that measure each construct needed to stay uncorrelated, and then we performed discriminant validity [75]. The evaluation process is to check the values of the square root of the average extracted variance (AVE) and compare them to the correlation between the construct and any other factors in the proposed model [64].

3.5. The Structural Equation Modeling Approach

In this work, we analyze the proposed model six times: once for the total population and another five for each personality trait. PLS-SEM was used to test the models, and SMART PLS 4.2 was employed in this process. PLS-SEM, or partial least squares structural equation modeling, can handle complex models and determine parameters under non-normality. As a result, this strategy is well-liked and well-established among researchers in numerous domains [76,77]. The measurement model assessment was performed in the first stage of the data analysis for the current study, and the structural model assessment was performed in the second step [78].

4. Results

4.1. The Measurement Model

As can be seen in Table 1, all constructs in all six models had factor loadings that were equal to or greater than the threshold value of 0.5. All constructions' Cronbach's alphas were higher than the criterion value of 0.7, demonstrating a high level of internal consistency. Additionally, all-composite reliability (CR) scores were greater than 0.7, indicating the reliability of all structures. The average variance extracted (AVE) for all constructs was greater than 0.5, indicating that all constructs had sufficient convergent validity when they were first formed. Table 1 additionally displays the elements that were eliminated in order to maintain internal consistency as an X.

The values of the square root of AVE (the diagonal of Tables 2–7) remain more extensive than those of the other factors; we can infer that there is no correlation. We can conclude that the data passed the discriminant validity test in the present case.

Table 1. Measurement items and loadings.

Constructs	M. I.	Factor Loadings					
		G	E	A	N	O	C
Biospheric Values (BV)	BV1	0.812	1.212	0.807	0.917	0.727	0.767
	BV2	0.793	0.577	0.697	0.859	0.692	0.834
	BV3	0.764	X	0.777	0.823	0.735	0.735
	BV4	0.777	X	0.775	0.793	0.738	0.769
Altruistic Values (AVA)	AVA1	0.703	X	0.713	0.881	0.567	0.611
	AVA2	0.806	0.954	0.746	0.910	0.886	0.709
	AVA3	0.677	0.831	0.586	0.512	0.719	0.706
	AVA4	0.842	X	0.920	0.706	0.917	0.785
	AVA5	0.739	X	0.721	0.720	0.678	0.738
Egoistic Values (EV)	EV1	0.749	X	0.621	0.574	0.567	0.831
	EV2	X	X	X	X	X	X
	EV3	X	1.950	X	X	0.516	X
	EV4	0.500	0.500	0.500	0.811	X	0.500
Hedonic Values (HV)	HV1	0.673	0.729	X	0.691	X	X
	HV2	0.715	X	X	0.851	X	X
	HV3	0.643	X	X	0.610	X	0.647
	HV4	X	0.773	0.778	0.646	0.762	0.793
	HV5	0.681	0.598	0.717	0.800	X	X
	HV6	0.668	0.637	0.607	0.682	0.537	0.669
	HV7	X	0.917	X	X	0.747	X
New Ecological Paradigm (NEP)	NEP1	X	X	X	0.500	X	X
	NEP2	0.592	X	0.605	0.652	X	0.570
	NEP3	0.618	0.726	0.652	0.640	0.627	0.559
	NEP4	0.733	0.884	0.607	0.794	0.806	0.719
	NEP5	0.500	0.742	X	0.557	X	X
	NEP6	0.721	0.541	0.709	0.749	0.659	0.713
	NEP7	0.768	0.692	0.728	0.812	0.691	0.788
	NEP8	0.857	0.750	0.868	0.842	0.826	0.829
	NEP9	0.736	0.590	0.731	0.728	0.580	0.765
	NEP10	0.817	0.733	0.777	0.692	0.833	0.838
	NEP11	0.815	0.746	0.742	0.857	0.826	0.780
External Influences (EI)	EI1	X	0.504	X	0.531	X	X
	EI2	0.650	0.523	0.528	0.798	0.677	0.711
	EI3	X	X	X	0.635	X	X
	EI4	0.812	1.113	0.805	0.821	0.901	0.770
	EI5	0.801	0.807	0.827	0.966	0.684	0.683
	EI6	X	0.779	X	X	X	X
	EI7	X	0.500	X	X	X	X
	EI8	X	X	X	X	X	X
Awareness of consequences (AOC)	AOC1	0.743	0.719	0.714	0.722	0.753	0.752
	AOC2	0.766	0.850	0.656	0.889	0.764	0.766
	AOC3	0.797	0.699	0.784	0.839	0.724	0.795
	AOC4	0.791	0.803	0.781	0.818	0.758	0.772
	AOC5	0.748	0.546	0.720	0.814	0.790	0.706
	AOC6	0.781	0.822	0.766	0.792	0.801	0.745
Ascription of Responsibility (AOR)	AOR1	0.768	0.848	0.764	0.807	0.807	0.733
	AOR2	0.731	0.817	0.681	0.707	0.710	0.756
	AOR3	0.802	0.901	0.790	0.730	0.796	0.809
Personal Norms (PN)	PN1	0.753	0.864	0.774	0.636	0.632	0.793
	PN2	0.814	0.815	0.851	0.896	0.712	0.733
	PN3	0.591	0.793	0.537	0.800	X	0.545
	PN4	0.769	0.792	0.782	0.788	0.713	0.741
	PN5	0.777	0.613	0.792	0.808	0.762	0.728

Table 1. *Cont.*

Constructs	M. I.	Factor Loadings					
		G	E	A	N	O	C
Waste Preventer (WP)	WP1	0.611	0.676	X	X	X	0.807
	WP2	X	0.527	X	X	X	0.539
	WP3	X	0.744	X	X	X	0.652
	WP4	0.699	0.940	0.774	0.639	X	0.672
	WP5	0.610	0.841	0.688	0.686	0.765	0.535
	WP6	X	X	X	0.711	0.605	X
	WP7	0.667	X	0.658	0.873	0.716	0.727
	WP8	X	0.911	X	0.595	X	X
	WP9	X	0.633	X	X	X	X
Avoider (AV)	AV1	1.196	X	1.415	X	0.996	1.248
	AV2	0.771	X	0.819	0.830	0.561	0.755
	AV3	0.724	X	0.540	0.930	0.758	0.648
	AV4	0.894	0.500	0.731	0.750	0.978	0.842
	AV5	0.597	X	0.523	0.844	0.581	X
	AV6	0.667	1.240	0.587	X	0.765	0.606
Green Consumer (GC)	GC1	X	0.835	0.653	0.620	0.867	0.775
	GC2	0.688	0.720	0.818	0.735	0.618	0.618
	GC3	0.720	0.607	0.628	0.731	0.657	0.727
	GC4	0.685	0.692	0.719	0.689	X	0.631
	GC5	0.592	X	X	0.703	X	0.577
	GC6	0.577	0.712	X	0.663	X	0.591
	GC7	0.586	0.719	X	0.559	X	0.550
	GC8	0.633	0.658	X	0.801	0.620	0.628
	GC9	0.692	0.877	X	X	X	0.666
	GC10	X	0.658	X	0.633	X	X
	GC11	0.717	0.840	X	X	X	0.663
	GC12	0.628	X	X	X	X	0.679

Note. M.I.: Measurement Items; G: General; E: Extroversion; A: Agreeableness; N: Neuroticism; O: Openness; C: Consciousness.

Table 2. Construct reliability and validity—General Model.

	α	CR	AVE	AOC	AOR	AV	AVA	BV	EI	EV	GC	HV	NEP	PN	WP
AOC	0.898	0.898	0.595	0.771											
AOR	0.811	0.812	0.589	0.773	0.767										
AV	0.938	0.971	0.692	0.234	0.211	0.832									
AVA	0.869	0.874	0.571	0.567	0.481	0.141	0.756								
BV	0.867	0.867	0.619	0.574	0.519	0.110	0.743	0.787							
EI	0.796	0.810	0.575	0.468	0.414	0.270	0.365	0.300	0.758						
EV	0.512	0.591	0.386	0.259	0.173	0.099	0.425	0.368	0.223	0.621					
GC	0.884	0.884	0.427	0.449	0.441	0.233	0.230	0.260	0.277	0.272	0.654				
HV	0.808	0.809	0.458	0.553	0.471	0.130	0.741	0.734	0.328	0.497	0.251	0.676			
NEP	0.915	0.923	0.520	0.727	0.687	0.188	0.432	0.506	0.433	0.222	0.557	0.414	0.721		
PN	0.859	0.867	0.555	0.759	0.716	0.171	0.543	0.618	0.437	0.379	0.491	0.550	0.618	0.745	
WP	0.741	0.745	0.420	0.519	0.488	0.273	0.277	0.298	0.319	0.200	0.648	0.248	0.298	0.566	0.648

Table 3. Construct reliability and validity—Extroversion.

	α	CR	AVE	AOC	AOR	AV	AVA	BV	EI	EV	GC	HV	NEP	PN	WP
AOC	0.916	0.928	0.912	0.747											
AOR	0.883	0.893	0.721	0.691	0.856										
AV	0.889	0.897	0.661	0.140	0.174	0.931									
AVA	0.873	0.899	0.640	0.498	0.260	0.284	0.894								
BV	0.681	0.669	0.408	0.404	0.404	0.246	0.795	0.949							

Table 3. *Cont.*

	α	CR	AVE	AOC	AOR	AV	AVA	BV	EI	EV	GC	HV	NEP	PN	WP
EI	0.745	0.746	0.501	0.387	0.387	0.461	0.349	0.192	0.716						
EV	0.539	0.647	0.427	−0.019	−0.007	0.132	0.161	0.157	0.008	1.399					
GC	0.770	0.825	0.555	0.412	0.452	0.271	0.137	0.249	0.327	−0.042	0.737				
HV	0.732	0.741	0.481	0.442	0.442	0.221	0.803	0.575	0.183	0.154	0.141	0.739			
NEP	0.895	0.905	0.514	0.546	0.705	0.114	0.056	0.138	0.564	−0.083	0.503	−0.169	0.718		
PN	0.864	0.870	0.563	0.728	0.575	0.090	0.417	0.343	0.564	−0.136	0.637	0.226	0.717	0.780	
WP	0.707	0.725	0.309	0.347	0.508	0.253	0.001	0.179	0.383	−0.091	0.716	−0.294	0.613	0.668	0.766

Table 4. Construct reliability and validity—Agreeableness.

	α	CR	AVE	AOC	AOR	AV	AVA	BV	EI	EV	GC	HV	NEP	PN	WP
AOC	0.877	0.880	0.545	0.738											
AOR	0.790	0.794	0.557	0.729	0.746										
AV	0.940	1.056	0.686	0.092	0.184	0.828									
AVA	0.860	0.875	0.555	0.561	0.420	0.010	0.745								
BV	0.851	0.852	0.586	0.559	0.527	−0.001	0.702	0.765							
EI	0.761	0.801	0.537	0.490	0.421	0.163	0.315	0.296	0.733						
EV	0.464	0.481	0.311	0.281	0.195	0.081	0.394	0.384	0.207	0.558					
GC	0.801	0.808	0.502	0.372	0.386	0.171	0.190	0.205	0.239	0.278	0.708				
HV	0.743	0.754	0.500	0.565	0.485	0.026	0.725	0.661	0.331	0.432	0.196	0.704			
NEP	0.905	0.910	0.515	0.735	0.684	0.090	0.394	0.456	0.387	0.179	0.464	0.418	0.718		
PN	0.866	0.879	0.570	0.760	0.736	0.119	0.516	0.590	0.402	0.448	0.396	0.528	0.665	0.755	
WP	0.748	0.755	0.502	0.475	0.538	0.172	0.180	0.227	0.302	0.172	0.707	0.213	0.560	0.488	0.709

Table 5. Construct reliability and validity—Consciousness.

	α	CR	AVE	AOC	AOR	AV	AVA	BV	EI	EV	GC	HV	NEP	PN	WP
AOC	0.889	0.890	0.573	0.757											
AOR	0.809	0.812	0.587	0.754	0.766										
AV	0.934	0.996	0.724	0.286	0.197	0.851									
AVA	0.838	0.841	0.507	0.605	0.548	0.186	0.712								
BV	0.858	0.861	0.603	0.559	0.531	0.130	0.815	0.777							
EI	0.764	0.768	0.522	0.408	0.328	0.330	0.371	0.273	0.723						
EV	0.511	0.676	0.430	0.223	0.110	0.047	0.370	0.313	0.199	0.656					
GC	0.890	0.892	0.421	0.442	0.438	0.165	0.247	0.283	0.208	0.297	0.649				
HV	0.746	0.755	0.500	0.562	0.473	0.185	0.704	0.658	0.260	0.321	0.253	0.706			
NEP	0.912	0.919	0.541	0.702	0.711	0.180	0.490	0.580	0.366	0.233	0.565	0.401	0.735		
PN	0.840	0.852	0.521	0.730	0.717	0.177	0.612	0.612	0.386	0.306	0.515	0.519	0.725	0.721	
WP	0.829	0.834	0.439	0.394	0.388	0.263	0.256	0.286	0.210	0.195	0.569	0.214	0.515	0.477	0.662

Table 6. Construct reliability and validity—Neuroticism.

	α	CR	AVE	AOC	AOR	AV	AVA	BV	EI	EV	GC	HV	NEP	PN	WP
AOC	0.920	0.924	0.662	0.814											
AOR	0.793	0.796	0.561	0.746	0.749										
AV	0.907	0.911	0.707	0.383	0.260	0.841									
AVA	0.878	0.892	0.577	0.553	0.472	0.271	0.760								
BV	0.912	0.914	0.721	0.586	0.470	0.255	0.753	0.849							
EI	0.864	0.900	0.586	0.545	0.687	0.379	0.462	0.382	0.765						
EV	0.635	0.686	0.500	0.282	0.170	0.128	0.511	0.391	0.319	0.702					
GC	0.913	0.919	0.508	0.515	0.427	0.272	0.248	0.227	0.438	0.251	0.713				
HV	0.866	0.872	0.516	0.593	0.468	0.228	0.724	0.416	0.416	0.621	0.247	0.718			
NEP	0.917	0.928	0.503	0.785	0.678	0.253	0.464	0.551	0.599	0.272	0.675	0.495	0.709		
PN	0.892	0.899	0.624	0.715	0.715	0.267	0.468	0.621	0.605	0.441	0.534	0.678	0.701	0.790	
WP	0.832	0.844	0.500	0.652	0.454	0.456	0.468	0.377	0.613	0.238	0.742	0.459	0.706	0.662	0.707

Table 7. Construct reliability and validity—Openness.

	α	CR	AVE	AOC	AOR	AV	AVA	BV	EI	EV	GC	HV	NEP	PN	WP
AOC	0.895	0.895	0.586	0.765											
AOR	0.816	0.818	0.596	0.758	0.772										
AV	0.919	0.935	0.906	0.311	0.260	0.792									
AVA	0.876	0.894	0.585	0.385	0.377	0.184	0.765								
BV	0.814	0.815	0.523	0.470	0.442	0.124	0.698	0.723							
EI	0.795	0.823	0.579	0.397	0.293	0.239	0.227	0.169	0.761						
EV	0.453	0.455	0.294	0.288	0.262	0.182	0.430	0.282	0.269	0.520					
GC	0.786	0.808	0.500	0.436	0.407	0.410	0.163	0.266	0.196	0.167	0.698				
HV	0.730	0.745	0.476	0.412	0.433	0.239	0.635	0.72	0.274	0.590	0.209	0.690			
NEP	0.905	0.912	0.543	0.642	0.638	0.353	0.334	0.380	0.441	0.314	0.473	0.486	0.737		
PN	0.800	0.802	0.500	0.799	0.716	0.297	0.454	0.627	0.371	0.455	0.517	0.488	0.700	0.706	
WP	0.744	0.748	0.500	0.428	0.370	0.334	0.139	0.157	0.221	0.392	0.524	0.108	0.559	0.535	0.699

4.2. The Structural Model

PLS was used to evaluate the structural models. A total of 5000 iterations of the bootstrapping process were performed together with the PLS algorithm to assess the significance and estimate the route coefficient (Tables 7–12). Relationships among the constructs were validated with *p*-values less than 0.05. The impact of the predictor variable is high at the structural level if f^2 is 0.35, and it is medium if f^2 is 0.15. It is small if f^2 is 0.02 [79]. The model's f^2 effect size shows how much an exogenous latent variable contributes to an endogenous latent variable´s R^2 value. In simple terms, effect size assesses the magnitude or strength of the relationship between the latent variables. Predictive relevance (Q^2) is shown with values over 0. Q^2 values of 0.02, 0.15, and 0.35 are for weak, moderate, and strong degrees of predictive relevance of each effect [80].

Table 8. Results of the structural model—General Model.

Predictors	Outcomes	R^2	Beta	*p*-Value	Supported	f^2	Q^2
BV	NEP	0.344	0.411	0.000	Yes	0.089	0.275
AVA			−0.028	0.000	Yes	0.000	
EV			−0.003	0.000	Yes	0.000	
HV			0.035	0.000	Yes	0.001	
EI			0.309	0.000	Yes	0.125	
EI	AOC	0.557	0.188	0.000	Yes	0.065	0.307
NEP			0.646	0.000	Yes	0.765	
EI	AOR	0.631	0.037	0.304	No	0.003	0.223
NEP			0.259	0.000	Yes	0.084	
AOC			0.567	0.000	Yes	0.386	
AOC	PN	0.706	0.466	0.000	Yes	0.298	0.266
AOR			0.427	0.000	Yes	0.250	
PN	GC	0.241	0.491	0.000	Yes	0.317	0.065
PN	WP	0.321	0.566	0.000	Yes	0.472	0.072
PN	AV	0.029	0.171	0.000	Yes	0.030	0.022

Table 9. Results of the structural model—Agreeableness.

Predictors	Outcomes	R^2	Beta	*p*-Value	Supported	f^2	Q^2
BV	NEP	0.292	0.281	0.000	Yes	0.051	0.211
AVA			0.033	0.000	Yes	0.001	
EV			−0.061	0.000	Yes	0.004	
HV			0.150	0.000	Yes	0.013	
EI			0.257	0.000	Yes	0.081	
EI	AOC	0.657	0.219	0.000	Yes	0.118	0.309
NEP			0.700	0.000	Yes	1.214	
EI	AOR	0.600	0.065	0.323	No	0.008	0.709
NEP			0.228	0.026	Yes	0.050	
AOC			0.548	0.000	Yes	0.258	
AOC	PN	0.662	0.423	0.000	Yes	0.224	0.233
AOR			0.445	0.000	Yes	0.249	
PN	GC	0.157	0.396	0.000	Yes	0.186	0.037
PN	WP	0.230	0.480	0.000	Yes	0.299	0.051
PN	AV	0.014	0.119	0.000	Yes	0.014	0.007

Table 10. Results of the structural model—Consciousness.

Predictors	Outcomes	R^2	Beta	*p*-Value	Supported	f^2	Q^2
BV	NEP	0.385	0.552	0.000	Yes	0.162	0.290
AVA			−0.074	0.000	Yes	0.002	
EV			0.035	0.000	Yes	0.002	
HV			0.022	0.000	Yes	0.000	
EI			0.230	0.000	Yes	0.073	
EI	AOC	0.519	0.174	0.001	Yes	0.055	0.278
NEP			0.638	0.000	Yes	0.734	
EI	AOR	0.666	−0.020	0.708	No	0.001	0.208
NEP			0.320	0.000	Yes	0.153	
AOC			0.567	0.000	Yes	0.463	
AOC	PN	0.761	0.493	0.000	Yes	0.391	0.260
AOR			0.431	0.000	Yes	0.299	
PN	GC	0.265	0.515	0.000	Yes	0.360	0.058
PN	WP	0.228	0.477	0.000	Yes	0.295	0.052
PN	AV	0.031	0.177	0.000	Yes	0.032	0.025

Table 11. Results of the structural model—Extroversion.

Predictors	Outcomes	R^2	Beta	*p*-Value	Supported	f^2	Q^2
BV	NEP	0.452	0.339	0.000	Yes	0.072	0.094
AVA			−0.119	0.000	Yes	0.004	
EV			−0.064	0.000	Yes	0.007	
HV			−0.370	0.000	Yes	0.082	
EI			0.609	0.000	Yes	0.555	
EI	AOC	0.307	0.116	0.000	Yes	0.013	−0.076
NEP			0.481	0.000	Yes	0.228	
EI	AOR	0.631	0.040	0.000	Yes	0.003	0.032
NEP			0.446	0.000	Yes	0.300	
AOC			0.432	0.000	Yes	0.351	
AOC	PN	0.686	0.825	0.000	Yes	1.134	0.126
AOR			0.005	0.986	No	0.000	
PN	GC	0.406	0.637	0.000	Yes	0.684	0.059
PN	WP	0.446	0.668	0.000	Yes	0.804	0.136
PN	AV	0.008	0.090	0.000	Yes	0.008	0.015

Table 12. Results of the structural model—Neuroticism.

Predictors	Outcomes	R Square	Beta	*p*-Value	Supported	f Square	Q Square
BV	NEP	0.495	0.418	0.000	Yes	0.112	0.340
AVA			−0.221	0.000	Yes	0.023	
EV			−0.051	0.000	Yes	0.003	
HV			0.193	0.000	Yes	0.017	
EI			0.477	0.000	Yes	0.350	
EI	AOC	0.626	0.116	0.297	No	0.023	0.330
NEP			0.716	0.000	Yes	0.878	
EI	AOR	0.670	0.381	0.006	Yes	0.276	0.351
NEP			0.071	0.706	No	0.005	
AOC			0.482	0.036	Yes	0.265	
AOC	PN	0.585	0.410	0.148	No	0.180	0.356
AOR			0.409	0.164	No	0.179	
PN	GC	0.285	0.534	0.000	Yes	0.399	0.106
PN	WP	0.438	0.662	0.000	Yes	0.780	0.199
PN	AV	0.071	0.267	0.000	Yes	0.077	0.056

For the general model (Table 8, Figure 3), the results indicate that all five predictors influence NEP, BV, HV, and EI in a positive manner, and AVA and EV in a negative manner. From f^2 values, NEP is activated by both BV and EI. AOC is mostly activated by NEP, with a high f^2 value of 0.765 and a high R^2 value of 0.557. AOR is influenced by all three constructs (EI, NEP, and AOC), but it is mostly predicted by AOC, with an f^2 of 0.386. PN is hardly predicted by AOC and AOR and has an R^2 value of 0.706. PN positively influences all three pro-environmental behaviors, with R^2 values of 0.321, 0.241, and 0.029 for WP, GC, and AV, respectively. The average R^2 value for the whole model is 0.404. Q^2 values are higher than 0.02, with AOC the highest with 0.307 and AV the lowest with 0.022.

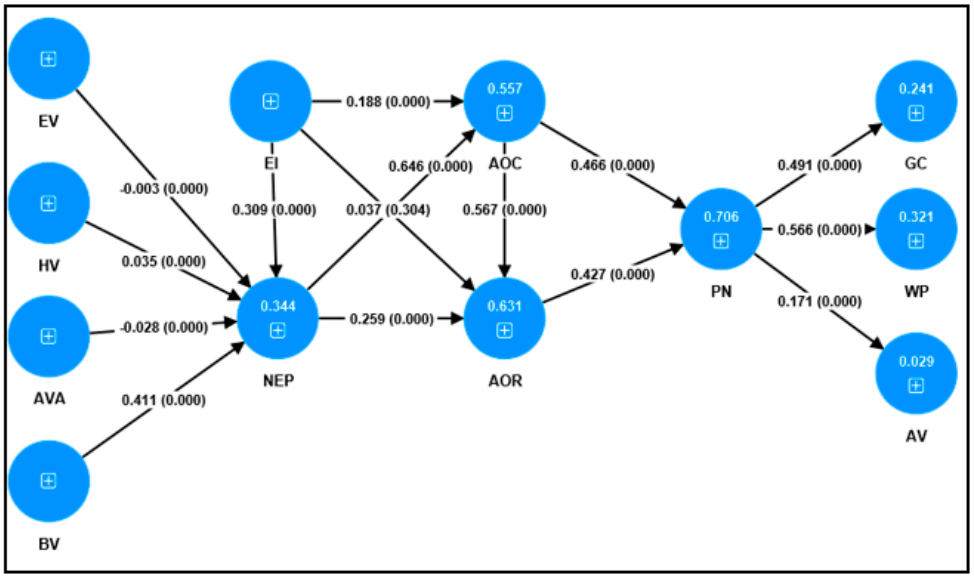

Figure 3. Structural Model-General (β-Coefficient, (*p*-value), +R^2 Value) (Source: SmartPls).

For the agreeableness personality (Table 9 and Figure 4), the results indicate that all five predictors influence NEP, four of them in a positive manner (BV, AVA, HV, and EI), and EV in a negative way. From f^2 values, it can be seen that BV and EI are the strongest predictors of NEP. AOC is predicted positively by both EI and NEP and has a strong R^2 value of 0.657. AOR is strongly predicted by AOC, followed by NEP and has an R^2 value of 0.600. PN is very much predicted by AOC and AOR and has an R^2 value of 0.662. Also, PN influences positively all three pro-environmental behaviors, being the R^2 values 0.157, 0.230, and 0.014 for GC, WP, and AV, respectively. The average R^2 value for the whole model was 0.373. Also, ever construct has a good predictor power with Q^2 values higher than 0.02 being AOR the biggest with 0.709, and AV the smallest with 0.07.

For the consciousness personality (Table 10 and Figure 4), the results indicate that four out of five constructs (BV, EV, HV, and EI) influence NEP in a positive way but AVA, however, only BV and EI are strong predictors when looking at the f^2 values. AOC is mostly predicted by NEP; however, EI also influences positively AOC. R^2 value is high for AOC with 0.519. AOR is positively influenced by NEP and AOC with an R^2 value of 0.666. Also, AOC is its strongest predictor with an f^2 value of 0.463. PN is positively influenced and predicted by AOC and AOR, obtaining an R^2 value of 0.761. Also, PN positively influences all three pro-environmental behaviors with R^2 values of 0.265, 0.228, and 0.031 for GC, WP, and AV, respectively. Q^2 values are higher than 0.02 being NEP the highest with 0.290 and AV the lowest with 0.025.

For the extroversion personality (Table 11 and Figure 4), the results indicate that BV and EI positively influence NEP; however, AVA, EV, and HV negatively do. The strongest predictor is EI, followed by BV and HV, looking at f^2 values. AOC is positively influenced by EI and NEP with an R^2 value of 0.307 and mostly predicted by NEP with an R^2 value of 0.228. AOR is positively influenced by EI, NEP, and AOC, with the last one being its strongest predictor with an f^2 value of 0.351. R^2 values of AOC and AOR are 0.307 and 0.631. PN is influenced and only predicted by AOC, with a high R^2 value of 0.686 and an f^2 value of 1.134. PN also positively influences all three pro-environmental behaviors and strongly predicts GC and WP behaviors. The Q^2 value was the lowest for AOC with −0.076 and the highest for WP with 0.136. The average R^2 value for the entire model is 0.419.

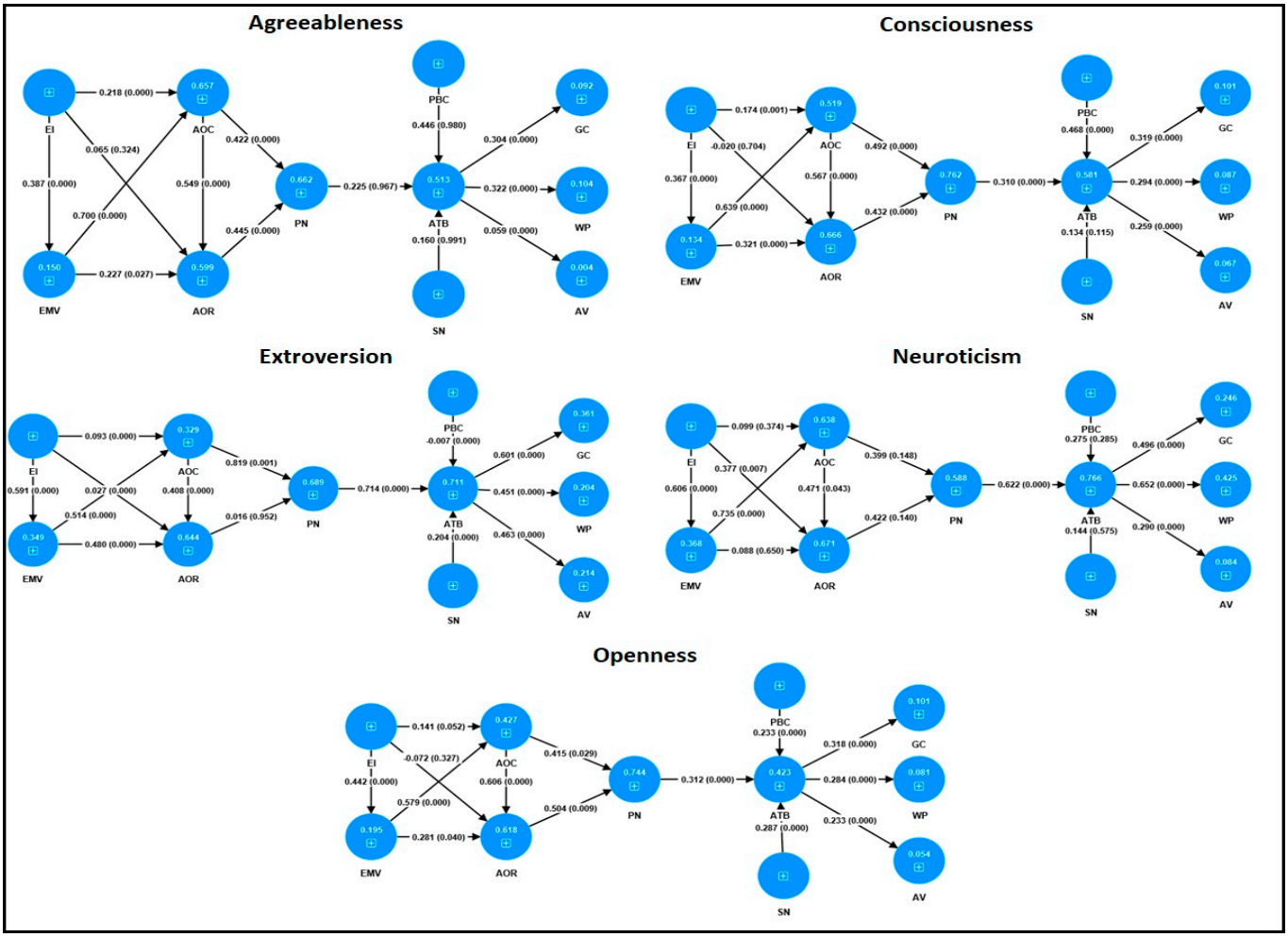

Figure 4. Structural Model—Personal Traits (β-Coefficient, (*p*-value), +R^2 Value) (Source: SmartPls).

For the neuroticism personality (Table 12 and Figure 4), the results indicate that BV, HV, and EI positively affect NEP; however, AVA and EV negatively influence NEP. EI is the strongest predictor with an f^2 value of 0.350, followed by medium-power predictors BV (f^2 = 0.112) and AVA (f^2 = 0.023). The R^2 value for NEP is 0.495. AOC is only predicted by NEP with an f^2 value of 0.878 and an R^2 value of 0.626. AOR is moderately predicted by EI (f^2 = 0.276) and AOC (f^2 = 0.265) and has an R^2 value of 0.670. PN is not influenced by AOC and AOR; however, both are strong predictors, providing an R^2 value of 0.585. Also, PN positively influences GC, WP, and AV behaviors; however, PN only strongly predicts GC (f^2 = 0.399) and WP (f^2 = 0.780). The average R^2 value for the entire model is 0.453. Q^2 values are higher than the minimum of 0.02, with the highest PN being 0.356.

For the openness personality (Table 13 and Figure 4), the results indicate that four out of five indicators positively influence NEP (BV, EV, HV, EI), and AVA negatively influences NEP. However, only EI and HV predict NEP, with f^2 values of 0.154 and 0.053, respectively. The R^2 value is 0.342 for NEP. AOC is positively influenced by NEP and also strongly predicted by it (f^2 = 0.472). AOR is positively influenced by NEP and AOC, strongly predicted by AOC (f^2 = 0.549), and moderately predicted by NEP (f^2 = 0.113). R^2 values for both AOC and AOR are high, with 0.428 and 0.617, respectively. PN is positively influenced by AOC and AOR but is mostly predicted by AOR (f^2 = 0.402). PN positively activates GC, WP, and AV behaviors in a strong manner for GC (f^2 = 0.366) and WP (f^2 = 0.401) and predicts AV with low power (f^2 = 0.097). The average R^2 value for the entire model is 0.396. Q2 values are higher than the minimum of 0.02, with the highest NEP (Q^2 = 0.217) and the lowest WP (Q^2 = 0.024).

Table 13. Results of the structural model—Openness.

Predictors	Outcomes	R Square	Beta	*p*-Value	Supported	f Square	Q Square
BV	NEP	0.342	0.093	0.000	Yes	0.004	0.217
AVA			−0.020	0.000	Yes	0.000	
EV			0.008	0.000	Yes	0.000	
HV			0.335	0.000	Yes	0.053	
EI			0.336	0.000	Yes	0.154	
EI	AOC	0.428	0.141	0.051	No	0.028	0.184
NEP			0.579	0.000	Yes	0.472	
EI	AOR	0.617	−0.071	0.331	No	0.010	0.126
NEP			0.281	0.041	Yes	0.113	
AOC			0.606	0.000	Yes	0.549	
AOC	PN	0.742	0.424	0.026	Yes	0.296	0.180
AOR			0.494	0.011	Yes	0.402	
PN	GC	0.268	0.517	0.000	Yes	0.366	0.034
PN	WP	0.286	0.535	0.000	Yes	0.401	0.024
PN	AV	0.088	0.297	0.000	Yes	0.097	0.028

5. Discussion

Through the use of cluster analysis, it was discovered that residents of the great metropolis can be meaningfully grouped according to their personality traits. These clusters can be used to better understand what motivates individuals to reduce waste by preventing it from happening in the first place and consuming sustainably. When comparing their explained variance and strongest predictors, the clusters varied quite a bit; nonetheless, structural equation modeling research into the links between components showed that the clusters are relatively comparable in this regard. However, there are also intriguing distinctions within clusters that can offer crucial insights into how these individuals in the poor world can be handled in order to encourage sustainable behavior.

The relationships between core personality characteristics, pro-environmental actions, and the VBN hypothesis were in line with earlier findings in the literature [55,81,82]. Our study showed that ecological personal norms positively influence all three studied pro-environmental behaviors for all personality trait clusters. However, the relationship between avoider behavior and personal norms showed low β values, average variance (R^2), and low-medium predictive power ($f^2 < 0.097$) for all five personality traits, which means that other clusters should be analyzed to better understand the drivers of this behavior. Even though there have not been significant associations reported for extroversion personality in the literature [12,14,83], this research has found that personal norms are the best drivers for waste preventer (WP) and green consumer (GC) behaviors for this personality trait, with the highest β and R2 values among all personality clusters (WP:$\beta = 0.668$, $R^2 = 0.446$; GC:$\beta = 0.637$, $R^2 = 0.406$). PN predicts very well both of these behaviors, with f^2 values of 0.804 and 0.684 for WP and GC, respectively. The neuroticism trait shows close β, f^2, and R^2 values to those of extroversion for WP behavior, being the second highest. This is consistent with past research showing a favorable relationship between neuroticism and pro-environmental behavior [83–85]. The worry about the effects of environmental degradation brought on by trash generation is one likely explanation for this association [12].

Neuroticism, openness, and consciousness personalities showed similar relationship values (confirming the first hypothesis) between PN and GC behavior, even though the explained variance was not as high as for the extraversion personality; however, PN

strongly predicts GC behaviors with all f^2 values over 0.35. Environmental participation for people with neurotic personalities may be associated with worldwide inclinations to experience high levels of anxiety and emotional volatility (for example, preservation norms related to the enjoyment of our surrounding nature and the conservation of our resources) [86]. Flexible and abstract thinking, which characterizes openness, may have long-term and distant environmental effects [53].

Because agreeableness is associated with higher levels of empathy, it was expected that this personality trait would have a significant correlation with all three pro-environmental behaviors. However, despite the relationships being confirmed by *p*-values less than 0.001, this personality trait had the lowest correlation of all five clusters. These findings are consistent with those of [82], whose research did not find any conclusive relationships between attitudes toward the environment and behavior.

The explained variance (R^2) of personal norms was high for all five personality traits, going from 0.585 for neuroticism to 0.761 for consciousness, and personal norms are also predicted by every model for each personality trait with Q^2 values going from weak, with 0.126 for extroversion to strong with 0.356 for neuroticism. For openness, consciousness, and agreeableness personalities, personal norms are roughly equally driven by and predicted by awareness of consequences and ascription of responsibility. [87] developed the value-belief-norm theory, stating that for people to perform pro-environmental behaviors, an awareness of consequences must induce an ascribed personality to perform the behaviors, which in turn activates a personal norm or moral obligation to perform behaviors. However, for these three personality traits, personal norms are induced by both AOC and AOR. Personal norms are not induced by AOC and AOC for neuroticism personality; however, they are very much predicted by them both, with medium power f^2 values (0.180 and 0.179, respectively) and the highest Q^2 value of all the personalities´ models (0.356). Finally, for the extroversion personality, personal norms are very much induced and predicted only by AOC, with the strongest β-value (0.825) and f^2 (1.134) for all the models. This can be since extroverted personalities make more deontological decisions, which treat morality as a duty or a set of universal norms stipulating what is right or wrong, so this personality would be more influenced by the consequences of their actions rather than feeling responsible for them [88].

The explained variance (R^2) of the AOR construct was also strong, with all values higher than 0.600. AOR is not induced by external influences for four out of five personality traits, but it is significant for neuroticism. One reason for this could be the predisposition of a neurotic personality to be affected by externalities and to get more upset and unsettled by life stressors, such as social pressures. AOC induces and strongly predicts AOR for all five personality traits. This is in line with the statement of the value-belief-norm theory developed by [89]. Finally, NEP also induces and predicts AOR for agreeableness, consciousness, extroversion, and openness but not for neuroticism. This could be because individuals with high neuroticism show a less pronounced locus of control, demonstrating a lower willingness to take responsibility for the consequences of their actions because they do not rely on their own strength [89].

For the case of AOC, even though R^2 values were not as high as those for AOR, they significantly explained variance, with the lowest for extroversion (R^2 = 0.307) and the highest for agreeableness (R^2 = 0.657). AOC is very much predicted for all five personalities, with Q^2 values ranging from 0.076 for extroversion to 0.330 for neuroticism. As stated by Schwartz [87], NEP strongly drives and predicts AOC for all five personality traits; however, EI does not induce AOC for neuroticism and openness traits. Higher agreeableness is significantly associated with a lower intuitive and rational decision-making style [53], so external influences should not influence this personality trait´s awareness of consequences.

NEP is explained in all the personality trait models with moderate R^2 and Q^2 values. Extending the model with the use of external influences showed good results, being relevant for all five personalities and predicting NEP with weak, moderate, and strong relevance. Biospheric values influence and positively predict NEP for all personality

traits. BV translates into more caring and environmentally friendly people [87]. Low hedonic values increase NEP for extroversion personality ($\beta = -0.370$) and increase NEP for openness personality ($\beta = 0.335$), and it was not significant for the other three personality traits. This means that for extroversion personalities, the lower their hedonic values, the higher NEP they will develop, and the other way around for openness personalities. Hedonic values consist of searching for happiness through pleasure, not through pain or regret. An extroverted personality is interested in its surroundings; extroverted people with low levels of hedonic values will care more about the environment than people with high levels of hedonic values, who will care more about what the environment can give them. However, an open personality will absorb its surroundings´ new ideas and different opinions, and due to the high level of environmentally friendly behavior available online and the topic of many discussions, hedonistic and open people tend to follow what society establishes as good.

5.1. Theoretical Implications

The present research contributes important insights regarding the role of personality traits as a powerful moderator between the VBN theory and consumers' pro-environmental behaviors, namely, avoider, green consumer, and waste preventer. Policymakers can capitalize on this discovery by running green campaigns to impact people's impressions of green habits. By understanding the long-term impact of their behaviors, citizens can be motivated to opt to act green.

Also, since external influences were found to affect the model, policymakers can use this information to highlight the environmental benefits of choosing green behaviors, potentially using well-known celebrities to stimulate social pressure in favor of eco-friendly choices. Efforts from retailers through their corporate social responsibility programs can also reinforce this message.

Furthermore, policymakers should incentivize and support companies and retailers that adopt sustainable business models, such as reusing containers or avoiding single-use plastics, through tax reductions or other initiatives. Effective marketing strategies should be employed to educate consumers about the advantages of acting green, both to the environment and to their personal economies, since they can avoid wasting food with economic value. Finally, by disseminating this information, environmental consciousness regarding our actions can be enhanced, encouraging more environmentally responsible consumer behavior.

5.2. Limitations and Future Research

Despite the fact that our study has produced some significant findings, there are still several restrictions. Firstly, the sampling method mainly includes urban citizens in Guayaquil, and most respondents were young (between 18 and 30 years old) with low income levels (almost 86% of the population had salaries less than $700.00). Second, the sampling technique prevented us from generalizing the findings of our study because we polled participants outside of public spaces, yet the population with higher income levels typically does not venture outside of shopping malls or public parks. Thirdly, we did not incorporate demographic parameters as control variables in our research model. We primarily concentrate on the VNN theory factors for various personality traits. As a result, our study is unable to address the question of how demographic factors affect pro-environmental activities among individuals with various personality types. Our current inability to explore the pro-environmental actions of Guayaquil's citizens may be expanded upon in future studies. Fourthly, our study paradigm has given more weight to consumers' intentions to engage in pro-environmental activity than to their actual actions. Thus, it is still necessary to investigate the disconnect between intention and actual conduct. Using a sample group as a subject, for instance. Fifthly, we neglected to examine how the VBN theory and all three pro-environmental behaviors in Guayaquil can be influenced by other notions, such as pride and guilt. As a result, additional research should be done to close this

gap. Finally, only three common types of pro-environmental behavior were covered in this study. In the context of the city, there are additional study areas that need to be explored, including the recent introduction of green cosmetics, green fashion, and organic food consumerism. We, therefore, propose further research to broaden our research approach to other industries.

Additionally, improving access to and/or contact with nature through urban planning may be one approach for meeting sustainability targets, since a growing body of evidence suggests that exposure to natural environments (e.g., urban green space, forest, grassland, etc.) increases the adoption of sustainable behaviors [89].

6. Conclusions

The research presented in this study addresses a significant gap in understanding the relationship between personality traits and pro-environmental behaviors within the context of an emerging economy, specifically focusing on Guayaquil, Ecuador. The study aims to investigate how the Big Five personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness) influence pro-environmental behaviors, including waste prevention, green consumption, and avoidance behaviors. By applying the extended value-belief-norm (VBN) Theory as a theoretical framework, this study contributes to our understanding of the complex interplay between personality traits, values, beliefs, norms, and environmental behaviors.

The findings of this research have provided valuable insights into the psychological drivers that influence individuals' choices and actions in the realm of environmental conservation. Several important conclusions can be drawn from the study:

- Personality Traits Influence Pro-Environmental Behaviors: The study establishes that the Big Five personality traits have a significant impact on individuals' pro-environmental behaviors. This implies that an individual's inherent personality traits play a crucial role in shaping their environmental attitudes and actions.
- Values and Beliefs Shape Pro-Environmental Norms: The study validates the theoretical framework of the extended VBN theory, indicating that values and beliefs about the environment influence the formation of personal norms. This suggests that individuals' internalized values and beliefs are powerful drivers of their pro-environmental intentions and actions.
- External Influences Play a Role: The study underscores the role of external influences, such as social pressure and cultural norms, in shaping pro-environmental behaviors. This finding highlights the importance of considering the broader socio-cultural context when designing interventions to promote sustainable behaviors.
- Behavioral Typology: The research sets the foundation for understanding how different personality traits might align with specific pro-environmental behaviors. This opens the door to developing targeted interventions tailored to individuals' personality profiles, thereby increasing the effectiveness of behavior change campaigns.
- Applicability to Emerging Economies: The study's focus on an emerging economy like Ecuador adds value to the global discourse on environmental conservation. It highlights that even in resource-constrained settings, personality traits can play a significant role in driving positive environmental behaviors.
- Implications for Policy and Interventions: The insights gained from this research can inform the design of more effective environmental education campaigns, policy initiatives, and interventions that leverage individuals' personality traits to encourage sustainable behaviors. For instance, strategies could be customized to resonate with the values and tendencies of different personality types.
- Need for Further Research: While this study provides a substantial contribution to the field, it also underscores the need for further research in different contexts and with larger, more diverse samples. Exploring the interplay of personality traits and pro-environmental behaviors in various cultural, economic, and geographic settings can enrich our understanding of these dynamics.

As a call for future exploration, the study suggests widening the scope to encompass other industries beyond the examined pro-environmental behaviors, thus providing a more comprehensive understanding of sustainable consumerism. Additionally, investigating the impact of urban planning and access to natural environments on promoting sustainable behaviors presents a compelling avenue for further investigation.

In sum, this study offers a valuable contribution to the field of sustainability research by providing a multi-faceted analysis of the interplay between personality traits and pro-environmental behaviors. By acknowledging its findings, limitations, and potential for future research, this work advances our comprehension of the factors that influence individuals' decisions towards a more environmentally conscious way of life.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su151712803/s1.

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