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FACTORS AFFECTING CITIZENS' INTENTIONS TO REDUCE PLASTIC WASTE

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Abstract

The necessity of protecting the ecosystem is of crucial importance and requires immediate attention. The issues of pollution, waste, and the need to modify both individual and business practices have become dominant, especially in developing countries and disadvantaged nations. Identifying the key drivers that facilitate a shift towards circular economic processes and a significant transformation in citizens' environmentally-friendly behaviors is imperative. The aim of this study is to examine the recycling practices of residents in Bitola and Prilep, located in the Pelagonia region of the Republic of North Macedonia and to identify the main motivating factors for changing habits related to plastic recycling. Specifically, the study aims to increase plastic waste sorting practices and encourage the use of reverse vending machines (RVM). A survey was conducted, collecting data from 842 citizens to gain insights into their habits and intentions. Analyses of the studyconfirm that the most significant motivators for changing citizens' recycling

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practices are financial incentives, such as rewards or discounts. Additionally, the need to increase public awareness and provide greater education on recycling remains essential elements in initiatives aimed at changing citizens' behavior.

Keywords: recycling, citizen's behavior, waste management, circular economy, ecological law.

1. Introduction

The last few decades waste management has been a crucial motive and essential part of the policies of well-developed countries' governments. Almost all of the statistical research shows that the quantity of the waste is drastically and exponentially increasing. It is estimated that the annual global waste volume will increase to 3.40 billion tons by 2050 (Kaza et al., 2018). Plastics are everywhere but a large part of it is used only once before thrown away. It ends up polluting the environment, depriving the economy of a valuable resource. According to estimates, only 5% of the value of plastic packaging material remains in the economy, the rest is lost after a very short first-use. This is a big cost for Europe, with the annual bill ranging between €70 and €105 billion. In Europe, the majority of plastic is still landfilled or incinerated rather than being recycled (European Commission, 2018).

The negative impact of litter, the issue related to air, weather and soil quality is well known; unfortunately, it may be considered that not much has been done in this field to drastically improve or stop the littering of the Earth.

Well-developed countries are a few steps ahead in how they deal with pollution and waste management compared to developing countries,especially those with low and middle-income levels. Waste managementbehavior is inseparably linked to the cultural background of the residents, butit is also influenced by the political and infrastructure order and organizational properties of countries and communities. The successful management and marketing of any household solid waste recycling scheme will require national and local governments to encourage high levels ofpublic participation to ensure that the planned technology is implemented successfully (Zhang et al. 2015).

The cultural background, the legal framework, and sometimes the qualifications of certain behaviors, such as penalties or incentives for selecting, reducing, and recycling waste can be decisive factors in the acceptance of recycling such as a citizen's unconscious daily routine.

The legal framework is a necessary base for acceptance and directing some behavior as normal and acceptable by the citizens. Each country's government should strategically plan and regulate the entire process, starting from production that includes packaging, waste generation, sorting, prevention, reuse, recycling packaging waste to energy recovery.

For that purpose, in the Republic of North Macedonia, the Law on Packaging and Packaging Waste Management was enacted on September 15, 2021, as part of the legislative package in the field of waste management, in accordance with the goals for long-term environmental protection and the introduction of the concept of a circular economy. The law is aligned withthe Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste adopted on December 20, 1994. The objectives of the law are to prevent the generation of packaging waste,reduce and limit the use of harmful metals and substances in packaging, promote sorting of waste, achieve a high level of reuse, recycling, and other forms of processing, thereby reducing landfilling (Mateski et al., 2021).

According to the law, manufacturers are obligated to ensure the implementation of national targets related to the collection, recycling, and processing of packaging waste resulting from packaged products released on the market in the Republic of North Macedonia. The law specifies the following quantities of packaging waste released on the market in the Republic of North Macedonia to be collected to meet national targets: 65% by 2024, 70% by 2025, 75% by 2026, 80% by 2027, and 85% by 2028. In accordance with the law, the national targets of the Republic of North Macedonia for the collection, processing, and recycling of packaging waste by December 31, 2030, are a minimum of 65% of the weight of all packaging waste to be recycled, with a requirement to selectively collect at least 50% of plastic packaging waste. According to the Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste and its amendments, the corresponding target for the European Union

for the same period is a minimum of 55% of plastic packaging waste to be recycled.

To gradually achieve the goals of the Law, the minister leading the environmental authority establishes annual national targets for the collection, processing, and recycling of packaging waste, in accordance with planning documents adopted in line with waste management regulations, no later than December 15 of the current year for the following year. In this regard, the Plan for Preventing Waste Generation in the Republic of North Macedonia for the period 2022-2028 was introduced. According to the Plan, aiming for "zero waste" or a sustainable circular economy requires a joint commitment from the central government, local self-governments, the business community, the education sector, the NGO sector, and citizens/consumers (Ministry of Environment and Physical Planning, 2022). "Zero waste" implies designing and managing products and processes with the intention of reducing the volume and toxicity of waste and materials, preserving and renewing all resources without incineration or landfilling (Zero Waste International Alliance). The implementation of "zero waste" will eliminate all waste that could end up in the soil, water, or air, posing a threat to human health, animals, or the planet Earth. Zero waste is a concept for minimizing waste by reducing the use of products that produce waste (Zamzam et al. 2023).

The Waste Prevention Plan encompasses numerous policies with the ultimate goal of addressing waste more quickly and efficiently, reducing waste, increasing reuse, and recycling. The objectives and vision of the plan include the development of collection and recycling systems that can be integrated into local economic activities, reducing the quantities of residual waste that need to be landfilled by removing recyclable materials and organic waste from the total waste, and more.

2. Influencing Factors for Reducing Plastic Waste

Low and middle-income countries still face major challenges in ensuring universal access to waste collection services, eliminating uncontrolled disposal and burning and moving towards environmentally sound management for all waste. Hence, there is a need for implementation of innovative and effective policies and practices to promote waste prevention

and stem the relentless increase in waste per capita as economies develop. (UNEP 2015, p.7).

Eliminating plastic waste requires wide-scale system changes and a shift from a linear to a circular plastics economy; where products are re-used, re-purposed, recycled, and recovered (Allison et al., 2022).

Reducing or eliminating plastic waste requires an active role from all stakeholders to encourage sustainable plastic use. Specifically, individuals, industry, and the government play a key role in these processes through consumer behavior, responsible production, green plastic packaging, raising public awareness, and plastic waste management for recycling and remanufacturing (Jia, Evans & Linden, 2019).

The elimination of plastic waste depends, in part, on changing human behavior. Various behaviors, such as reducing, reusing, and recycling, can be adopted by individuals to minimize plastic waste (Union, 2008 as cited in Allison et al., 2022).

Chan (1998) found that the media content of environmental news on local pollution problems may give us better understanding of the 'public agenda' and the 'media agenda' and that publicity messages from the mass media should be effective for promoting green behaviors.

Some authors highlight that for improvement and promotion of smart recycling systems, the focus should be put to promoting public intention to use and enhance their environmentally-friendly behavior in a playful way. Namely, Liu and Hsu in their study analyzed the following four factors influencing the intention of urban residents to use smart recycling systems: environmental concerns, perceived playfulness, perceived usefulness, and perceived ease of use. Perceived playfulness significantly affects intention to use. They indicated that the effect of perceived playfulness on intention to use is greater than that of environmental concern, but perceived ease of use cannot significantly affect intention to use (Allison et al., 2022).

Factors affecting recycling behavior presented in the literature are categorized as follows (Barnosky, Delmas & Huysentruyt):

1. Knowledge - Not enough awareness or knowledge about recycling and recycling initiatives
2. Inconvenience - Perceptions of recycling (in)convenience
3. Responsibility - Lack of personal responsibility.

People can be influenced, and their recycling habits can be changed through diverse, effective, and innovative incentive schemes (Gibovic & Bikfalvi, 2021). The necessary factors that can trigger a change in public behavior, as identified by Defra in 2006 (cited in Timlett & Williams, 2008), include:

- Enablers - infrastructure, education and information and removal of barriers.
- Encouragement - taxes, penalties, rewards and league tables.
- Engagement - communication, feedback, consultation, community involvement and 'bottom up' policies.
- Exemplify - leading by example.

Often, as a practice to change and initiate citizens' recycling behavior, the promotion of using green cards to collect points for waste recycling is used. The accumulated points can later be used for specific purchases or discounts at supermarkets or other places.

The Macedonian company Pakomak undertakes initial initiatives to change waste sorting habits. It is the first Macedonian company to introduce the global trend in sorting within the Republic of North Macedonia – reverse vending machines for collecting plastic bottles and cans (Pakomak, 2023). Citizens benefit from using these vending machines by collecting points through the Ekomak application. The application allows users to gatherpoints and use them as vouchers in markets. It is part of a larger ecosystem where users authenticate themselves with the vending machine through the application and collect points for the disposed bottle. The green points can then be exchanged for valuable rewards and benefits, such as discount vouchers in markets and other retail outlets, discounts on public services and utility costs, donations, etc. The list of places where vouchers can be used is expanding daily and can be viewed on the mobile application itself.

Practices similar to those of Pakomak have been introduced and implemented in various parts of the world, few years before Pakomak did it in Macedonia. For example, to facilitate and encourage public participation in community recycling facilities, Hong Kong has introduced the GREEN$ -

Greeny Coins (Hong Kong Waste Reduction Website) smart card. This card allows the public to earn GREEN$ and exchange them for gift items. Individuals bringing no less than 2 kg of recyclables to the new community recycling network can register to receive a GREEN$ smart card. By presenting the GREEN$ smart card or the QR code image printed on theback of the card during subsequent submission of recyclables, the public can earn GREEN$ for the redemption of gift items. Furthermore, Bracknell Forest Council, in the south of England, gives an opportunity to every citizenwho wants to use an "e+ card" where points are accumulated. Points are awarded for each pick-up of specified bins, which are emptied if eligible by the personnel of the waste truck. The system does not employ a weight-basedmechanism, and no fee reduction is offered for managing the residual waste bin. Users of the system do not receive a cashable value, but a maximum total value of GBP 26 in credits (points) per year is provided. The main rewards include leisure benefits, such as discounts or direct access to sports facilities, membership to local clubs, gyms, and pools (Plastic Smart Cities, 2023).

Additionally, Yoyo - http://yoyo.eco was founded in early 2017. Present in six major cities in France, including Paris, Lyon, Bordeaux, Marseille, Reims, and Mulhouse, the company is aiming to make recycling not only more convenient in France, but also more fun. Through a system of Sortersand Coaches, Yoyo participants receive points for diverting plastic bottles from landfills. The results are promising — in just two years, the community has grown to almost 400 Coaches and over 12,000 Sorters,collecting almost 3.7 million plastic bottles in France. Yoyo's approach showcases the effectiveness of combining convenience, social engagement, and incentives to promote positive recycling practices (Barnosky, Delmas & Huysentruyt).

The monetary incentive that is provided by RVMs is strong motivation to engage the general public in recycling efforts (Amantayeva et al., 2021). "Cash for trash" as a motto is well known and used worldwide for tackling litter, recycling for some money or other reward, bearing in mind that the main goal of the whole process is to keep the environment clean.

The adoption of innovative recycling practices, such as the use of green cards, reverse vending machines, and smart cards with incentives, has provento be helpful in motivating citizens to actively participate in waste management initiatives. Initiatives such as Ekomak of Pakomak in North Macedonia, Plastic Smart Cities in Hong Kong, e+ card of Bracknell Forest Council, in the south of England and Yoyo in France have successfully implemented reward-based systems that not only promote environmentally responsible behavior but also contribute to the broader goal of keeping the environment clean. The expansion of these practices globally, as well as the incorporation of monetary incentives, as demonstrated by the strong motivation provided by RVMs, reflects a growing awareness and commitment to sustainable waste management practices on a global scale. The integration of convenient, social, and incentive-driven approaches, exemplified by these initiatives, offers a promising blueprint for fostering positive recycling habits and fostering a cleaner, more sustainable planet.

3. Research and discussion

3.1. Methodology

The primary objective of the research is to identify the awareness and motivation factors among the populations in the cities Bitola and Prilep, which are part of the Pelagonia region in the Republic of North Macedonia, regarding the recycling of plastic waste, with a particular emphasis on plasticbottles. The choice of this part of Pelagonia region was made as a result of the importance that cities have in the region due to the significant economic activity of numerous companies and its significant population. At the same time the amount of solid waste generated by the population and companies from this region continues to increase. It's noteworthy that, at the time the survey was conducted, there were no vending machines available in the above-mentioned cities. The research intends to provide valuable information that will help to develop strategies for encouraging environmentally friendly waste management practices.

The research was conducted entirely online from July 1st to August 1st 2023, using a structured, non-disguised questionnaire. The questionnaire included both closed and open-ended questions, aiming to obtain comprehensive insights. A survey link was distributed to 2000 citizens (1000 from each

city), and 842 responses were received (360 from Bitola and 482 fromPrilep).

To achieve the research objective, a questionnaire was designed, consisting of three parts. The first part included questions related to the general characteristics of the respondents. The second set of questions aimed to identify the current eco-practices of the respondents. The third set was designed to collect data on the respondents' perceptions of the usage of revese vending machines and their familiarity with their functionality.

The collected data were analyzed using survey administration software SF Google Forms and SPSS software package. The hypotheses were testedusing the non-parametric Chi-square test, with the significance of results set at a 5% risk or a confidence level of 95% in statistical inference.

3.2. Demographic Overview and Sampling Framework

The research was carried out in North Macedonia's Pelagonia Region (with the focus on Prilep and Bitola), aimed to comprehensively explore and understand the demographic and socioeconomic characteristics of the participant pool. A total of 842 participants took part in the survey, representing a wide range of the Pelagonia Region's population. Detailed characteristics, including age, gender, educational level, and employability status, are presented in Table 1.

Upon reviewing Table 1, the distribution of respondents based on gender reveals that 68% were female, while 32% were male. Analyzing the age structure, a significant portion, comprising 34% of the participants, belong to the age group of 30 to 40 years. Subsequently, respondents aged 41 to 50 years constituted 27.4%, those in the age group of 15 to 29 years accounted for 20.4%, participants aged 51 to 64 years comprised 16%, and the least represented group consisted of respondents aged above 64 years at 2.2%.

In terms of education, the majority of respondents had completed higher education (54.28%). Following closely were individuals who had completed postgraduate or doctoral studies, constituting 22.92%. Participants with secondary education comprised 21.62%, while those with primary education represented a smaller percentage at 0.71%. Additionally, respondents with

vocational education and those without formal education made up a combined 0.5%.

In terms of employment status, the majority of respondents, numbering 701 (83.25%), were employed. A smaller percentage, 67 (7.96%), identified as students, while 44 (5.23%) were unemployed. Additionally, 27 (3.21%) respondents were retired, and a minor fraction, constituting 3 (0.36%), provided responses categorized as "other."

Table 1. Characteristics of the respondents

Characteristics of respondents	Number of respondents	%
Age	842	
15-29	172	20.4
30-40	286	34
41-50	231	27.4
51-64	134	16
over 64 years old	19	2.2
Gender		
Male	269	32
Female	573	68
Education level		
Primary education	6	0.71
Secondary education	182	21.62
Higher education	457	54.28
Postgraduate/PhD	193	22.92
Other	4	0.48
Employment status		
High school student	11	1.31
University student	56	6.65
Employed	701	83.25
Unemployed	44	5.23
Pensioner/Retire	27	3.21
Other	3	0.36

Source: own research

3.3. Research results

Research carried out in the Bitola and Prilep has provided important insights on waste management practices and the readiness of citizens to adopt sustainable lifestyles. The data analyzes from the conducted research confirm that, concerning waste sorting practices, 48% of the respondents consistently

participate in waste sorting. On the other hand, the remaining respondents mentioned that they engage in waste sorting either occasionally or never.

The concept that implementing focused programs and incentives can effectively promote citizens' adoption of sustainable behavior is confirmed by the analysis of the research data. The analysis of the gathered data not only confirms but also enhances the validity of the concept, showing a clear correlation between the implementation of targeted initiatives and the favorable change in people's behaviors and attitudes toward sustainable activities.

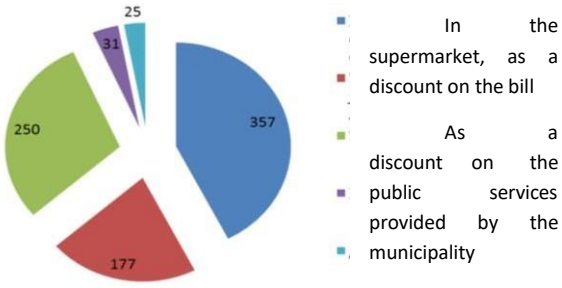
When analyzing the data regarding how many plastic bottles or cans respondents generate weekly, the majority indicated that they accumulate between 5 to 10 plastic bottles or cans per week. The analyses confirm that a substantial 89% of respondents stated that they would certainly or probably recycle more waste if there were rewards or discounts for certain products or services in exchange for a specific quantity of collected and returned plastic bottles or cans. The highest percentage of respondents believe that, for recycling, a financial reward or incentive should be provided. It is encouraging to note that a positive 94% of respondents expressed willingness to personally use reverse vending machines if installed in their city. This attitude prevails among respondents regardless of age, gender, or the municipality they reside in. The majority of respondents (42.5%) expressed a preference to use the benefits/points earned from depositing theirused plastic bottles and cans into such machines for obtaining a discount in supermarkets. Approximately 30% of respondents indicated a desire to use them for donations, and around 21% for receiving discounts on public services provided by the municipality.

The respondents emphasized financial incentives as the most significant motivator for changing recycling practices. However, they also highlighted the need for greater education to increase awareness and promote the use of reverse vending machines.

To the question: “In what way would you personally like to use the benefits/points earned from depositing your used plastic bottles and cans into

reverse vending machines?", respondents provided the following summary of responses:

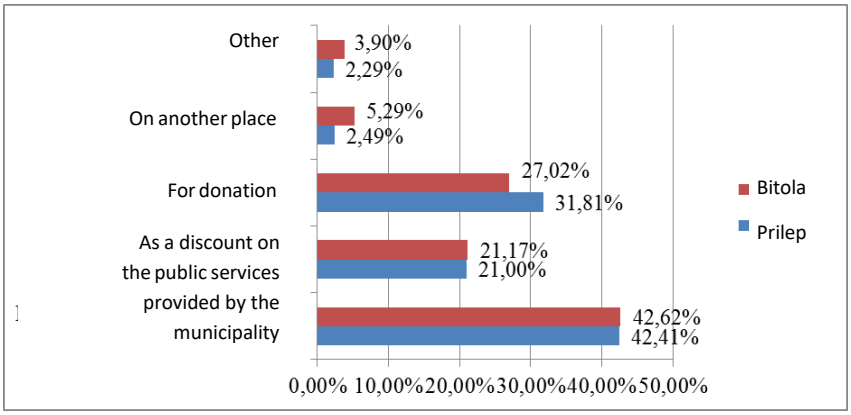
Figure 1. Desired benefits from depositing used plastic bottles and cans into reverse vending machines?



Regarding this question, the majority of respondents, approximately 42.5% (357), expressed a preference to use the benefits/points earned from depositing their used plastic bottles and cans into such machines for obtaining a discount in supermarkets. Around 30% or 250 of respondents indicated a desire to use them for donations, approximately 21% (177) for receiving discounts on public services provided by the municipality, 3.7%
(31) for other places such as cafes, restaurants, tickets for sports events, etc., and about 3% or 25 respondents for other purposes (all statements refer to monetary compensation).

To visualize the difference in responses among the respondents in the two largest municipalities in the Pelagonia region, the percentages are presented on the following figure:

Figure 2. In what way would you personally like to use the benefits/points earned from depositing your used plastic bottles and cans into reverse vending machines? - Percentage breakdown by municipality



The responses to the question: "'In what way would you personally like to use the benefits/points earned from depositing your used plastic bottles and cans into reverse vending machines?" indicate that there is no significant difference in the attitudes of respondents from Bitola and Prilep municipalities regarding their answers to this question. The most of them prefer to use the benefits/points earned from depositing their used plastic bottles and cans into such machines for obtaining a discount in supermarkets.

In the next part of this research, an in-depth examination will be conducted through hypothesis testing, specifically focusing on factors influencing recycling incentives. Additionally, the study will explore the cluster affiliation of citizens, aiming to discern patterns and groupings within the respondent population based on their attitudes and behaviors towards recycling practices.

3.4. Hypothesis testing

With the application of a test in the SPSS software package, as a result of input information, as well as the corresponding empirical and calculated (theoretical) values of respondents' answers, and in accordance with thesubject and purpose of the research, the following general hypothesis has been tested:

H_0 - The motivation to engage more in recycling does not depend on the cluster affiliation (gender, age, education and employment status of the citizens) when there is a reward or discount for a certain number of collected and returned plastic bottles or cans, applicable to certain products or services.

Specific hypotheses derived from the general hypothesis are:

H_{01} - The motivation to engage more in recycling does not depend on the gender of the citizens when there is a reward or discount for a certain number of collected and returned plastic bottles or cans, applicable to certain products or services.

Table 2. The empirical values of the respondents' answers by gender

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
M	95	5	151	1	12	269
F	204	29	301	11	28	573
Sum	299	34	452	17	40	842

Table 3. Theoretical values of the respondents' answers by gender

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
M	95,5237530	10,86223278	144,4038005	5,43111639	12,7790974	269
F	203,476247	23,13776722	307,5961995	11,5688836	27,2209026	573
Sum	299	34	452	17	40	842

Results:

Critical chi-square:	9.49
Computed chi-square:	91.98
Degrees of freedom	4

$p = 0.26227$

$\alpha = 0.05$

As the calculated test is greater than the critical (tabular) value, it can be concluded that the first specific hypothesis is rejected, meaning that the

motivation to engage more in recycling, if for a certain number of collected and returned plastic bottles or cans there is a reward or discount for certain products or services, depends on the gender of the citizens.

H_{02} – The motivation to engage more in recycling does not depend on the age of the citizens when there is a reward or discount for a certain number of collected and returned plastic bottles or cans, applicable to certain products or services.

Table 4. The empirical values of the respondents' answers by age

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
15-29	52	2	105	7	6	172
30-40	111	10	149	3	13	286
41-50	90	12	113	4	12	231
51-64	44	6	74	2	8	134
65+	2	4	11	1	1	19
Sum	299	34	452	17	40	842

Table 5. Theoretical values of the respondents' answers by age

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
15-29	61,07839	6,945368	92,332541	3,4726841	8,1710213	72
30-40	101,56057	11,548693	153,52970	5,7743468	13,586698	86
41-50	82,029691	9,327800	124,00475	4,6638955	10,973872	31
51-64	47,584323	5,4109263	71,933491	2,7054632	6,3657958	34
65+	6,7470309	0,76722	10,199525	0,3836105	0,9026128	9
Sum	299	34	452	17	40	42

Results:

Critical chi-square:	26.3
Computed chi-square:	35.07
Degrees of freedom	16

$p = 0.003882$

$\alpha = 0.05$

As the calculated test is greater than the critical (tabular) value, it can be concluded that the second specific hypothesis is rejected, meaning that the motivation to engage more in recycling, if for a certain number of collected and returned plastic bottles or cans there is a reward or discount for certain products or services, depends on the age of the citizens.

H_{03} – The motivation to engage more in recycling does not depend on the education of the citizens when there is a reward or discount for a certain number of collected and returned plastic bottles or cans, applicable to certain products or services.

Table 6. The empirical values of the respondents' answers by education

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
without f.e.	2	0	1	0	0	3
higher e.	161	16	250	9	21	457
2 years h.e.	0	0	0	0	1	1
master/PhD	72	13	97	5	6	193
primary	1	0	5	0	0	6
secondary	63	5	99	3	12	182
Sum	299	34	452	17	40	842

Table 7. Theoretical values of the respondents' answers by education

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
without f.e.	1,0653207	0,1211401	1,6104513	0,0605701	0,142517	3
higher e.	162,28385	18,453682	245,32542	9,2268409	21,71021	457
2 years h.e.	0,3551069	0,0403801	0,5368171	0,0201900	0,047506	1
master/PhD	68,535630	7,7933492	103,60570	3,8966746	9,168647	193
Primary	2,130641	0,2422803	3,2209026	0,1211401	0,285036	6
secondary	64,629454	7,3491686	97,700713	3,6745843	8,64608	182
Sum	299	34	452	17	40	842

Results:

Critical chi-square:	31.41
Computed chi-square:	31.83
Degrees of freedom	20

$p = 0.045171$

$\alpha = 0.05$

As the calculated test is greater than the critical (tabular) value, it can be concluded that the third specific hypothesis is rejected, meaning that the motivation to engage more in recycling, if for a certain number of collected and returned plastic bottles or cans there is a reward or discount for certain products or services, depends on the education of the citizens.

H_{04} – The motivation to engage more in recycling does not depend on the employment status of the citizens when there is a reward or discount for a certain number of collected and returned plastic bottles or cans, applicable to certain products or services.

Table 8. The empirical values of the respondents' answers by employment status

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
employee	255	29	375	14	28	701
unemployed	14	0	22	1	7	44
retiree	6	4	13	2	2	27
high school student	23	1	30	0	2	56
middle school student	0	0	10	0	1	11
other	1	0	2	0	0	3
Sum	299	34	452	17	40	842

Table 9. Theoretical values of the respondents' answers by employment status

	I would probably select more	I probably wouldn't select more	I would certainly select more	I would certainly not select more	I don't know	Sum
employee	248,92992	28,30641	376,30879	14,153207	33,30166	701
unemployed	15,624703	1,776722	23,619952	0,8883610	2,090261	44
retiree	9,5878860	1,0902613	14,494061	0,5451306	1,282660	27
high school student	19,885986	2,261283	30,061758	1,1306413	2,660332	56
middle school student	3,9061758	0,4441805	5,9049881	0,2220902	0,522565	11
other	1,0653207	0,1211401	1,6104513	0,0605700	0,142518	3
Sum	299	34	452	17	40	842

Results:

Critical chi-square: 31.41
Computed chi-square: 2409.25
Degrees of freedom 20
$p = 0.006819$
$\alpha = 0.05$

As the calculated test is greater than the critical (tabular) value, it can be concluded that the fourth specific hypothesis is rejected, meaning that the motivation to engage more in recycling, if for a certain number of collected and returned plastic bottles or cans there is a reward or discount for certain products or services, depends on the employment status of the citizens.

From the hypothesis testing, a general conclusion can be drawn that the general hypothesis, H_0- The motivation to engage more in recycling does not depend on the cluster affiliation (gender, age, education and employment status of the citizens) when there is a reward or discount for a certain number of collected and returned plastic bottles or cans, applicable to certain products or services, is rejected.

4. Conclusion

Raising awareness and educating the general population about the usefulness of reverse vending machines and the associated benefits are crucial initiatives. These initiatives should focus on clarifying the ease of use, environmental advantages, and the positive impact on sustainable waste management that reverse vending machines can contribute.

In addition to educational campaigns, it is also necessary to implement supplementary programs with financial incentives. These programs should be carefully designed to motivate and reward individuals for adopting stronger recycling practices. Financial incentives can include discounts on products or services, loyalty programs, or other tangible rewards that serve as a compelling incentive to actively participate in recycling efforts.

Analyses have confirmed that the motivation for increased waste sorting in the Pelagonia largest cities (Bitola and Prilep) depends on cluster affiliation, including gender, age, educational background, and employment status of the citizens. Therefore, when designing programs, it is necessary to consider and tailor them to the cluster characteristics of the citizens. Beyond the educational framework aimed at raising awareness among residents, given that bad behaviors and habits are contagious like a virus, there is a need for

greater activity from state and inspection authorities to monitor the consistent implementation of laws and other legal acts.

The country is shaped not only by the bureaucracy represented by elected individuals and government institutions but also by its population, their attitudes, actions, and collective contributions. Through their active engagement in sustainable practices and adoption of a responsible waste management approach, people make significant contributions to the general welfare of their communities and, consequently, the country as a whole. Therefore, creating an adaptable and ecologically conscious society requires that everyone be encouraged to consider themselves responsible for the environment.

Only through consistent, professional, and responsible behavior, aligned with domestic and European legal regulations and the best global practices, can the negative impact of waste on the environment be minimized. To achieve this goal precise waste management, implementation of environmentally friendly disposal methods, and promotion of recycling and circular economy practices are necessary.

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