Global NEST Journal, Vol 26, No 3, 05623

Investigation of zero waste management behavior in Turkey

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Received: 01/12/2023, Accepted: 03/02/2024, Available online: 20/02/2024
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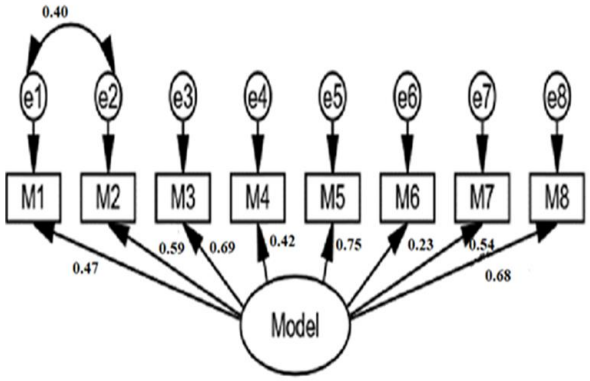
https://doi.org/10.30955/gnj.005623

Graphical abstract



Abstract

Population growth, industrialization and technological advances have significantly increased waste production, waste collection, transportation and disposal induced significant costs. Waste could be considered a resource that allows nations to reduce the consumption of primary raw materials, protect natural resources and improve economic revenues by reducing environmental pressures. Zero waste approach for sustainable waste management has been approved and implemented globally. The present study aimed to investigate the basic zero waste management in Turkey. Thus a scale that included eight items was developed and validity and reliability of the scale were analyzed. Explanatory factor analysis (EFA) was initially applied. Then, the fitness of the model was tested with confirmatory factor analysis (CFA). Cronbach's α (internal consistency coefficient) was calculated as 0.778. Chi-square test, RMSEA, GFI and CFI fit indices were employed in the first-order confirmatory factor analysis conducted on the whole sample. Chi-square was calculated as 1.310 in confirmatory factor analysis. Also, comparative and absolute fit indices were determined as follows: RMSEA=0.035, GFI=0.976, CFI=0.987, RMR=0.030. The analysis of the findings revealed that "Zero Waste Management Behavior" scale fit indices demonstrated excellent model fit for the findings. Furthermore, there were no significant differences between one-way ANOVA and T test results on participant statements based on gender, while there were significant differences between these variables based on age, education level and the region of residence.

Keywords: Zero waste management, survey, scale development, consumer behavior

1. Introduction

The Intergovernmental Panel on Climate Change described climate change as any changes in climate observed due to natural causes or anthropogenic activities (Climate change 2022). Global warming is among the prominent aspects of climate change (Menzel *et al.* 2006) and it was reported that greenhouse gas (GHG) emissions are one the most significant factors behind global warming (Solomon *et al.* 2009). Also, the waste disposal industry and methane GHG emissions by this industry are the major contributors to global warming (Chuenwong *et al.* 2022; Allam *et al.* 2018). 'Zero Waste' could help alleviate the impact of waste on GHG emissions, the population growth, technological advances, economic growth, and rapid urbanization significantly shifted human lifestyle and consumption, leading to a significant increase in solid waste disposal (Zaman *and* Lehmann 2011). It was expected that the world population would reach 9.5 billion by 2050, more than 66 % of which would live in cities (Chuenwong *et al.* 2022). The World Bank report on urban development emphasized that municipal solid waste (MSW) was 1.3 billion tons in 2010 and will be 2.2 billion tons by 2025, and by 2050, the same figure is expected to be 3.5 billion tons (Kaza *et al.* 2018).

Zero waste adopts the concept of sustainable waste management and aims to reduce the disposed part through recycling and energy recovery. To adapt this approach to zero waste management and recycling economy, prevention of the waste before production and recycling the unavoidable waste should be prioritized. When waste that causes a significant burden of cost due to transportation and disposal requirements is perceived as a resource, it creates environmental and economic added value. Employment of waste as a resource would reduce the consumption of primary raw materials, the imports of the countries that import the majority of their raw material, leading to economic revenues, contributing to the reduction of greenhouse gas emissions and climate change control (Misir *and* Arikan 2022). Thus, it is possible

to increase the quality of life and longterm environmental sustainability of the entire system (Zaman 2017).

The amendment to the Landfill Directive (99/31/EC) published by the European Commission stated that the volume of disposed waste disposed to landfills could noy exceed 10% of the total waste until 2035 (European Commission 1999). The Waste Framework Directive (2008/98/EC) revision targeted the reuse and recycling 55% of municipal solid waste by 2025, 60% by 2030 and 65% by 2035 (European Commission 2008). The Packaging & Packaging Waste Directive (94/62/EC) set new targets for packaging waste recycling: 65% by the end of 2025 and 70% by the end of 2030 (European Commission 1994). The zero waste project in Turkey was initiated in 2017, and the legislative infrastructure was established by the Zero Waste Regulation published in 2019 and revised in 2021. Turkey aimed to establish an infrastructure for the recovery of 60% of urban solid waste by 2035, and reuse and recycle 55% of packaging wastes by 2026 and 60% by 2031, consistent with the European Commission directives (Chuenwong *et al.* 2022).

Different factors are effective on the development of waste management behavior (Coskun 2021). The present study aimed to investigate the zero waste management behavior. Thus, a scale was developed for this purpose and explanatory factor analysis was conducted on the scale. Then, the fitness of the model was tested with confirmatory factor analysis. The effects of participant age, education, gender and residence on zero waste management behavior were investigated.

2. Materials and methods

2.1. Model and Study Participants

The scale included 2 sections. Participant demographics were determined in the first section based on sociodemographic questions, and the second section included questions on zero waste management. All participants lived in Turkey and responded to e-mail or social media messages to participate in the study between May 2 and June 2 2021.

The current study aimed to measure zero waste management behavior. The quantitative study was designed as a descriptive survey research. Descriptive surveys are conducted on a population that includes several elements or a sample to reach a general judgment about the population (Balcı 2021). Based on this theoretical model, the following hypotheses were determined:

H1= Zero waste management behavior significantly differs based on participant gender.

H2= Zero waste management behavior significantly differs based on participant age.

H3= Zero waste management behavior significantly differs based on education level of the participants.

H4= Zero waste management behavior significantly differs based on participants' region of residence.

2.2. Population and sample

The study population included individuals living in seven regions in Turkey: Marmara, Aegean, Mediterranean, Black Sea, Central Anatolia, Eastern Anatolia and South East Anatolia. These regions were categorized into four groups. Marmara Region (the region with the highest concentration of industry and population), Aegean region, Mediterranean Region, (regions with high population density, where industry, tourism and agriculture are the main sources of income), and other regions (Central Anatolia, Eastern Anatolia, Southeastern Anatolia and Black Sea), which are mainly rural, and livelihood is based on agriculture and animal husbandry. The population of the regions was α=83,000,000. A sample is a small set selected from a certain population according to certain rules and considered to represent the population. There are certain known sampling rules. Only when these rules are followed, the sample is considered to represent the population (Karasar 2012). Sample size is determined based on the probability of generalization about the population with the data collected from a sample. Thus, the probability of an inaccurate generalization decreases as the sample size increases. Therefore, the researcher must decide an adequate sample size based on the analysis of representation, cost, time and data (Coşkun *et al.* 2020). There are two main sampling techniques: random and nonrandom sampling. In simple random sampling, every item in the population has an "equal" and "independent" chance of selection. That is, each item has an equal chance of selection and the selection of one item should not interfere with the selection of another (Kararsar 2012). In the study, the sample size was determined as n=>384 with a confidence level of 0.95 and significance of 0.05. The authors attempted to reach potential participants with simple random sampling method, and n=250 individuals responded to the scale.

2.3. Data collection instrument

The study data were collected with 5-point Likert-type (never, rarely, sometimes, often, always) Zero Waste Management Behavior Scale. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted, and reliability coefficient was determined. The study data were analyzed with the SPSS 25.0 and AMOS 23.0 software. Sample fitness was determined with the Kaiser-Meyer-Olkin (KMO) test and suitability of the data for factor analysis was determined with the Bartlett test (Hair *et al.* 2018). Scale items are presented in Table 1.

The internal consistency coefficient Cronbach's Alpha (α) was calculated to determine whether the "Zero Waste Management Behavior" scale was a reliable measurement tool. Descriptive statistics include statistical techniques and methods that aim to describe observation results using certain statistical measurements. Descriptive statistics measure central trends such as mean, median and mode, the deviation from the mean, namely the standard deviation and variance, and the deviation from the normal, namely skewness and kurtosis (Arıcı 1998).

The t test is employed to determine whether there was a difference between the group means. The analysis of the significance of the differences between the groups determines whether they are one-tailed or two-tailed in t-test analysis (Kalaycı 2018). The significance level was accepted as p<0.05 in the study. The analysis findings are presented in tables based on the research questions.

Table 1. Scale items

	Items
1.	Do you try to avoid consuming packaged products?
2.	Would you prefer to consume nature-friendly products?
3.	Do you write on both sides of the paper and do you recycle used paper?
4.	Do you conserve water during personal care activities (bathing, shaving, brushing teeth, etc.)?
5.	How often do you use recycle bins?
6.	Do you think charging for plastic bags would reduce plastic bag consumption?
7.	Would you caution others to be sensitive about zero waste?
8.	Do you collect waste separately at home and/or workplace?

3. Results and discussion

3.1. Participant demographics

The analysis of the participant demographics presented in Table 2 demonstrated that 28.8% of the participants were male and 71.2% were female. 52.8% of the participants were 25 years old or younger, 47.2% were 26 years old or older. 69.2% of the participants had undergraduate degrees, and 44.8% lived in Marmara Region, 21.2% lived in other regions, 18.8% lived in Mediterranean Region, and 15.2% lived in Aegean Region.

Table 2. Participant demographics

		Frequency (f)	Percentage (%)
Gender	Male	72	28.8%
	Female	178	71.2%
Age	<25	132	52.8%
	>26	118	47.2%
Education	Primary and Secondary	34	13.6%
	Undergraduate	173	69.2%
	Graduate	43	17.2%
Region	Mediterranean	47	18.8%
	Marmara	112	44.8%
	Aegean	38	15.2%
	Others	53	21.2%

3.2. Explanatory and confirmatory factor analysis results

Explanatory and confirmatory factor analyzes were conducted on the measurement tool. Explanatory factor analysis findings are presented in Table 3. The KMO was determined as 0.830 in explanatory factor analysis. It demonstrated that the data set was adequate (Pituch *and* Stevens 2018). Factor loads varied 0.485 and 0.757. Thus, the factor loads were high (Kalaycı 2018). The total variance explained was 41.149%, and the Eigen value was 3.292. An eigen value of >1 indicates that there is a significant factor in the measurement tool (Pituch *and* Stevens 2018). An explained variance between 40% and 60% is acceptable (Özdamar 2015). The scree plot for the measurement tool is presented in Figure 1.

Table 3. Explanatory factor analysis results

Item	Common Factor Variance	Factor load
1	0.406	0.637
2	0.538	0.734
3	0.528	0.727
4	0.268	0.518
5	0.573	0.757
6	0.481	0.485
7	0.382	0.618
8	0.516	0.718

KMO=0.830

Bartlett's X^2=487.745 df=28 p=0.000

Eigen value=3.292

Total variance=41.149

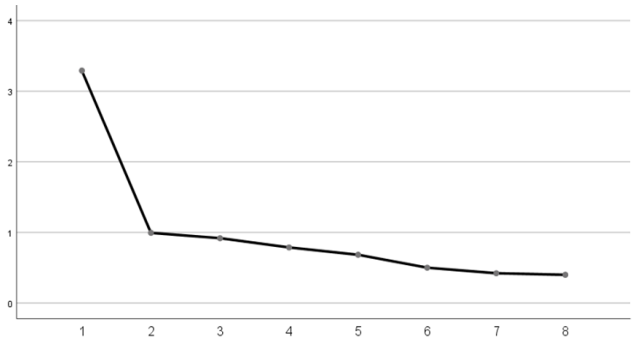


Figure 1. The scree plot for the measurement tool

The scale items (X-axis) and related Eigen values are presented in the scree plot (Figure 1). It was observed that there was an item with an Eigen value of >1 in the plot; thus, there was a single factor in the measurement tool. The confirmatory factor analysis diagram is presented in Figure 2.

As seen in Figure 2, factor loads varied between 0.23 and 0.75. Furthermore, the error covariance of the scale was 0.40, between the items e1 and e2. The model fit index criteria and model fit findings are presented in Table 4.

Various statistics are available to test the model fit of the data. The most popular statistics include Chi-square test (CMIN/DF), the goodness of fit index (GFI), the comparative fit indices (CFI), the root mean square of the approximation (RMSEA) and Root Mean Square Residuals (RMR) (Whittaker *and* Schumacker 2022). The chi-square value was X^2=24.894, degrees of freedom was df=19 and the significance was p=0.164 in the current study. The X^2/sd ≤ 3 ration indicated a perfect fit in confirmatory factor analysis; X^2/df was 1.310, which was a perfect fit. A relative chi-square (X^2/df) is suggested to be less than 5 (Ullman 2001), while the score should be less than 3 (Whittaker *and* Schumacker 2022). The chi-square statistic indicates perfect fit when X^2/df <2 (Bryne 2011). Furthermore, comparative and absolute fit indices were as follows: RMSEA=0.035, GFI=0.976, CFI=0.987, RMR=0.030. A RMSEA of <0.05 and a RMR of <0.05, 0.90 ≤ GFI, CFI>0.95 indicate perfect fit. In the current study, these findings indicated acceptable fit. Overall analysis of the fit indices revealed that the fit indices for the "Zero Waste

Management Behavior" scale exhibited a perfectly fit model (Whittaker *and* Schumacker 2022; Bryne 2011). Also, the internal reliability coefficient alpha was calculated as 0.778. The coefficient should be 0.70 or above (Tavakol *and* Dennick 2011). It was observed that the "Zero Waste Management Behavior" scale had high reliability.

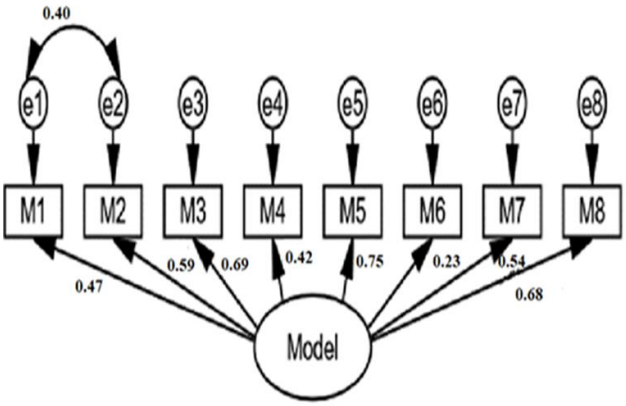


Figure 2. The confirmatory factor analysis diagram

Table 4. The model fit index criteria and model fit findings

Model Fit Criterion	Good fit	Acceptable fit	Model result
X^2 fitness test	0.05 < p ≤ 1	0.01 < p ≤ 0.05	0.164
CMIN / DF	X^2 /sd ≤ 3	X^2 /sd ≤ 5	1.310
Comparative fit indices			
CFI	0.97 ≤ CFI	0.95 ≤ CFI	0.987
RMSEA	RMSEA ≤ 0.05	RMSEA ≤ 0.08	0.035
Absolute fit indices			
GFI	0.90 ≤ GFI	0.85 ≤ GFI	0.976
Residual fit indices			
RMR	0 < RMR ≤ 0.05	0 < RMR ≤ 0.08	0.030

The descriptive statistical analysis findings for the zero waste management behavior scale scores are presented in Table 5.

Table 5. Descriptive analysis of scale scores

Measurement Data	Arithmetic Mean	Standard Deviation	Skewness	Kurtosis
Scale score	3.73	0.596	-0.482	0.235

The descriptive statistical analysis of the scale scores revealed that the arithmetic mean and standard deviation of the scores were 3.73±0.596. The skewness and kurtosis were between -2.0 and +2.0, and the data distribution was normal (George *and* Mallery 2022). The kurtosis and skewness values were included in the normal distribution curve. It was determined that the zero waste management behavior scale scores tended to increase.

Descriptive Statistical Analysis Results of the Scale Items on the Gender Variable is presented in Table S1., Descriptive Statistical Analysis based on Participant Age Variable is presented in Table S2., Descriptive Statistical Analysis based on Education Level Variable is presented in Table S3., Descriptive Statistical Analysis based on the Region of Residence Variable is presented in Table S4. (Appendix).

The independent samples t-test and one-way analysis of variance results con-ducted to determine whether there was a significant difference between zero waste management behavior of the participants based on gender, age, education level and the region of residence variables are presented in Table 6.

Table 6. Score differences based on study variables

	N	Arithmetic mean	Standard deviation
Male	72	3.68	0.657
Female	178	3.75	0.571
Test result [t=0.777 p=0.438*]			
Age <25	132	3.59	0.634
Age >=26	118	3.89	0.509
Test result [t=4.137 p=0.000**]			
Primary and secondary	34	3.70	0.744
Undergraduate	173	3.672	0.570
Graduate	43	4.013	0.502
Test result [F(2-247)=5.708 p=0.004 Difference=2-3*]			
Mediterranean Region	47	3.68	0.630
Marmara Region	112	3.852	0.579
Aegean Region	38	3.64	0.581
Other Regions	53	3.584	0.578
Test result [F(3-246)=3.145 p=0.026 Difference=2-4*]			

*p<0.05 **p<0.01**

One main component of the zero waste pathway was associated with consumption behavior (Zaman *and* Lehmann 2011; Zaman 2015; Zaman *and* Newman 2021). Based on the gender variable, previous studies reported contradictory findings (Ananno *et al.* 2021). Certain studies reported that men were less likely to recycle when compared to women (Echegaray *and* Hansstein 2017). These findings were not consistent with other findings (Werner and Makela 1998; Do Valle *et al.* 2004) and certain studies reported no correlation between zero waste management and gender (Coskun 2022; Domina *and* Koch 2002). The results of the independent samples t-test conducted to determine whether there was a significant difference between the zero waste management behavior of the participants based on the gender variable demonstrated that t was 0.777 (p=0.438), demonstrating that there was no difference between the zero waste management behavior of the participants based on gender. Thus, "H1= Zero waste management behavior differs significantly based on gender" hypothesis was rejected. Certain studies reported that zero waste management behavior was positively affected by the increase in age (Ewing 2001; Scott 1999), however, others reported no significant correlation between recycling behavior and age (Corral-Verdugo 1997; Werner *and* Makela 1998). The results of the independent samples t-test conducted to determine whether the zero waste management behavior of the participants significantly differed based on the age variable (t=4.137; p=0.000; Table 6) demonstrated that 26 years old or older

participants exhibited better zero waste management behavior. Thus, "H2= Zero waste management behavior significantly differs based on age" hypothesis was accepted. Sarbassov *et al.* (2019) similarly reported that although age played a key role, gender was not a critical factor. Although not all studies reported an impact of education level on ecological behavior, certain findings suggested that higher education promoted zero waste management behavior (Echegaray *and* Hansstein 2017; Do Valle *et al.* 2004; Padilla *and* Trujillo 2018). The one-way analysis of variance conducted to determine whether there was a significant difference between zero waste management behavior based on education level (F=5.708 p=0.004) demonstrated that the zero waste management behavior of the participants with a graduate degree was better. There was a significant difference between the behavior of the undergraduate and graduate participants. Thus, "H3= Zero waste management behavior significantly differs based on education level" hypothesis was accepted. Studies conducted in Italy reported regional differences, and when they narrowed and refined the scale, the population exhibited similar behavior in the same province (Agovinoa *et al.* 2019; Crociata *et al.* 2016). The current study investigated populations in 4 Turkish regions. The one-way analysis of variance conducted to determine whether there was a significant difference between the zero waste management behavior of the participants based on the region of residence (F=3.145; p=0.026; Table 6) demonstrated that the zero waste management behavior of the participants who lived in the Marmara region (the region with the highest population density and the most advanced industry and technology in Turkey) were better. There was a significant difference between the scores of the participants who lived in the Marmara region and those living in other regions (predominantly rural regions). Thus, "H4 = Zero waste management behavior significantly differs based on the region of residence" hypothesis was accepted.

Table 7. Recycling behavior based on age

Category	Sub-category	<25		>25	
		f	%	f	%
Domestic waste	I donate if in working condition	63	47.7	54	45.8
Old clothing	I donate	60	45.5	66	55.9
Used batteries	I use used battery recycling bins	66	50.0	96	81.4
Electronic waste	I get them repaired if possible.	59	44.7	48	40.7

In the study, the participants were also asked the following questions: "What do you do with the old or waste domestic items? What do you do with your old clothes? How do you dispose of used batteries? What do you do with electronic waste?" The most common answers to these questions were analyzed based on age. The analysis results are presented in Table 7.

The analysis of the recycling behavior of the participants based on the age variable (Table 7) revealed that 47.7% of the 25 years old or younger participants and 45.8% of the 25 years old or older participants answered the question "What do you do with the old or waste domestic items?" by stating that they donated these if they are in working condition, 45.5% of the 25 years old or younger participants and 55.9% of the 25 years old or older participants answered the question "What do you do with your old clothes?" by stating that they donated those to people in need". 50.0% of the 25 years old or younger participants aged and 81.4% of the 26 years old or older participants answered the question "How do you dispose of used batteries?" by stating that they employed used battery bins. 47.7% of the 25 years old or younger participants aged and 40.7% of the 26 years old or older participants answered the question "What do you do with electronic waste?" by stating that they get them repaired if possible. The chi-square value was X^2=9.475 (p=0.000), demonstrating that the findings of the analysis of waste disposal methods were significant based on age.

Ye *et al.* (2020) reported that gender was not significant and that public needed informal and formal education. Zhang *et al.* (2019) reported that it was possible to influence individual behavior by raising awareness about the consequences of not recycling and demonstrating that personal behavior could make a difference. Changes in individual behavior could improve resource diversification and minimize the waste of reusable materials. The findings of a study conducted in Nigeria demonstrated a need for continuous public awareness education on waste prevention and recycling (Ezeah and Roberts 2012). Due to the increasing demand for natural and man-made resources in all areas, some solid materials (glass, wood, plastic, metal, etc.) have come under pressure for effective recovery and reuse. Therefore, waste reduction at source, reuse and recycling practices are becoming increasingly important. Moreover, achieving a circular economy by promoting the 3Rs (Reduce, Reuse and Recycle) is nowadays an important government policy. (Anwari *et al.* 2023; Coskun 2021; Sahin *et al*. 2021; Sahin *et al*. 2022). Waste reduction is a primary municipal waste policy in EU and the UK. However, although reduction was established as a principle, its meaning is quite vague, and its implications emphasize various means of waste avoidance by diversion of materials, and profoundly entail radical changes in household waste management (Andderson *and* Stage 2018; Minelgaite and Liobikiene 2018).

4. Conclusions

A 5-point Likert-type zero waste management behavior scale was developed in the present study. KMO and Bartlett's test results demonstrated that the dataset was adequate for scale development, and the coefficient Cronbach's Alpha coefficient (0.778) revealed that the scale was a reliable measurement instrument. The fit between the model and the dataset (x^2/df=1.310 <2) was excellent. In the theoretical domain of the study, 4

hypotheses were determined: H1= Zero waste management behavior significantly differs based on participant gender. H2= Zero waste management behavior significantly differs based on participant age. H3= Zero waste management behavior significantly differs based on education level of the participants. H4= Zero waste management behavior significantly differs based on participants' region of residence. Based on independent samples t-test and one-way analysis of variance results, H1 was rejected (t=0.777 p=0.438) and H2 (t=4.137 p=0.000), H3 (F=5.708 p=0.004), and H4 (F=3.145 p=0.026) were accepted.

The study has limitations due to the size of the sample, the fact that it includes only participants using social media and that it was applied to Turkish citizens. The study findings did not significantly differ based on gender variable, while they did based on the education level (especially in the case of the participants with graduate degrees), age (in the case of 26 years old or older participants), and the region of residence (in the case of the Marmara Region regions) of the participants. For global success of zero waste management behavior, each nation should identify local issues. Public awareness should be constantly raised with educational programs, waste containers that allow separation of the waste should be placed more frequently and at closer distances, constructive remedial policies and legislative infrastructure should be improved in cooperation with the government and municipalities, and sustainability should be ensured with innovative product design. Every remedial measure that aims to minimize waste would contribute to the reduction of waste; thus, greenhouse gas emissions would be reduced, resources and energy would be saved, and sustainability and new employment opportunities would be achieved with the development of green technologies.

Funding

The author declared that this study has received no financial support.

Data Availability Statement

Not applicable.

Conflicts of Interest

The author declares no conflict of interest.

Institutional Review Board Statement

The scope of the study was found to be in compliance with ethical principles and human rights by the SDU science and engineering sciences ethics committee committee survey. (Date: 28.03. 2023-72-2)

Appendix

Table S1. Descriptive statistical analysis results of the scale items on the gender variable

		Male		Female	
		f	%	f	%
Do you take care to refrain from using packaged products?	Never	4	5.6%	11	6.2%
	Very rarely	9	12.5%	33	18.5%
	Sometimes	38	52.8%	63	35.4%
	Often	16	22.2%	57	32.0%
	Always	5	6.9%	14	7.9%
Would you prefer to use nature-friendly products?	Never	2	2.8%	1	0.6%
	Very rarely	2	2.8%	8	4.5%
	Sometimes	16	22.2%	44	24.7%
	Often	35	48.6%	90	50.6%
	Always	17	23.6%	35	19.7%
Do you use both sides of the paper you write on and do you throw the papers you use into the recycling bins?	Never	3	4.2%	1	0.6%
	Very rarely	4	5.6%	11	6.2%
	Sometimes	10	13.9%	20	11.2%
	Often	26	36.1%	68	38.2%
	Always	29	40.3%	78	43.8%
Do you pay attention to the waste of water when doing personal care (bathing, shaving, brushing teeth, etc.)?	Never	0	0%	0	0%
	Very rarely	1	1.4%	1	0.6%
	Sometimes	9	12.5%	14	7.9%
	Often	24	33.3%	53	29.8%
	Always	38	52.8%	110	61.8%
How often do you use the recycling bins?	Never	1	1.4%	3	1.7%
	Very rarely	7	9.7%	17	9.6%
	Sometimes	16	22.2%	56	31.5%
	Often	30	41.7%	64	36.0%
	Always	18	25.0%	38	21.3%
Do you think the fact that the bags are paid will be helpful in reducing the use of bags?	Never	2	2.8%	4	2.2%
	Very rarely	10	13.9%	26	14.6%
	Sometimes	19	26.4%	58	32.6%

	Often	24	33.3%	58	32.6%
	Always	17	23.6%	32	18.0%
Would you warn the people around you to be aware of zero waste?	Never	3	4.2%	1	0.6%
	Very rarely	13	18.1%	14	7.9%
	Sometimes	22	30.6%	58	32.6%
	Often	25	34.7%	69	38.8%
	Always	9	12.5%	36	20.2%
Do you collect your waste separately in your homes and/or workplaces?	Never	3	4.2%	12	6.7%
	Very rarely	14	19.4%	23	12.9%
	Sometimes	22	30.6%	58	32.6%
	Often	22	30.6%	51	28.7%
	Always	11	15.3%	34	19.1%

Table S2. Descriptive statistical analysis results of the age variable of the scale items

		<25		**>26**	
		f	**%**	**f**	**%**
Do you take care to refrain from using packaged products?	Never	10	7.6%	5	4.2%
	Very rarely	28	21.2%	14	11.9%
	Sometimes	61	46.2%	40	33.9%
	Often	26	19.7%	47	39.8%
	Always	7	5.3%	12	10.2%
Would you prefer to use nature-friendly products?	Never	2	1.5%	1	0.8%
	Very rarely	10	7.6%	0	0.0%
	Sometimes	38	28.8%	22	18.6%
	Often	63	47.7%	62	52.5%
	Always	19	14.4%	33	28.0%
Do you use both sides of the paper you write on and do you throw the papers you use into the recycling bins?	Never	3	2.3%	1	0.8%
	Very rarely	13	9.8%	2	1.7%
	Sometimes	20	15.2%	10	8.5%
	Often	46	34.8%	48	40.7%
	Always	50	37.9%	57	48.3%
Do you pay attention to the waste of water when doing personal care (bathing, shaving, brushing teeth, etc.)?	Never	0	0%	0	0%
	Very rarely	1	0.8%	1	0.8%
	Sometimes	16	12.1%	7	5.9%
	Often	42	31.8%	35	29.7%
	Always	73	55.3%	75	63.6%
How often do you use the recycling bins?	Never	3	2.3%	1	0.8%
	Very rarely	19	14.4%	5	4.2%
	Sometimes	44	33.3%	28	23.7%
	Often	40	30.3%	54	45.8%
	Always	26	19.7%	30	25.4%
Do you think the fact that the bags are paid will be helpful in reducing the use of bags?	Never	5	3.8%	1	0.8%
	Very rarely	14	10.6%	22	18.6%
	Sometimes	49	37.1%	28	23.7%
	Often	39	29.5%	43	36.4%
	Always	25	18.9%	24	20.3%
Would you warn the people around you to be aware of zero waste?	Never	4	3.0%	0	0%
	Very rarely	16	12.1%	11	9.3%
	Sometimes	39	29.5%	41	34.7%
	Often	48	36.4%	46	39.0%
	Always	25	18.9%	20	16.9%
Do you collect your waste separately in your homes and/or workplaces?	Never	11	8.3%	4	3.4%
	Very rarely	26	19.7%	11	9.3%
	Sometimes	46	34.8%	34	28.8%
	Often	28	21.2%	45	38.1%
	Always	21	15.9%	24	20.3%

Table S3. Descriptive statistical analysis results of the scale items on the variable of educational status

		Elementary and High school		Bachelor Education		Postgraduate Education	
		f	%	f	%	f	%
Do you take care to refrain from using packaged products?	Never	1	2.9%	10	5.8%	4	9.3%
	Very rarely	5	14.7%	31	17.9%	6	14.0%
	Sometimes	13	38.2%	77	44.5%	11	25.6%
	Often	13	38.2%	44	25.4%	16	37.2%
	Always	2	5.9%	11	6.4%	6	14.0%
Would you prefer to use nature-friendly products?	Never	1	2.9%	2	1.2%	0	0.0%
	Very rarely	0	0%	9	5.2%	1	2.3%
	Sometimes	6	17.6%	45	26.0%	9	20.9%
	Often	18	52.9%	82	47.4%	25	58.1%
	Always	9	26.5%	35	20.2%	8	18.6%
Do you use both sides of the paper you write on and do you throw the papers you use into the recycling bins?	Never	2	5.9%	2	1.2%	0	0%
	Very rarely	3	8.8%	12	6.9%	0	0%
	Sometimes	6	17.6%	20	11.6%	4	9.3%
	Often	8	23.5%	74	42.8%	12	27.9%
	Always	15	44.1%	65	37.6%	27	62.8%
Do you pay attention to the waste of water when doing personal care (bathing, shaving, brushing teeth, etc.)?	Never	0	0%	0	0%	0	0%
	Very rarely	0	0%	2	1.2%	0	0%
	Sometimes	5	14.7%	17	9.8%	1	2.3%
	Often	7	20.6%	60	34.7%	10	23.3%
	Always	22	64.7%	94	54.3%	32	74.4%
How often do you use the recycling bins?	Never	2	5.9%	2	1.2%	0	0%
	Very rarely	3	8.8%	19	11.0%	2	4.7%
	Sometimes	10	29.4%	58	33.5%	4	9.3%
	Often	10	29.4%	63	36.4%	21	48.8%
	Always	9	26.5%	31	17.9%	16	37.2%
Do you think the fact that the bags are paid will be helpful in reducing the use of bags?	Never	2	5.9%	4	2.3%	0	0%
	Very rarely	8	23.5%	22	12.7%	6	14.0%
	Sometimes	9	26.5%	54	31.2%	14	32.6%
	Often	6	17.6%	61	35.3%	15	34.9%
	Always	9	26.5%	32	18.5%	8	18.6%
Would you warn the people around you to be aware of zero waste?	Never	2	5.9%	2	1.2%	0	0%
	Very rarely	2	5.9%	23	13.3%	2	4.7%
	Sometimes	12	35.3%	54	31.2%	14	32.6%
	Often	11	32.4%	66	38.2%	17	39.5%
	Always	7	20.6%	28	16.2%	10	23.3%
Do you collect your waste separately in your homes and/or workplaces?	Never	4	11.8%	11	6.4%	0	0%
	Very rarely	4	11.8%	29	16.8%	4	9.3%
	Sometimes	9	26.5%	64	37.0%	7	16.3%
	Often	10	29.4%	43	24.9%	20	46.5%
	Always	7	20.6%	26	15.0%	12	279%

Table S4. Descriptive statistical analysis results of the scale items on the regions variable

		Mediterranean Region		Marmara Region		Aegean Region		Other Regions	
		f	%	f	%	f	%	f	%
Do you take care to refrain from using packaged products?	Never	4	8.5%	6	5.4%	3	7.9%	2	3.8%
	Very rarely	12	25.5%	14	12.5%	6	15.8%	10	18.9%
	Sometimes	16	34.0%	41	36.6%	17	44.7%	27	50.9%
	Often	13	27.7%	37	33.0%	10	26.3%	13	24.5%
	Always	2	4.3%	14	12.5%	2	5.3%	1	1.9%
Would you prefer to use nature-friendly products?	Never	2	4.3%	0	0%	1	2.6%	0	0%
	Very rarely	3	6.4%	5	4.5%	1	2.6%	1	1.9%
	Sometimes	13	27.7%	23	20.5%	8	21.1%	16	30.2%
	Often	23	48.9%	58	51.8%	21	55.3%	23	43.4%
	Always	6	12.8%	26	23.2%	7	18.4%	13	24.5%
Do you use both sides of	Never	1	2.1%	1	0.9%	0	0%	2	3.8%

the paper you write on and do you throw the papers you use into the recycling bins?	Very rarely	3	6.4%	5	4.5%	2	5.3%	5	9.4%
	Sometimes	4	8.5%	11	9.8%	6	15.8%	9	17.0%
	Often	18	38.3%	45	40.2%	16	42.1%	15	28.3%
	Always	21	44.7%	50	44.6%	14	36.8%	22	41.5%
Do you pay attention to the waste of water when doing personal care (bathing, shaving, brushing teeth, etc.)?	Never	0	0%	0	0%	0	0%	0	0%
	Very rarely	0	0%	2	1.8%	0	0%	0	0%
	Sometimes	5	10.6%	10	8.9%	3	7.9%	5	9.4%
	Often	10	21.3%	29	25.9%	21	55.3%	17	32.1%
	Always	32	68.1%	71	63.4%	14	36.8%	31	58.5%
How often do you use the recycling bins?	Never	2	4.3%	1	0.9%	0	0%	1	1.9%
	Very rarely	5	10.6%	6	5.4%	7	18.4%	6	11.3%
	Sometimes	9	19.1%	25	22.3%	16	42.1%	22	41.5%
	Often	24	51.1%	50	44.6%	3	7.9%	17	32.1%
	Always	7	14.9%	30	26.8%	12	31.6%	7	13.2%
Do you think the fact that the bags are paid will be helpful in reducing the use of bags?	Never	2	4.3%	1	0.9%	0	0%	3	5.7%
	Very rarely	3	6.4%	17	15.2%	5	13.2%	11	20.8%
	Sometimes	11	23.4%	35	31.3%	16	42.1%	15	28.3%
	Often	20	42.6%	35	31.3%	11	28.9%	16	30.2%
	Always	11	23.4%	24	21.4%	6	15.8%	8	15.1%
Would you warn the people around you to be aware of zero waste?	Never	2	4.3%	0	0%	1	2.6%	1	1.9%
	Very rarely	5	10.6%	8	7.1%	4	10.5%	10	18.9%
	Sometimes	13	27.7%	40	35.7%	12	31.6%	15	28.3%
	Often	16	34.0%	46	41.1%	15	39.5%	17	32.1%
	Always	11	23.4%	18	16.1%	6	15.8%	10	18.9%
Do you collect your waste separately in your homes and/or workplaces?	Never	5	10.6%	2	1.8%	1	2.6%	7	13.2%
	Very rarely	8	17.0%	10	8.9%	13	34.2%	6	11.3%
	Sometimes	13	27.7%	36	32.1%	9	23.7%	22	41.5%
	Often	15	31.9%	42	37.5%	6	15.8%	10	18.9%
	Always	6	12.8%	22	19.6%	9	23.7%	8	15.1%

Table S5. Descriptive statistical analysis results of the age variable of the Table 7

		<25		**>26**	
		f	**%**	**f**	**%**
How would you evaluate the old or waste items in your home?	If it works, I'll give it to someone who needs it.	63	47.7%	5	4.2%
	I trash it.	9	6.8%	14	11.9%
	I'll put it away for later use at home.	21	15.9%	40	33.9%
	I throw it in the recycling bins.	19	14.4%	47	39.8%
	I will fix it and continue to use it.	20	15.2%	12	10.2%
How do you generally evaluate your worn-out clothes?	I wear it while doing gardening and house cleaning.	16	12.1%	18	15.3%
	I trash it.	1	0.8%	1	0.8%
	I give it to those in need.	60	45.5%	66	55.9%
	I cut it out and use it in a different form like a cleaning-cloth.	20	15.2%	6	5.1%
	I make ornaments, dolls, etc.	5	3.8%	1	0.8%
	I throw it in the clothes piggy bank around where I live.	30	22.7%	26	22.0%
How do you assess your waste batteries?	I throw them into waste battery boxes.	66	50.0%	96	81.4%
	I throw it in the garden/ on the sidewalk/ on the street etc.	2	1.5%	0	0%
	I throw it in the trash.	32	24.2%	14	11.9%
	I collect at home.	28	21.2%	7	5.9%
	I take it to the place where I bought it and give it to them to recycle.	4	3.0%	1	0.8%
How do you evaluate your e-waste?	I sell the working parts to places that use it as parts.	12	9.1%	13	11.0%
	I trash it.	13	9.8%	9	7.6%
	I'll be picked up somewhere at home.	30	22.7%	11	9.3%
	I throw it in the recycling bins.	18	13.6%	37	31.4%
	If it's repairable, I'll have it repaired.	59	44.7%	48	40.7%

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