J. Int. Environmental Application & Science, Vol. **19**(1): 13-30 (2024)
Research Paper

Evaluation of Solid Waste Management in Mamak District Centre of Ankara Province

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Received February 21, 2024; Accepted March 24, 2024

Abstract: Due to the increasing population and the concentration of population especially in metropolises, the solid waste problem is gradually increasing. Most of the solid wastes that arise as an important environmental problem consist of materials with recycling and recovery properties. It is important for solid waste generators to reduce the amount of solid waste or contribute to recycling. In this study, in order to determine the behaviours, attitudes, knowledge levels and sensitivities of individuals who play the most important role in solid waste management, a WEB-based questionnaire with 30 questions was applied to total 204 people aged 18 and over residing in Mamak. SPSS analysis was applied to the survey results and the margin of error of the study is 6.86 and the confidence interval is 95%. Normality analysis, ANOVA analysis, correlation and regression analyses were performed on the data obtained and frequency tables were created. As a result, it has been determined that most of the individuals participating in the survey, 44.60%, do not collect waste separately, do not attach enough importance to the separate collection of solid wastes at home and would like to have more information about reducing the waste generated in their daily lives. The 31.4% of the individuals participating in the survey stated that they would like to have a share in the recycling economy and that financial rewards would encourage them to separate waste and contribute to recycling. In this respect, it is important to make the society more conscious and sensitive by disseminating the zero waste approach and solid waste management studies.

Keywords: *Solid Waste Management, Zero Waste, Mamak, Ankara.*

Introduction

People's lifestyles, daily routines, consumption habits, socio-economic models and development levels have a significant impact on the amount and type of solid waste. Due to population growth, industrialisation, urbanisation and development of industry, the environmental impact of wastes has reached dangerous dimensions. Excessive production and consumption have also led to a significant increase in resource consumption. This situation increases the pressure on nature and disrupts the ecological balance. Since resources are not infinite and wastes have negative effects on personal health and the environment, it has been felt that important steps should be taken in waste management (Anonymous, 2019). Citizens of society are those who make decisions and act in ways that have a direct or indirect impact on their environment. Citizens need to be knowledgeable about environmental problems, understand potential solutions and be willing to implement effective solutions in order to make efficient decisions (Stapp, 1969).

The environmental sociology literature, which examines social-environmental relations at the point of explaining the causes of environmental problems, can empirically examine issues such as environmental attitudes and behaviours, environmental movements and environmental policies with a holistic perspective, as well as the effects of environmental events (such as the relationship between exposure to air pollution and social class as an independent or control variable) on social structure, or conduct conceptual and theoretical studies on the environment. In this context, dealing with issues such as garbage production, garbage content, sorting behaviour, recycling awareness depending on social status and/or class position also falls within the field of study of environmental sociology. For example, when saying "Tell me what you throw away, I'll tell you who you are!" (Baudrillard 2013), the reality that the amount and content of garbage, as well as environmental awareness, can change depending on social status / class position can be put forward sociologically (Aygül, 2018).

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Depending on a country's socioeconomic status, income sources, education and development level, culture and lifestyle, attitudes and behaviours towards waste management can vary significantly. In Turkey, which is among developing countries, there is an increase in interest in waste separation and recycling (Arı & Yılmaz, 2016).

Factors such as the rapid growth of our country in recent years and today in terms of economic conditions, developing industrialisation, urbanisation, increasing population and welfare level have led to a significant increase in the amount of waste produced. The problems encountered with the increase in waste amounts have made "sustainable waste management approach", which aims to create zero or minimum waste, a necessity (Ulaşlı, 2018).

In sustainable waste management, separation of wastes at source is very important for reuse, recycling, and recovery processes. Mixed collection of wastes leads to contamination of wastes and materials, weakening of reuse, recycling, and recovery conditions, decrease in the material value of waste, increase in waste residues in waste processing facilities, *etc*. It leads to problems. It is important to prevent these problems from the beginning of the waste management process (Topal, 2012).

The aim of this study is to determine the level of awareness of individuals in solid waste management and to evaluate and interpret solid waste management according to the research results. The problems encountered in solid waste management were determined and the studies that can be done for an integrated and conscious waste management were evaluated.

Material and Method

Characteristics of the research area

This research was conducted in Mamak district centre of Ankara province, located in the Central Anatolia region of the Republic of Turkey. Mamak district, 39° 56' 31"N and 32° 55' 23" D (Çakmak, 2016). The district borders Altındağ in the north, Elmadağ in the east, Çankaya and Elmadağ in the south, Çankaya and Altındağ in the west. There are 65 neighbourhoods in Mamak district. The district has a typical continental climate, winters are rainy and cold, summers are hot and dry. The annual rainfall in the region is around 360 to 420 kg/m2 (Çakmak, 2016). Ankara city centre is 3.5 km away from the district. Its height above sea level is 899 m and its surface area is 308 km2. Kökpınar hill, which is 1503 metres above sea level, is the highest point of Mamak district. The lowest point in the region is Dikimevi, which is 899 metres above sea level. Mamak district has a hilly geography (Mamak Municipality Introductory Booklet, 2021). There are Blue Lake (Bayındır Dam) and Hatip Stream within the district borders. Service, mining, agriculture, industry, and trade sectors play an important role in the district economy. The main economic activities of the district are civil service, craftsmanship, private sector and construction labour. In addition, slums and infrastructure, unemployment, lack of education, security and transport are considered as the main problems of the district (Mamak Municipality, 2022).

Mamak has been one of the most important symbols of squatting, uncontrolled urbanisation and environmental destruction since the 1950s. The most important cause of environmental destruction is the Mamak landfill (Özaslan, 2014). Mamak landfill is a large solid waste landfill with an area of 26.6 hectares (Güngör and Torunoğlu, 2022). Since it was thought that the Mamak landfill could cause negative impacts such as epidemics, natural resource pollution, visual pollution, bad odours, greenhouse gas emissions to the atmosphere and explosion risks, the improvement work was urgently implemented. The Mamak landfill was transformed into a solid waste reclamation centre thanks to the project implemented by Ankara Metropolitan Municipality in cooperation with ITC, which started operations in 2002.

The average amount of solid waste collected daily in Ankara is 5.000 tonnes. There are 13 private transfer stations in the province. There are two solid waste landfill sites in Mamak and Sincan districts of Ankara. Leachate collection systems are used in both locations (Ankara Provincial Directorate of Environment, Urbanisation and Climate Change, 2021). The figure shows the characteristics of solid wastes in Ankara province as of 2021. According to Figure 1, 52.58% of the wastes are biodegradable wastes. Table 1 shows the numerical values of solid waste potential generated in Mamak district from 2013 to 2022.

Mamak is the 4th largest district of Ankara in terms of population density. According to the 31 December 2022 Address Based Population Registration System results, Mamak district has a population of 687,535 people (TUİK, 2022). The total female population of Mamak district is 346,420 and the total male population is 340,915. In percentage terms, 50.38% of the total population is female and 49.62%

is male. It is seen that the population of Mamak has increased in recent years until today. The population statistics of Mamak between 2007 and 2022 are shown in Table 2.

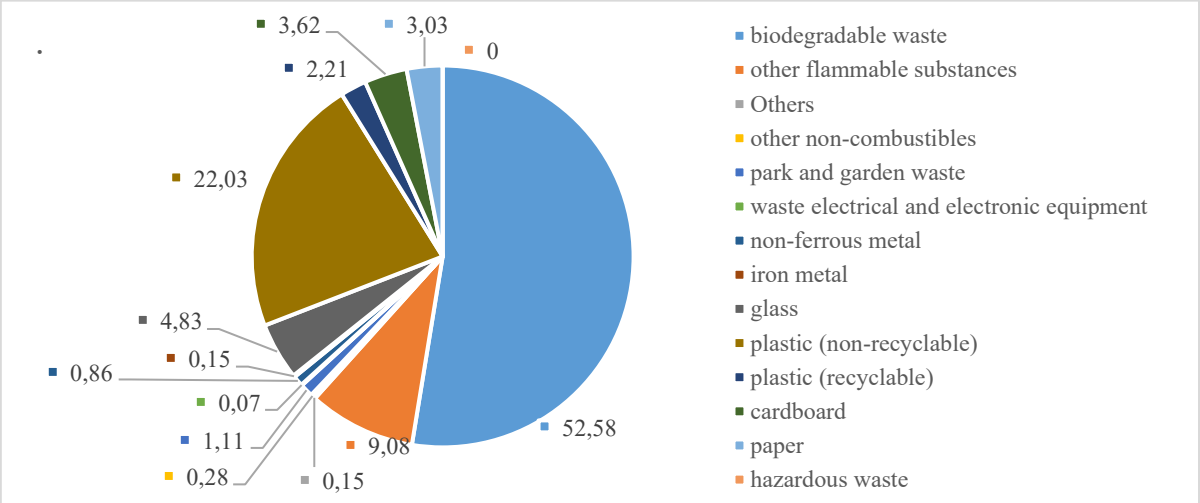

Figure 1. Waste characterisation of Ankara province in 2021 (Ankara Provincial Directorate of Environment, Urbanisation & Climate Change, 2021)

Table 1. Mamak district solid waste amounts collected between 2013-2022 (Mamak Municipality Directorate of Cleaning Affairs, 2022)

Amount of Waste Collected between 2013-2022 (Mamak Municipality Directorate of Cleaning Affairs, 2022)									
Year	**Domestic waste kg**	**Packaging waste kg**	**Textile kg**	**Vegetable oil waste kg**	**Pharmaceutical waste kg**	**Batterykg**	**Electronic waste kg**	**Hazardous waste fluorescents kg**	**Hazardous waste cartridges kg**
2013	No data	2.795.017,00		8.770,00					
2014	No data	4.075.430,00		17.480,00					
2015	160.220.480,00	4.120.660,00		3.100,00		2.730,00			
2016	160.480.830,00	5.631.480,00				1.759,00			
2017	162.980.010,00	6.903.120,00				469,50			
2018	179.601.600,00	12.620.680,00				5.057,90			
2019	175.378.585,00	7.102.020,00				560,19			
2020	191.306.170,00	1.225.320,00				1.338,20			
2021	184.018.310,00	2.505.740,00	17.172,00	1.947,00	239,00	253,00	77,00	550,00	50,00
2022	172.796.800,00	818.710,00	363.400,00	3.372,00	6,00	20,00	15,00	-	350,00
Total	1.386.782.780,00	47.971.377,00	380.572,00	34.669,00	245,00	12.187,79	92,00		400,00

Table 2. Mamak district population between 2007-2022 (TUIK, 2022)

Year	Mamak Population	Male population	Female Population
2022	**687.535**	340.915	346.620
2021	**682.420**	340.018	342.402
2020	**669.465**	333.567	335.898
2019	**665.978**	332.512	333.466
2018	**647.252**	323.710	323.542
2017	**637.935**	318.309	319.626
2016	**625.083**	313.174	311.909
2015	**607.878**	304.502	303.376
2014	**587.565**	394.672	292.893
2013	**568.396**	284.830	283.566
2012	**559.597**	282.464	277.133
2011	**558.223**	284.649	273.574
2010	**549.585**	281.036	268.549
2009	**532.873**	271.531	261.342
2008	**520.446**	263.156	257.290
2007	**503.663**	254.647	249.016

Evaluation of Solid Waste Management

In the research, quantitative research method and primary data analysis, field research and secondary data research were applied. A survey was conducted to determine the behaviours and attitudes of individuals residing in Mamak district centre of Ankara province on solid waste, their approaches to solid waste management, their sensitivity and knowledge levels on environment and waste management.

The survey content was created with Google Survey Forms tool. Thirty questions were prepared to serve the purpose of the research. Within the scope of the study, within 2 months (January-March 2023), a WEB-based 30-question survey was applied by delivering the relevant link and QR code to the participants without any special information of the individuals. For the survey study, a letter of approval was obtained from Konya Technical University Scientific Research and Publication Ethics Committee dated 08.12.2022. The data obtained from the research were analysed using SPSS analysis, margin of error and reliability level. Normality analysis, ANOVA analysis, correlation and regression analyses were performed, and frequency tables were created and interpreted.

A survey consisting of demographic and scale questions was designed to learn the waste awareness of individuals residing in Ankara Mamak district. After receiving survey answers from people with or without awareness and conducting research using the quantitive method, analyses and tables were created with the licensed SPSS 29 version package.

Here according to the number of people residing in Mamak district and based on a margin of error of 6.86%, the population of the research was determined as a minimum of 204 people in the research with the Raosoft Sample Size Calculation program, using the unknown sample size formula. (Raosoft,2004)

It is possible to state that this study is based on academic and practical knowledge. The sample size of the research was determined by taking into account the type of the research, the design of the research, the number of variables, the data analysis method to be applied, and the confidence interval accepted for estimation. 204 people aged 18 and over, living in Mamak district, were surveyed. The margin of error of the study is 6.86 and the confidence interval is 95%.

Findings

The results of the survey applied to 204 participants residing in Mamak district, demographics, frequencies and breakdowns and tables are shown below and explained in detail. In the survey conducted in Mamak district, 45.1% of the respondents were male and 54.9% were female (Table 3).

Table 3. Gender distribution of the participants

Gender		
	Number of answers (N)	**Per cent (%)**
Male	92	45,1
Female	112	54,9
Total	204	100

Table 4 shows the age distribution of the participants of the research conducted in Mamak district. It is stated that the age group that constitutes most of the survey is between 26-35 years old with 49%. Since this survey is a web-based survey, it is necessary to use a smartphone or computer with internet access. Accordingly, the proportion of respondents aged 60 and over is also low.

Table 4. Age distribution of the participants

Age range		
	Number of answers (N)	**Per cent (%)**
18-25	42	20,6
26-35	100	49
36-45	45	22,1
46-59	16	7,8
60 years and older	1	0,5
Total	204	100

Table 5. Distribution of education level of the participants

Education level		
	Number of answers (N)	**Per cent (%)**
primary school	12	5,9
postgraduate	18	8,8
high school	46	22,5
university	128	62,7
Total	204	100

The education levels of the people who participated in the study conducted in Mamak district are shown in Table 5. It is seen that 62.7% of the respondents are university graduates and 5.9% of them are primary school graduates. It is seen that as the level of education increases, the willingness and sensitivity to participate in the research also increases.

In the study conducted in Mamak district, 78.9% of the participants stated that they had a medium level of income (Table 6).

Table 6. Income level distribution of the participants

Income Level		
	Number of answer(N)	**Per cent(%)**
	1	0,5
low	36	17,6
medium	161	78,9
high	6	2,9
Total	204	100

Table 7. Distribution of duration of residence of the participants in Mamak district

Duration of Residence in Mamak District		
	Number of answers (N)	**Per cent (%)**
	1	0,5
11-15 years	17	8,3
16 years and over	63	30,9
Less than 5 years	88	43,1
5-10 years	35	17,2
Total	204	100

In Mamak, 43.1% of the respondents have been residing in the district for "less than 5 years". In addition, the number of those who have been living in the district for "16 years and more" is also quite high (Table 7). A very high rate of 97.1% of the respondents use the natural gas system (Table 8).

Table 8. Distribution of the participants heating system

Heating System of the House		
	Number of answers (N)	**Per cent (%)**
Natural gas	198	97,1
Electric Home Heating System	2	1
Air Conditioner	2	1
Stove	2	1
Total	204	100

Table 9. Distribution of the most important environmental problems in Mamak district according to the participants

Which environmental problem do you consider the most important in the district where you live?		
	Number of answers (N)	**Per cent (%)**
Noise pollution	24	11,8
Air pollution	17	8,3
Drinking water pollution	28	13,7
Insufficiency of sewerage-treatment facilities	11	5,4
Solid waste (rubbish) problem	57	27,9
Insufficient green areas	67	32,8

32.8 per cent of the participants stated that the most important environmental problem within the borders of Mamak district is the lack of green areas and 27.9 per cent stated solid waste and garbage problems (Table 9). It is seen that the participants of the survey conducted in Mamak district centre are disturbed about the lack of green areas and solid waste. In the research conducted by Yapıcı and Yaman (2020) by applying a questionnaire to 680 people residing in Karabük, it was determined that solid waste was evaluated as an important environmental problem and the residents of the region were not actively

involved in activities and it was concluded that individuals should play an active role. In a study conducted by Gül and Yaman (2021) on 648 people in Altındağ, Çankaya, Etimesgut, Sincan, Pursaklar, Yenimahalle, Keçiören and Mamak districts of Ankara, it was concluded that individuals consider solid waste as an important environmental problem in Ankara. The results of these studies support the findings of Mamak and it was revealed that individual opinions were similar.

Table 10. Participation in Training on Environmental Problems, Zero Waste and Solid Waste

Have you received any training on environmental issues, zero waste and solid waste?		
	Number of answers (N)	**Per cent (%)**
Yes	56	27,5
No	148	72,5
Total	204	100

As can be seen in the table, the majority of the people who participated in the research conducted in Mamak district were disturbed by the insufficiency of green areas and solid waste problems. When the same people were asked whether they had participated in any training on this subject, the majority (72.5%) stated that they had not (Table 10). In the survey conducted by Argun (2021), 48.9% of the participants in the questionnaire study on the question of receiving training on the environment did not receive any training on the environment, while the remaining participants received training at least once. When the results of the two studies are compared with each other, it is seen that the rate of participation in environmental education in Mamak is lower.

Table 11. Participants Thoughts about Waste

What do you think about waste?	**Number of answers (N)**	**Percent (%)**
Wastes disrupt the balance of the ecosystem when they are released into the environment, they may have harmful effects on human and environmental health, some wastes can be reused as raw materials and brought back to the economy, Some wastes can produce energy.	136	66,7
Some wastes can be reused as raw materials and brought into the economy.	11	5,4
When wastes are released into the environment, they disturb the balance of the ecosystem, they may have harmful effects on human and environmental health, Some wastes can be reused as raw materials and brought into the economy.	7	3,4
It may have harmful effects on human and environmental health, some wastes can be reused as raw materials and brought into the economy.	6	2,9
When wastes are released into the environment, they disturb the balance of the ecosystem.	5	2,5
It may have harmful effects on human and environmental health.	5	2,5
When wastes are released into the environment, they disrupt the balance of the ecosystem and may have harmful effects on human and environmental health.	4	2
Wastes disrupt the balance of the ecosystem when they are released into the environment, they may have harmful effects on human and environmental health, they are useless substances with an expired useful life, Wastes have no economic value.	4	2
It may have harmful effects on human and environmental health, some wastes can be reused as raw materials and brought back into the economy, some wastes can be used to produce energy.	4	2
When wastes are released into the environment, they disturb the balance of the ecosystem. Some wastes can be reused as raw materials and brought back to the economy; some wastes can produce energy.	3	1,5
Wastes disrupt the balance of the ecosystem when they are released into the environment, they may have harmful effects on human and environmental health, some wastes can be reused as raw materials and brought back to the economy, they are useless substances with an expired useful life.	3	1,5
Some wastes can be reused as raw materials and brought back into the economy; some wastes can be used to produce energy.	2	1

In the survey carried out in Mamak, the respondents were asked about the ideas about waste and their level of agreement with these ideas. Each participant has the right to give more than one answer. It is possible to say that the idea of "Wastes disrupt the balance of the ecosystem when they are left to the environment", "Wastes can have harmful effects on human and environmental health", "Some wastes can be reused as raw materials and brought back to the economy", "Some wastes can be used as raw

materials and brought back to the economy" are the most accepted ideas with a participation rate of 66.7% (Table 11). Considering the amount of solid waste (garbage) produced by households, 42.2% of the participants stated that the amount of solid waste (garbage) produced by their households is between 1 and 2 kg per day (Table 12). According to the 2021 State of Environment Report of Ankara province, the average amount of waste generated per person in Ankara province is 1.03 kg/day (Ankara Provincial Directorate of Environment, Urbanisation and Climate Change, 2021).

Table 12. Distribution of the approximate amount of waste generated in the house during the day

Approximately how many kilograms of solid waste (rubbish) are generated daily in your household?	Number of answers (N)	Per cent (%)
1 kg and less	61	29,9
1-2 kg	86	42,2
2-3 kg	37	18,1
3-4 kg	14	6,9
4-5 kg	6	2,9

According to the data of the Turkish Statistical Institute in 2021, the average household size in Ankara is 2.96 people and each household produces an average of 3.05 kg of waste. According to the results, most of the participants think that they create less waste in their homes. In the study conducted by Argun (2021) in Karaman, 1263 participants were asked a question to evaluate the amount of waste generated at home daily. 41.3% of the participants answered 1-2 kg. According to this result, the opinions of the individuals participating in the survey in Mamak district regarding the amount of waste generation are similar to the opinions of the individuals participating in the research in Karaman. In the research conducted by Kılıç (2017), in response to the question "Approximately how many kg of solid waste is generated daily where you live?", 27% in Yıldırım and Nilüfer and 28% in Osmangazi stated that 2-3 kg of solid waste can be generated from their homes, although the people living in all three districts do not know how much solid waste they generate daily. Although this amount varies depending on the eating and drinking habits of the people, the rate of those who produce less than 1 kg solid waste varies between 14-23%.

In response to the question "Which wastes are mostly generated in your household?", 80.4% of the participants answered, as "Kitchen wastes" (Table 13). The amount and content of household waste also depends on industrialisation, urbanisation, geographical location, socio-economic structure, seasonal changes, and dietary habits. According to the findings, to reduce and properly manage kitchen waste, participants should improve their consumption habits and adopt a zero-waste approach to cooking and food. In the survey conducted by Argun (2021), 93% of the participants answered the question of what kind of wastes are generated in your home (more than one marking can be made) as organic wastes, 51% as recyclable wastes and 23% as vegetable waste oils. In this context, it is seen that waste generators do not know the types of wastes they generate.

Table 13. Distribution of the most common wastes at home

Which wastes are mostly generated in your household?	Number of answers (N)	Per cent (%)
Paper waste (file papers, paper towels, magazines and newspapers, note papers)	5	2,5
Kitchen waste (napkins, leftover food, tin cans, grocery bags)	164	80,4
Plastic waste	13	6,4
Food packaging	22	10,8

Table 14. Distribution of participants opinions on separate collection of waste

What is your opinion on collecting waste separately (separation at source)?	Number of answers (N)	Per cent (%)
I think it will not help waste management.	6	2,9
It is not necessary to separate waste at source, waste can also be deposited in mixed form.	8	3,9
I have no information.	16	7,8
I think it will increase efficiency in recycling.	174	85,3

85.3% of the respondents in Mamak region accept and are aware of the idea that separation of wastes at source increases recycling efficiency (Table 14).

Table 15. Attitudes of participants towards separate collection of household waste

Do you collect your household waste (recyclable waste, food waste, hazardous waste, waste oil) separately?	Number of answers (N)	Per cent (%)
I collect waste oil separately from other waste.	5	2,5
Sometimes I save.	59	28,9
Saving.	22	10,8
I don't save.	91	44,6
I only collect recyclable waste separately from other waste.	20	9,8
I only collect hazardous waste separately from other waste.	7	3,4

The majority (44.6%) of the residents living in Mamak district who participated in the survey stated that they do not collect their wastes separately (Table 15). Kılıç (2017) conducted a survey among 600 people living in Yıldırım, Osmangazi and Nilüfer districts of Bursa. In this survey, the question "Do you separate your solid waste from home?" was asked. While most of the residents of Yıldırım and Osmangazi reported a positive opinion on waste separation, 51.1% of Nilüfer residents stated that they do not separate waste. As a result, the results obtained in Mamak are like these results. It is seen that individuals mostly do not spare time for separate waste collection.

Table 16. Distribution of **s**olid wastes outside the house

In general, what do you put solid waste (rubbish) in when you take it out of your home?	Number of answers (N)	Per cent (%)
I put them in shopping bags.	64	31,4
Other	2	1
I put it in a special rubbish bag.	133	65,2
I put it in the rubbish bin without using a bag.	5	2,5

The 65.2% of the residents of Mamak district who participated in the survey stated that they throw their solid waste and garbage into special garbage bags. In addition, there are also people who use shopping bags. According to the findings, it was concluded that more than half of the participants accumulate their solid waste and garbage in special garbage bags obtained from the markets (Table 16). In the study conducted by Kılıç (2017), when the survey participants were asked how they accumulate their solid wastes, 48% of the residents of Yıldırım district stated that they accumulate their solid wastes in special plastic garbage bags, 51% of the residents of Nilüfer and 50% of Osmangazi residents stated that they accumulate them in shopping bags. In both studies, the use of special rubbish bags and shopping bags is high.

Table 17. Distribution of participants time of taking their rubbish out of the house

Between which hours do you take your rubbish out of the house?	Number of answers (N)	Percent (%)
16.30-18.00	97	47,5
No specific time.	30	14,7
I'll take it out when the bin's full.	47	23
Whenever I want	16	7,8
On the way to work and school in the morning	14	6,9

These findings can be interpreted as that the participants, who are assumed to live in an apartment with natural gas, take out their rubbish at regular intervals in accordance with the rules of the apartment. 47.5% of the individuals take out their garbage between 16.30 and 18.00 (Table 17). It was concluded that garbage collection services are generally available in the evening hours in Mamak district, and accordingly, individuals take out their garbage in the evening hours.

58.8% of the participants use the plastic bags, which they buy from the market for 25 kuruş, to carry and store the products they buy from the market. 35.3% of the individuals take cloth bags or net bags to the market to carry and store the products (Table 18). Since 2019, the practice of making grocery bags paid in our country has led many individuals to use reusable cloth bags and nets.

Table 18. Distribution participants methods of preserving products purchased from the supermarket.

What do you use to transport and store the products you buy from the supermarket?	Number of answers (N)	Per cent (%)
I use the bags I buy from the supermarket for 25 cents.	120	58,8
I'm using a market trolley.	5	2,5
I'm using my rucksack.	6	2,9
I use reusable cloth bags or mesh bags.	72	35,3

According to the findings, 82.4% of the participants were aware that batteries pose a potential danger to human and environmental health (Table 19).

able 19. Participants knowledge of waste materials harmful to the environment

Which of the waste materials is more dangerous for the environment than the others?	Number of answers (N)	Paper (%)
Paper	2	1
Metals	26	12,7
Batteries	168	82,4
Food waste	8	3,9

Table 20. Distribution of the ways of reaching Mamak Municipality for solid waste management requests and complaints

By which means do you convey your complaints and requests regarding solid waste management services to Mamak Municipality?	Number of answers (N)	Per cent (%)
By petition	4	2
Electronic Mail	12	5,9
All of them	51	25
Mamak Municipality Official Website	23	11,3
With Social Media Tools	50	24,5
Telephone	64	31,4

It was concluded that complaints and requests regarding solid waste management were mainly communicated through social media and telephone calls (Table 20). In the study conducted by Solak (2018), 34.9% answered the question "In which ways do citizens convey their complaints and requests to your municipality regarding the provision of solid waste management?" with information phones. Social media has also started to be used at a significant rate as a means of wishes and complaints.

Table 21. Distribution of participants awareness of recycling waste

Do you know about recyclable waste?	Number of answers (N)	Per cent (%)
I know some of them.	85	41,7
I know.	112	54,9
I don't know.	7	3,4

It is seen that half of the participants answered the question "Do you know about recyclable wastes?" as having knowledge, and less than half of the participants answered that they partially know (Table 21). In the survey conducted by Gündüz (2021) among 307 people consisting of Necmettin Erbakan University students, academicians, administrative staff and private sector employees, 69% of the participants strongly agreed with the question "I know that wastes are classified". It can be said that the more people are aware of whether the wastes they produce are within the scope of recyclable waste, the more likely they will contribute to the Zero Waste Project.

Table 22. Participants knowledge about the existence of recycling bins- clothes and shoes

Are there recycling bins close to your home or within your reach where you can leave your old clothes and shoes to deliver them to people in need?	Number of answers (N)	Per cent (%)
I don't know, I haven't seen it.	19	9,3
Yes, I do, but I only see it.	47	23
Yes, there are, but not in sufficient numbers.	31	15,2
Yes, I know where it is and I'm using it.	92	45,1
No, I don't.	15	7,4

45.1% of the residents of Mamak district who participated in the research reported that there are recycling bins for clothes and shoes near or within a close distance of their homes, that they know where these bins are located and that they use these bins. 23% stated that they have seen these bins but have never used them (Table 22). In another study involving 315 students studying in the department of science teaching in Turkey, it was determined that 41.4% of first-year students, 36.2% of second-year students, 48.8% of third-year students, and 51.1% of fourth-year students had a recycling container 250 metres or closer to their residence (Harman & Çelikler, 2018). In a study examining the change in the recycling behaviour of consumers in Turkey over the years, the rate of consumers who thought that recycling containers were too far away was 62.1% in 2006, while this rate was 54.3% in 2012 (Bayraktar and Çobanoğlu, 2016).

Table 23. Participants knowledge about the existence of recycling bins- glass, paper, plastic and battery

Are there recycling bins close to your home or within your reach where you can leave your glass, paper, plastic and battery waste?	Number of answers (N)	Per cent (%)
I don't know if there is. I don't know if there is.	49	24
Yes, I do, but I only see it.	35	17,2
Yes, there are, but not in sufficient numbers.	25	12,3
Yes, I know where it is and I'm using it.	25	12,3
No, I don't.	70	34,3

It is stated that 12.3 per cent of Mamak residents who participated in the research have recycling bins near their houses where they can leave glass, paper, plastic, and battery waste, know where these bins are located and even use these bins. On the other hand, 34.3 per cent of the residents said that there were none (Table 23). In a survey conducted by Gül and Yaman (2021), it was concluded that there are "partially" piggy banks where waste can be collected separately according to type in accordance with zero waste projects. According to these results, it is considered that increasing the number of recycling bins for glass, paper, plastic and battery wastes will contribute to a conscious waste management.

Table 24. Participants knowledge about recycling purposes

Which is not one of the purposes of recycling?	Number of answers (N)	Per cent (%)
Reducing the amount of waste.	11	5,4
Recycling of wastes into second raw materials by various methods and bringing them into the economy.	25	12,3
To ensure the protection of natural resources.	9	4,4
Mixed accumulation of all kinds of waste.	159	77,9

In response to the question "Which of the following is not one of the objectives of recycling?", the answer "Mixed accumulation of all kinds of wastes" was given predominantly (Table 24). It is known by the majority that mixed waste accumulation does not contribute to recycling aims and objectives. However, 10.8% of the participants separate and accumulate their wastes.

Table 25. Distribution of participants opinions on zero waste

What is your opinion on Zero Waste?	Number of answers (N)	Per cent (%)
I have no information.	20	9,8
It will be beneficial for the environment.	34	16,7
When applied correctly, it will reduce waste generation, and if waste is generated, it will ensure that it is collected separately at its source and recycled.	97	47,5
I think that it is not given enough importance by the society.	44	21,6
It is a difficult goal to achieve.	9	4,4

It is seen that 47.5% of Mamak residents who participated in the research answered, "When implemented correctly, it will reduce waste generation, and if waste is generated, it will ensure that it is collected separately at the source and recovered" and a relationship is established that zero waste contributes to recovery (Table 25).

Table 26. Distribution of participants zero waste lifestyle behaviours

What are you doing about Zero Waste lifestyle?	Number of answers (N)	Per cent(%)
I avoid the use of disposable products (such as plastic, cardboard, paper forks, knives, plates, straws).	83	26,4
When I go shopping, I use net or cloth bags instead of plastic bags.	38	12,1
I leave the waste I collect separately in recycling bins or waste collection centres.	9	2,87
I transform stale bread into different flavours by making use of it instead of throwing it away, I think about whether I really need something before I buy it, I donate the things I do not use to charities and charitable organisations.	20	6,37
I collect the waste in my house separately, I transform stale bread into different flavours instead of throwing it away.	30	9,55
When I go to a coffee shop, I take my own coffee cup or flask, I collect the wastes in my house separately, I leave the wastes I collect separately in recycling bins or waste collection centres, I think about whether I really need something before I buy it.	30	9,55
I sell the things I don't use to second-hand shops or people who want to buy them over the internet, I transform stale bread into different flavors by evaluating it instead of throwing it away.	77	24,52
I shop in shops that sell products by weight without packaging, I leave the waste I collect separately in recycling bins or waste collection centers, I transform stale bread into different flavors by evaluating it instead of throwing it away, I think about whether I really need something before I buy it.	24	7,64
I buy some of the things I need second-hand or rent them.	1	0,32
I think about whether I really need something before I buy it, I donate the things I don't use to charities and charitable organizations.	1	0,32
I participate in training and awareness raising activities on environment, waste and zero waste.	1	0,32

Respondents living in the district are not very aware of the zero-waste lifestyle, with only 26.43% saying that they do not use single-use materials (Table 26).

Table 27. Distribution of participants opinions on the reduction of household waste

Do you plan to reduce your household waste?	Number of answers (N)	Per cent (%)
When I know more about reducing waste, I plan to reduce it.	55	27
I don't think so.	17	8,3
Thinking.	132	64,7

In Mamak district, 1 out of every 6 people who participated in the research said that they think about reducing the amount of waste generated at home (Table 27). In the research conducted by Argun (2021), 46 percent of the participants answered, "I think" and 43.6 percent answered "I would think if I had information about how to reduce it" to the question "Do you think about reducing the waste generated in your home?". This means that 90% of the people want to reduce their waste but do not have information on how to do so. In both studies, the opinions of individuals are similar.

Table 28. Participants Awareness of Mamak 1st class waste collection center

Do you know the Mamak Municipality 1st Class Waste Collection Center on Samsun Road, which was opened within the scope of the "Zero Waste" project to prevent environmental pollution and to recycle recyclable waste into the economy?	Number of answers (N)	Per cent (%)
I know, but I've never been.	62	30,4
I know and I take my recyclable waste to this waste collection center.	12	5,9
I don't know.	130	63,7

It was observed that 63.7% of the participants answered "I do not know" to the question "Do you know about Mamak Municipality 1st Class Waste Collection Center?" (Table 28). This result shows that the residents participating in the research are unaware of the waste collection center in their districts. It is important to organize events, meetings and seminars for the residents of the region to be aware of the waste collection center and waste types in their districts, and to organize events, meetings and seminars in order to have their wastes collected or brought.

Table 29. Distribution of participants expectations about contributing to recycling

What will make society want to collect household waste separately and contribute to the recycling process?	Number of answers (N)	Per cent (%)
Showing concretely where, how and what waste is transformed into and what it is used for.	26	12,7
Increasing collection containers for separately collected waste.	35	17,2
To inform the society more about the importance of the issue, to create environmental awareness.	47	23
Rewarding citizens.	32	15,7
Citizens are included in the process and get their share of the recycling economy.	64	31,4

It is seen that the residents of the region who participated in the research want to have a share in the "recycling economy" and want to say that financial rewards will encourage them (Table 29). In a study conducted by Aygül and Yıldız (2018) in Antalya-Muratpaşa district, it was observed that 64 percent of those who sorted waste at source when individuals received money in return consisted of people who had not sorted waste at source before. This result is an indication of how effective it can be for citizens to contribute to the process by separating at source and taking their share of the recycling economy.

Table 30. Distribution the most important problems that respondents see in solid waste management services.

Which is the most important problem related to the provision of solid waste management services?	Number of answers (N)	Per cent (%)
Lack of awareness of responsibility among waste generators.	28	13,7
Problems with inspections.	22	10,8
Public institutions and organizations do not pay enough attention to the issue.	35	17,2
Lack of information and education about the importance of the issue.	75	36,8
Insufficient equipment (personnel, vehicles, containers, etc.) in institutions.	16	7,8
Inadequate legal regulations.	28	13,7

According to the results, "lack of education and information" is seen as the most important problem in solid waste management services by 36.8% (Table 30). In a study conducted by Argun (2021), 59.5% of the participants responded to the question "What do you think are the obstacles to waste minimization and recycling?" in which more than one option was marked, 59.5% of the participants answered lack of responsibility awareness, 52.7% answered lack of education and information. This issue is encountered in many tables and is seen as one of the processes that should be prioritized.

Table 31. Distribution of the participants opinions on raising social awareness in Mamak district

What should be done to make the society more aware of solid waste and environmental pollution in the district where you live?	Number of answers (N)	Per cent (%)
Environmental awareness and waste should be taught in schools, especially in kindergartens and nurseries.	42	20,6
Meetings and seminars should be organized in which everyone can participate.	20	9,8
Citizens should be made more aware through advertisements, posters and announcements.	34	16,7
Those who break the rules should be fined.	45	22,1
There should be more awareness-raising programs and posts on TV, radio and social media.	63	30,9

According to these results, 30.9% of the participants think that more awareness-raising programs and posts should be made on TV, radio and social media tools in order to raise public awareness in Mamak district (Table 31). The results show that these tools will help to access and share information faster, reach more people, exchange ideas and increase communication awareness.

Table 32. Participation in Education in Mamak District

Would you participate if there were activities or studies on waste, solid waste management, zero waste and environmental awareness in the district where you live?	Number of answers (N)	Per cent (%)
Yes	167	81,9
No	37	18,1

To the question "Would you participate if there were activities or studies on waste, solid waste management, zero waste and environmental awareness in the district where you live?" 81.9% of the participants answered "Yes" (Table 32). In the study conducted by Gündüz (2021) among 307 students, academicians, administrative staff and private sector employees at Necmettin Erbakan University, 31% of the participants answered, "strongly agree" and 23.4% answered "agree" to the question "I would participate if an event on Zero Waste management is organized at the university". These results show that as the level of education increases, the level of awareness, problem awareness and the rate of being disturbed by this problem increases. As the level of education increases, the willingness to participate in the activity also increases.

Table 33. Normality analysis

			Statistic	Std. Error
Gender:	Mean		1,55	0,035
	95% Confidence Interval for Mean	Lower Bound	1,48	
		Upper Bound	1,62	
	5% Trimmed Mean		1,55	
	Median		2	
	Variance		0,249	
	Std. Deviation		0,499	
	Minimum		1	
	Maximum		2	
	Range		1	
	Interquartile Range		1	
	Skewness		**-0,198**	0,17
	Kurtosis		**-1,98**	0,339
Have you received any training on environmental issues, zero waste and solid waste?	Mean		1,73	0,031
	95% Confidence Interval for Mean	Lower Bound	1,66	
		Upper Bound	1,79	
	5% Trimmed Mean		1,75	
	Median		2	
	Variance		0,2	
	Std. Deviation		0,447	
	Minimum		1	
	Maximum		2	
	Range		1	
	Interquartile Range		1	
	Skewness		**-1,018**	0,17
	Kurtosis		**-0,973**	0,339

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Gender:	0,366	204	<,001	0,633	204	<,001
Have you received any training on environmental issues, zero waste and solid waste?	0,456	204	<,001	0,558	204	<,001

Normality analysis was tested on two questions of the research (Table 33). It is possible to say that the data are normally distributed. Accordingly, ANOVA, Pearson correlation and regression analyses will be applied.

Table 33 shows the Skewness and Kurtosis values, which we examined as kurtosis and skewness through normality analysis. Here, we say that it does not show a normal distribution because the reference ranges are not provided (normal distribution not provided in studies conducted with Likert scale)

- Source citing Shapiro Wilks and Kolmogorov Smirnov tests: Büyüköztürk, Ş. (2011). *Data Analysis Handbook for Social Sciences*. Ankara: Pegem Akademi, p: 42.
- Values between+- 1,00 are considered sufficient source: Büyüköztürk, Ş., Çokluk, Ö., Köklü, N. (2011). *Statistics fot the Social Sciences* (7th Ed.). Ankara: Pegem Akademi, p:48-63.

Table 34. ANOVA Test According to Gender, Age, Education Level, Income Level, Residence in Mamak District

		Sum of Squares	df	Mean Square	F	Sig.
Gender:	Between Groups	1,882	1	1,882	7,82	0,006
	Within Groups	48,627	202	0,241		
	Total	50,51	203			
Age:	Between Groups	0,726	1	0,726	0,964	0,327
	Within Groups	152,195	202	0,753		
	Total	152,922	203			
Education Level:	Between Groups	0,264	1	0,264	0,541	0,463
	Within Groups	98,481	202	0,488		
	Total	98,745	203			
Your income level:	Between Groups	0,264	1	0,264	0,541	0,463
	Within Groups	98,481	202	0,488		
	Total	98,745	203			
Duration of residence in Mamak district:	Between Groups	0,264	1	0,264	0,541	0,463
	Within Groups	98,481	202	0,488		
	Total	98,745	203			
Approximately how many kilograms of solid waste (garbage) are generated daily in your household?	Between Groups	8,922	1	8,922	9,163	0,003
	Within Groups	196,705	202	0,974		
	Total	205,627	203			
Do you know the Mamak Municipality 1st Class Waste Collection Center on Samsun Road, which was opened within the scope of the "Zero Waste" project to prevent environmental pollution and to recycle recyclable waste into the economy?	Between Groups	3,35	1	3,35	4,077	0,045
	Within Groups	165,983	202	0,822		
	Total	169,333	203			

		Point Estimate	95% Confidence Interval	
			Lower	Upper
Gender:	Eta-squared	0,037	0,003	0,1
	Epsilon-squared	0,033	-0,002	0,096
	Omega-squared Fixed-effect	0,032	-0,002	0,096
	Omega-squared Random-effect	0,032	-0,002	0,096
Age:	Eta-squared	0,005	0	0,041
	Epsilon-squared	0	-0,005	0,036
	Omega-squared Fixed-effect	0	-0,005	0,036
	Omega-squared Random-effect	0	-0,005	0,036
Education level:	Eta-squared	0,003	0	0,034
	Epsilon-squared	-0,002	-0,005	0,029
	Omega-squared Fixed-effect	-0,002	-0,005	0,029
	Omega-squared Random-effect	-0,002	-0,005	0,029
Your income level:	Eta-squared	0,003	0	0,034
	Epsilon-squared	-0,002	-0,005	0,029
	Omega-squared Fixed-effect	-0,002	-0,005	0,029
	Omega-squared Random-effect	-0,002	-0,005	0,029
Duration of residence in Mamak district:	Eta-squared	0,003	0	0,034
	Epsilon-squared	-0,002	-0,005	0,029
	Omega-squared Fixed-effect	-0,002	-0,005	0,029
	Omega-squared Random-effect	-0,002	-0,005	0,029
Approximately how many kilograms of solid waste (garbage) are generated daily in your household?	Eta-squared	0,043	0,005	0,109
	Epsilon-squared	0,039	0	0,105
	Omega-squared Fixed-effect	0,038	0	0,105
	Omega-squared Random-effect	0,038	0	0,105
Do you know the Mamak Municipality 1st Class Waste Collection Center on Samsun Road, which was opened within the scope of the "Zero Waste" project to prevent environmental pollution and to recycle recyclable waste into the economy?	Eta-squared	0,02	0	0,072
	Epsilon-squared	0,015	-0,005	0,068
	Omega-squared Fixed-effect	0,015	-0,005	0,067
	Omega-squared Random-effect	0,015	-0,005	0,067

According to Table 34, it is checked whether there is a homogeneous distribution between the independent variables and the dependent variable (scale mean), and it is expected that the sig (p) value is greater than 0.05.

Table 35. Pearson Correlation Test by Gender, Age, Education Level, Income Level, Residence in Mamak District

		Gender:	Age:	Education level:	Your income level:	Duration of residence in Mamak district:	Have you received any training on environmental issues, zero waste and solid waste?	Approximately how many kilograms of solid waste (garbage) are generated daily in your household?	Do you know the Mamak Municipality 1st Class Waste Collection Center on Samsun Road, which was opened within the scope of the "Zero Waste" project to prevent environmental pollution and to recycle recyclable waste into the economy?
Gender:	Pearson Correlation	1	0,047	-0,035	-0,035	-0,035	,193**	0,078	0,007
	Sig. (2-tailed)		0,504	0,622	0,622	0,622	0,006	0,269	0,918
	N	204	204	204	204	204	204	204	204
Age:	Pearson Correlation	0,047	1	-0,1	-0,1	-0,1	0,069	,225**	-0,035
	Sig. (2-tailed)	0,504		0,154	0,154	0,154	0,327	0,001	0,617
	N	204	204	204	204	204	204	204	204
Education level:	Pearson Correlation	-0,035	-0,1	1	1,000**	1,000**	-0,052	0,053	-0,028
	Sig. (2-tailed)	0,622	0,154		<,001	<,001	0,463	0,448	0,687
	N	204	204	204	204	204	204	204	204
Your income level:	Pearson Correlation	-0,035	-0,1	1,000**	1	1,000**	-0,052	0,053	-0,028
	Sig. (2-tailed)	0,622	0,154	<,001		<,001	0,463	0,448	0,687
	N	204	204	204	204	204	204	204	204
Duration of residence in Mamak district:	Pearson Correlation	-0,035	-0,1	1,000**	1,000**	1	-0,052	0,053	-0,028
	Sig. (2-tailed)	0,622	0,154	<,001	<,001		0,463	0,448	0,687
	N	204	204	204	204	204	204	204	204
Have you received any training on environmental issues, zero waste and solid waste?	Pearson Correlation	,193**	0,069	-0,052	-0,052	-0,052	1	,208**	,141*
	Sig. (2-tailed)	0,006	0,327	0,463	0,463	0,463		0,003	0,045
	N	204	204	204	204	204	204	204	204
Approximately how many kilograms of solid waste (garbage) are generated daily in your household?	Pearson Correlation	0,078	,225**	0,053	0,053	0,053	,208**	1	0,036
	Sig. (2-tailed)	0,269	0,001	0,448	0,448	0,448	0,003		0,612
	N	204	204	204	204	204	204	204	204
Do you know the Mamak Municipality 1st Class Waste Collection Center on Samsun Road, which was opened within the scope of the "Zero Waste" project to prevent environmental pollution and to recycle recyclable waste into the economy?	Pearson Correlation	0,007	-0,035	-0,028	-0,028	-0,028	,141*	0,036	1
	Sig. (2-tailed)	0,918	0,617	0,687	0,687	0,687	0,045	0,612	
	N	204	204	204	204	204	204	204	204

*There is a significant relationship between the criteria indicated as ** at 0.01 level (Table 35).*
*There is a significant relationship between the criteria indicated as * at 0.05 level (Table 35).*

Table 35 shows the relationship between the independent variables (demography questions) and the dependent variable. Especially in Pearson Correlation values, it is necessary to look at the criteria that the expressions indicated as * or ** are in a significant relationship at the level of 0.05 and 0.01, and that the sig (p) value is greater than 0.05. We see that the expressions that appear as 1,000** are

one-to-one correlated. In Table 36, the relationship between more than one independent variable and the scale is analysed and the sig (p) value less than 0,05 is accepted.

Table 36. Regression Test by Gender, Age, Education Level, Income Level, Residence in Mamak District

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	
,048a	0,002	-0,013	0,919	2,097	
	Sum of Squares	df	Mean Square	F	Sig.
Regression	0,394	3	0,131	0,156	,926b
Residual	168,939	200	0,845		
Total	169,333	203			
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2,515	0,38		6,611	<,001
Gender:	0,015	0,13	0,008	0,112	0,911
Age:	-0,041	0,075	-0,039	-0,546	0,586
Duration of residence in Mamak district:	-0,042	0,093	-0,032	-0,45	0,653

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2,21	2,46	2,33	0,044	204
Std. Predicted Value	-2,723	2,904	0	1	204
Standard Error of Predicted Value	0,092	0,239	0,125	0,032	204
Adjusted Predicted Value	2,17	2,48	2,33	0,05	204
Residual	-1,421	0,787	0	0,912	204
Std. Residual	-1,546	0,856	0	0,993	204
Stud. Residual	-1,578	0,878	0	1,003	204
Deleted Residual	-1,48	0,828	0	0,931	204
Stud. Deleted Residual	-1,584	0,878	-0,002	1,004	204
Mahal. Distance	1,023	12,701	2,985	2,234	204
Cook's Distance	0	0,027	0,005	0,005	204
Centered Leverage Value	0,005	0,063	0,015	0,011	204

Conclusion

- As the most important environmental problem within the borders of Mamak district, 32.8% of the participants answered insufficient green areas and 27.9% answered solid waste (garbage).
- The majority of the participants, 72.5%, state that they have not participated in any training on environmental problems, zero waste and solid waste.
- In the question where the daily amount of waste was evaluated, 42.2% of the participants answered 1-2 kg.
- 80.4% of the participants stated that kitchen waste was the most common waste generated from their homes.
- 85.3% of the participants think that separating waste at source will contribute to recycling.
- The majority of the participants, 44.6%, do not collect their wastes separately.
- 65.2% of the participants use special garbage bags when taking their garbage out of the house.
- 47.5% of the participants take out their rubbish between 16.30-18.00.
- 58.8% of the participants stated that they use plastic grocery bags to store the products they buy from the market.
- 82.4% of the participants think that batteries are more dangerous for the environment than other wastes.
- 31% of the participants think that getting a share from the recycling economy will contribute to the process of recycling and separate waste collection.
- 36.8% of the participants state that the most important problem encountered in solid waste management services is the lack of information and training.
- 81.9% of the participants stated that they would like to participate in activities and studies related to waste.
- When the answers given to the questions are evaluated according to demographic characteristics, the awareness of male individuals about solid wastes is higher than female individuals.

Discussion and Recommendations

Individuals who participated in the research think that the most important environmental problems in Mamak are the lack of green areas (32.8%) and solid waste (garbage) (27.9%). 72.5% said that they had not participated in trainings to solve these problems before.

Looking at the educational level in the results, the number of university graduates is quite high and as the educational level increases, there is a tendency for people to want to receive training on environment and waste management and to increase their awareness on these issues. As the education level of individuals increases, the rate of realizing the problems and feeling discomfort increases. In addition, as the level of education increases, there is an expectation for training, conferences and seminars related to this process.

Most of the individuals participating in the research think that they produce less waste at home. It is important for producers to be aware of the wastes they produce in order to prevent and reduce waste. When the answers given to the questions are analyzed according to demographic characteristics, it is concluded that male individuals are more aware of solid waste than female individuals.

85.3% of the respondents think that separation of waste at source increases recycling efficiency. However, 44.60% of them state that they do not separate their wastes at source. These results show that individuals do not have knowledge about how to separate waste at source and cannot actively apply the idea of separating waste in their daily lives.

According to the responses of the participants, requests and complaints regarding solid waste management are mostly communicated to Mamak Municipality through phone calls and social media. In this context, it is considered that the widespread use of Mamak Municipality's official website and mobile application may be beneficial.

Increasing the number of recycling bins where Mamak residents can leave their glass, paper, battery and plastic waste near their homes or within easy reach is expected to make a significant contribution to recycling.

According to the results, it was concluded that individuals have not yet adopted a zero-waste lifestyle. It is considered that the implementation and continuation of activities that encourage individuals about zero waste will contribute positively to the adoption of zero waste lifestyle.

Acknowledgment: *I would like to thank Environmental Engineer Nesrin Şimşir, who works in Mamak Municipality, for her contributions to this study, and Research Director Şeyda Aydın Varol for her contributions to the Analysis section. I would like to thank my husband, my family and all my friends for their unwavering help and support.*

Compliance with Ethical Standards Ethical responsibilities of Authors: *The author has read, understood, and complied as applicable with the statement on "Ethical responsibilities of Authors" as found in the Instructions for Authors".*

Funding: *There is funding this study.*

Conflict of Interest: *The authors declare that they do not have any conflict of interest.*

Change of Authorship: *The author has read, understood, and complied as applicable with the statement on "Ethical responsibilities of Authors" as found in the Instructions for Authors and is aware that with minor exceptions, no changes can be made to authorship once the paper is submitted.*

References

Ankara Provincial Directorate of Environment, Urbanization and Climate Change, (2021) Ankara Environmental Status Report, https://webdosya.csb.gov.tr/db/ced/icerikler/ankara_-cdr2021-20220902104900.pdf [Retrived: 18.05.2022].

Anonymous, 2019, Zero Waste, Ministry of Environment, Urbanization and Climate Change https://sifiratik.gov.tr/kutuphane/sifir-atik-kitabi#2816 [Date of Visit: 17.04.2023].

Argun Y, (2021) Integrated Solid Waste Management Optimization of Karaman Province in accordance with Zero Waste Principles. Doctoral Thesis. Aksaray Un., Aksaray.

Ari E, Altin M, Yilmaz V, (2023) Investigation of Household Waste Sorting Behaviours: Extended Waste Sorting Model. *J. Ankara Hacı Bayram Veli Un. Faculty of Economics & Administrative Sci.*, 25(2), 483-510. https://doi.org/10.26745/ahbvuibfd.1233576

Aygül HH, Yıldız D, (2018) Neighbor Card Application, *Mediter. J. Humanities*, **8**(2) 79-100.

Bayraktar S, Çobanoğlu E, 2016. Recycling in Turkey: A comparative analysis of 2006 and 2012 consumer motivation, attitudes and behaviours. *Akdeniz İİBF J*. **16**(33): 1-33.

Çakmak M, 2016. Ecological Characteristics of Mamak (Ankara) District, Master's Thesis, Gazi University Institute of Science and Technology, Ankara.

Gül M, Yaman K, (2021) Waste Management in Turkey and Evaluation of Zero Waste Project: The Case of Ankara. *Atatürk Univer. J. Economics & Adminis. Sci.* 35(4), Erzurum, 1267-1296.

Gündüz M, (2021) Control of Recyclable Wastes and Zero Waste Project Practices: The Case of Necmettin Erbakan University, Necmettin Erbakan University Institute of Science and Technology. Konya.

Güngör K, Torunoğlu E, (2008) Turkish Engineering News, Issue 409, 2000,5, Ankara.

Harman G, Çelikler D, (2016) Awareness of prospective science teachers about the concept of recycling. *Abant Izzet Baysal Un. J. Inst. Social Sci.* **16**(1): 331-353.

Kılıç, M. 2019. People's Approach in Domestic Solid Waste Management; *The Case of Bursa Province. Karaelmas Sci. & Engin. J.*, 9 (1): 41-50.

Mamak Municipality Introduction Booklet, 2020, T.C. Mamak Municipality Publications, ISBN: 9786058710436, Ankara. https://wpimages.mamak.bel.tr/2020/12/mamak-beled%c4%b0yes%c4%b0-tanıtım-k%c4%b0tap%c3%87ı%c4%9ei.pdf [Retrived: 23.11.2022].

Mamak Municipality, 2022, Mamak Municipality, 2022 Year Investment and Work Program, https://wpimages.mamak.bel.tr/2022/01/2022-yatirim-ve-calisma-programi.pdf [Retrived: 15.11. 2022].

Özaslan, M. 2014, Ankara'nın Kahtanesi'ydi Kayaş ve Mamak, *J. Ideal Urban Studies*, **5**, 11, 288-299.

Raosoft 2004, Sample Size Calculator. http://www.raosoft.com/samplesize.html

Solak GS, Pekküçükşen Ş, (2018) Municipal solid waste management in Turkey: A comparative analysis. *Manas J. Social Res*., **3**, 7.

Stapp W, (1969). The Concept of Environmental Education. *Environ. Educa.*, **1** (1), 30- 31.

Topal K, (2012) *Policy Instruments in Integrated Solid Waste Management*, Beta Basım Yayım Dağıtım A.Ş., İstanbul, ISBN: 9786053777151.

TUIK, (2021) Ankara Average Household Size, https://cip.tuik.gov.tr/# [Retrived: 04.04.2023].

TUIK, (2022) Favorite Reports, https://www.tuik.gov.tr/indir/duyuru/favori_raporlar.xlsx [Retrived: 11.03.2023].

Ulaşlı K, (2018) *Recoverable Waste Management and Zero Waste Project Practices: Kadıköy Municipality*, Master's Thesis, Hasan Kalyoncu Un. Institute of Sci. & Tech., Gaziantep, 1-3.

Yapıcı M, Yaman K, (2020) Public Perception of the Environmental Policy of Municipalities: Karabuk Case, *J. Contem. Local Gover*., **29** (1).117-144.