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CONTEMPORARY TRENDS TOWARD ENVIRONMENTAL ISSUES IN THE KURDISTAN REGION OF IRAQ



Współczesne tendencje w opiniach o zagadnieniach środowiskowych w irakijskim Kurdyście

Abstract: Environmental problems can be the public's concern, and they also feel the ratio of dangerousness. Consequently, collecting their opinions and trying to get to know the way of their thinking regarding their environmental problem and solving them was an attractive case study for the authors of this article. In this research, the authors found the public's opinion and attitude regarding environmental situations and issues in Kurdistan Region-Iraq throughout a public questionnaire/survey. Around 450 people randomly participated from various geographical locations/cities of the region proportioned to the population rate regarding different demography, gender, age, and academic background. The statistical Package for the Social Sciences (SPSS) program was used to analyze their opinion. Also, the cross-tabulation method was used to understand the relationship between two or more variables. Gender, age, and educational background had effects on the participants' attitudes toward environmental issues. Females, aged from 20 to 30, and Ph.D. degree holders were paying more attention to the environment. Geographically, the participation ratio for the Sulaimani, Erbil, Duhok, Halabja, and Kirkuk Provinces was 28.48 %, 21.95 %, 17.61%, 16.69%, and 15.00 %, respectively. High and low participation levels of the contributors are a reflection of the environmental awareness of the contributors, providing environmental

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facilities for the people, background, and culture of the community, and stability of political, economical, and social issues of the areas. Furthermore, COVID-19 affected the environment, and commonly it had a positive impact on the environment.

Key words: environment, Kurdistan Region, Iraq, pollution, COVID-19, geographical distribution

INTRODUCTION

The environment is the surroundings or conditions in which a person, animal, or plant lives or operates. Accordingly, the environment is the commonplace which we share for almost everything (Ingrao et al. 2018). When the question is raised regarding environmental subsections' fundamentals, it can be determined as land, water, and air. The fundamental subsections of the environment have natural cycles and interact with each other. Living beings (i.e., humans, animals, plants... etc.) can continue their life, grow, reproduce, die, and eventually decompose inside that same environment.

Humans are the only living kind whose ideas evolve, and their population increases steadily. Consequently, they are the major role player in changing the natural cycles in their only home, planet earth. Humanity's commitments lead our only and lonely planet to many problems, including many wars against humanity and eventually wars against the environment for the sake of power and economy (Jackson 2013).

The Industrial Revolution started a new era for humanity. It opened a new door for industries' growing all around the world. Then humanity introduced new inventions like electricity, automobiles, planes, jets... etc. Those inventions' side effects led to a new term inside the environment, called pollution. There are many types of pollution, mainly air, water, soil, radiation, and noise pollution are almost everywhere on this planet (Eum et al. 2015). Environmental pollutants can vary between different regions and areas according to geological location, economic status, and crowdie ratio (Grimm et al. 2008). Subsequently, the proposed solutions for solving any environmental problems should be specified and compatible with the region of study.

In this research, the authors dedicated their scope of studies to the Kurdistan Region of Iraq. After the Iraqi freedom operation in 2003, despite the instability of Iraq's political situation, the Kurdistan Region developed very fast (Natali 2010). Many local and international companies started investing in the Kurdistan Region (Leezenberg 2015). The economy developed, and many rules and acts were announced by parliament. In 2008, the Kurdistan parliament announced act number 8 for "Environmental Protection and Remediation" (<https://www.parliament.krd/>, 2008). The municipalities of major cities tried to solve their environmental problems by managing solid waste, wastewater treatment plants, planting trees, and punishing polluters. However, unfortunately, those attempts were not enough to protect Kurdistan Region because of some factors such as political, economic, social and war (Kulaksiz 2015). There are many environmental problems and conducted works in Kurdistan Region. Many people have published scientific papers, thesis, and seminars to improve the environmental issue in Kurdistan. For instance, Sulaimani province proposed a 30-year master plan in 2012 for solving solid waste management problems in a systematic and standard way, but due to some political, economic, and war obstacles, the process stopped till mid-2019, and now only a small part of that master plan was implemented (Karim et al. 2020). Some good proposals and assessments have been raised and made for solving solid waste components and management in Erbil City (Aziz et al. 2011; Aziz, Mustafa, 2018; Aziz et al. 2019). Solid waste management and wastewater management are two crucial problems in Kurdistan Region in which the authorities should try to solve it as soon as possible (Karim et al. 2020). Still, in the Kurdistan Region, there are many environmental problems almost from every angle. Some of them need urgent action by local authorities, and some need a good plan to start solving them (Issa 2014). On the other hand, many scientific works have been done to show the impact of

drought on the Kurdistan Region and the project of that existential threat (Fadhil 2011). On air pollution effects, there is some conducted research about Kurdistan Region. As an example, Amjadian et al. (2018) concluded that air pollution increases steadily inside city centres. Khorshid and Thiele-Bruhn (2016) stated that soil contamination, especially in urban areas, is a globally increasing threat. Some research tried to find a general environmental problem in urban areas like (Hassan 2010). During the COVID-19 disease, (Aziz 2020) investigated many positive impacts of the COVID-19 pandemic over environmental parameters in the Kurdistan Region. Additionally, the number of researches conducted in Erbil City on noise pollution, water, and wastewater treatment and quality, and solid waste.

COVID-19 pandemic affected all the world, including the Kurdistan Region. The pandemic's effect on Kurdistan Region and its first symptoms appeared in late February 2020, and the government announced a full lockdown (Ahmad, Murad 2020). The lockdown gave relief to the environment, and in major cities, the air quality improvement was observed clearly (Aziz 2020). People then became more cautious against pollution. Consequently, this article's authors thought this research was a necessary window to reflect public opinion regarding environmental situations and issues in the Kurdistan Region-Iraq.

In this study, the authors wanted to know the Kurdistan Region's environmental problems from different varieties of people who live in Kurdistan through a published online questionnaire. A survey or online questionnaire is a method for getting the public's idea regarding a survey subject. There are plenty of scientific articles that were based on questionnaires. Yildiz et al. (2011) made a questionnaire survey to know the environmental awareness ratio and status inside their university campus in Erzurum, Turkey. In their research, the campus population's environmental sensibility was 64.4%, and the relationships between the sensibility and education levels, age, gender, and income groups were investigated. Correspondingly, the authors of this research collected data through questionnaires' and then presented their assessment regarding environmental problems in the Kurdistan Region.

METHODOLOGY

Study site and Participants

In this research, the authors decided to prepare a survey/questionnaire with some general questions regarding the environment and factors affecting it, with other impacts by collecting public opinions by offering multiple choices for each question or checkbox. The survey contained 19 questions and was done in the Kurdistan Region-Iraq with the participation of 460 people from different places, cities, gender, ages, and nationalities. The authors wanted to analyze environmental problems in the Kurdistan Region from people's perspectives and propose solutions accordingly. The cross-sectional was performed during the COVID-19 partial lockdown in Kurdistan Region between 25 May 2020 and 15 June 2020, and all its subjects were chosen as the study population. Three basic exclusion criteria, including the ability to read, educational background at specific levels, and residency in the Kurdistan Region, were defined for participation. Anyone with these specifics was qualified to take part in the survey. Figure 1 demonstrates the geographical location of the Iraq and Kurdistan Region.

Procedure

The current study was designed to obtain information regarding the environmental issues concerning the awareness of pollution and people's attitude to show how the transaction is made with the environment. The questionnaire was developed using Google Forms; a free electronic tool provided by Google to collect information via the designed questionnaire voluntarily. General Data Protection Regulation (GDPR) was implemented and no personal data like name and surname, telephone number,

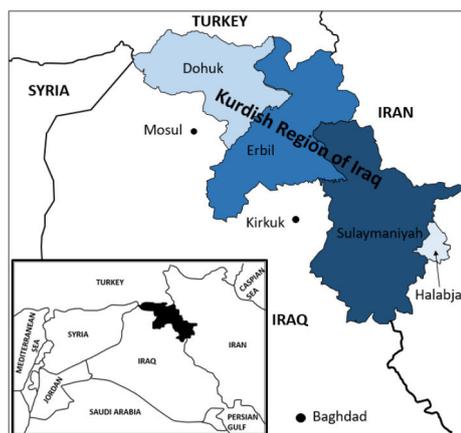


Fig. 1. Map of Kurdistan Region in Iraq
Source: Mohammed et al. 2019

or email was wanted nor saved. This survey consisted of 19 close-ended questions with a suggested filling period of about 3–5 minutes. The authors distributed the survey link in all areas of Kurdistan Region Provinces (i.e., Erbil, Sulaimani, Duhok, and Halabja) via social media using snowball sampling. The survey questionnaire was sent to 920 participants, and 460 of them from almost all the country's divisions aged between less than 20 to more than 40 years. Experts from the Tishik international university, Salahaddin University in the Kurdistan Region and Prof. Dr Zafer AYVAZ reviewed the draft questionnaire and analyzed the relationship between the items before the delivery of the questionnaire.

Determination of Sample Size

In 2020, the Kurdistan Region's population size was estimated at around 6,171,083 Iraqi people in total. Which among them around 5,022,603 (81.39%) people are in urban areas, and around 1,148,480 (18.61%) people live in rural areas (<http://www.krso.net/Default.aspx?page=article&id=893&l=3&#krso>, 2020). In that case, it would be reasonable to use the following formula to determine the necessary sample for this analysis. (Wadood et al. 2020):

$$n = \frac{N}{1 + Nd^2} \quad (1)$$

Where n = required sample size, N = population size, and d = margin of error (considered d = 0.05) (Rana et al. 2015).

$$n = \frac{6,171,083}{1 + (6,171,083 \times 0.05^2)} = 399.97$$

The formula provided that for this analysis, about 400 samples would be appropriate, and a simple random sampling technique was carried out because of the sample size allocated by considering the population in Kurdistan Region (Hao et al. 2019).

Instrument

Questionnaires consisted of four main parts. The first part is related to the demography. Demographic variables included gender, age, and education. The second part was focused on the potentially influential role of the platforms in developing personal knowledge, and policymakers have encouraged recycling and reuse strategies to reduce the demand for raw materials and decrease the quantity

of waste going to landfill. The third part showed that air pollution due to factories or loads of traffic will always affect the family health member and increase the rate of cancers with the worst environmental problem facing our planet; there has been an increased awareness of the interactions between ozone depletion and climate change. Finally, the spread of the COVID-19 crisis has appeared as a blessing for nature and the environment, then how the government needs to take advantage of the quarantine and lockdown opportunity to clean up more public places and draw a powerful program to serve the environment better.

Statistical Analysis

All statistical analyses were conducted using **Statistical Package for the Social Sciences (SPSS)** version 26.0. In the software, if a normality test was not statistically significant ($p > 0.05$), data were presented by frequencies and percentages. The independent T sample test was used to show the gender classes with statistical significance ($p < 0.05$) for each question. Cross tabulation is used as a method to analyze the relationship between multiple variables quantitatively. Also known as contingency tables or cross tabs, cross-tabulation groups variables to understand the correlation between different variables (Yucedag et al. 2018; Ahmed et al. 2021).

RESULTS AND DISCUSSIONS

Demography

General participant demographics totaling 460 participants were enrolled, of which (311) 67.6% were female and (149) 32.4% were male. Females are more likely to care about environmental information, while males are less interested. Their age was divided into four groups, under 20 years old, 20 to 30 years old, 30 to 40 years old, and above 40 years old. While most of the responders are between 20 to 30 years as 53.5%. Education data ranged up to Diploma, B.Sc., college, and M.Sc. with Ph.D. level. Also, the questionnaire was divided into 4 provinces in the Kurdistan region, Iraq.

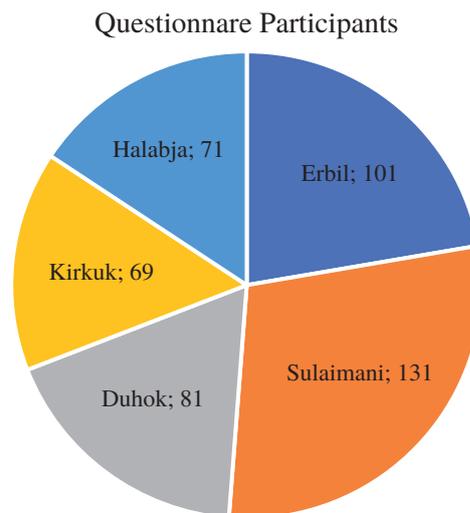


Fig. 2. Geographical distribution of the participants in the provinces
Source: Author's own elaboration.

In the chart below, the amount of responses from different geographical areas in the Kurdistan Region is shown; the amount of responses somehow reflects the population number of the city.

Geographically, the distribution of the participants from Erbil, Sulaimani, Duhok, Halabja, and Kirkuk Provinces were 101 (21.95 %), 131 (28.48 %), 81 (17.61%), 78 (16.96%), and 69 (15.00 %), respectively (Figure 2). Descending participation ratio for the provinces were 28.48 % (Sulaimani), 21.95 % (Erbil), 17.61% (Duhok), 16.69% (Halabja), and 15.00 % (Kirkuk). It can be noticed that high participation was recorded in Sulaimani Province and the low participation was in Kirkuk Province. The authors considered that the high and low contribution levels of the participants are a reflection of the environmental awareness of the participants, providing environmental services for the population, background and culture of the community, and stability of political, economical, and social issues of the province.

Effects by Gender

One of the questions asked in the demographics section is knowing the gender of the participant and how gender affects the environment (Vicente-Molina et al. 2018). Table 1 illustrated the results of the p-value and mean for questions. In the first question, the authors asked about pollution, and the reported responses were greater in females than males, as the p-value was 0.767 in females, while the p-value for the male is 0.776, which can show that the p-values were not statistically significant. The mean for females and males was about 1.4791 and 1.4966 respectively, while the mean differences are the same for both genders as it was about -0.01754 . In this research, the mean differences for females were -0.33883 while the value for males was -0.33883 , with a p-value of 0.052 in females and 0.060 for males.

Metal recycling is generally seen as a fruitful method for sustainability, but there is little knowledge of the degree to which recycling occurs (Graedel et al. 2011). Regarding how often the responders recycle, the mean differences are the same for both genders as it was -0.00423 and the p-value were 0.945 and 0.948 for females and males respectively, which both values are close to each other. While both genders are likely to do recycling, it needed to know which materials are most reused and recycled such as glass, plastic, paper, metal, and textile; the mean differences remained the same for males and females valued at about -0.51002 , while the p-value 0.022 for female and 0.029 for male.

As many papers show that one of the most dangerous materials that harm the environment is plastic and nano plastics (Ágnes et al. 2016) there are some ways to get rid of plastic waste as recycling and reusing again, for this question the p-value of 0.001 for female and 0.003 for male were observed, while the mean differences remained the same for both genders and the value was 0.21522. To reduce the damages that face the environment, especially the recent years as the energy demand increased due to the population growth, the government should use alternative energy sources and green practices, which can mitigate the harmful effect on the environment regardless of the increase of population, as the mean differences continued the same for both genders. The value was -0.01262 , while the p-value was 0.901 for females and 0.902 for males. One of the important points concerning the environment was the environmental protection law and should be paid more attention by the government to reduce pollution in the next years. The mean differences stayed the same for both genders, and the value was about -0.10488 , while the p-value was 0.010 for females and 0.023 for males, as both values were less than 0.05, so the p-values were statistically significant for both genders.

Renewable and biodegradable bio-composite materials at present have attracted a great deal of interest as promising green materials in various fields of use, such as smart food packaging, biomedical and drug delivery, bio-membranes, automotive and industrial composting applications, known as green materials, that are used in green packaging instead of sustainable packaging (Moustafa et al. 2019). About half of the responders are moderately likely to buy a more expensive product if its packaging is more environmentally friendly, with the p-value of 0.058 for females, and 0.067 for males whenever the mean differences are the same for both genders and which was -0.12091 . Comparing the

Table 1. Demographic information for the participants Add mean p-value

Question	Gender	P-value	Mean	Mean Difference
Concerning pollution	Female	0.767	1.4791	-0.01754
	Male	0.776	1.4966	-0.01754
Platforms	Female	0.052	1.3055	-0.33883
	Male	0.060	1.6443	-0.33883
How often Recycle	Female	0.945	2.2508	-0.00423
	Male	0.948	2.2550	-0.00423
Materials to recycle	Female	0.022	1.6913	-0.51002
	Male	0.029	2.2013	-0.51002
Way to get rid of plastic waste	Female	0.001	2.7588	0.21522
	Male	0.003	2.5436	0.21522
Energy sources next 10 years	Female	0.901	2.2894	-0.01262
	Male	0.902	2.3020	-0.01262
Environmental protection law	Female	0.010	1.0965	-0.10488
	Male	0.023	1.2013	-0.10488
Buy a little more expensive product	Female	0.058	1.7717	-0.12091
	Male	0.067	1.8926	-0.12091
Causes of environmental pollution	Female	0.039	2.6945	0.29856
	Male	0.039	2.3960	0.29856
Close of factories	Female	0.009	2.2283	0.22158
	Male	0.009	2.0067	0.22158
Dumping of factories and health	Female	0.010	1.3248	-0.15846
	Male	0.016	1.4832	-0.15846
Air pollution effect on family	Female	0.315	1.5273	-0.08341
	Male	0.324	1.6107	-0.08341
Worst environmental problem	Female	0.770	2.7878	-0.04443
	Male	0.762	2.8322	-0.04443
COVID-19 and environment	Female	0.769	1.5756	0.01852
	Male	0.769	1.5570	0.01852
Government clean public places	Female	0.058	1.1704	-0.09804
	Male	0.071	1.2685	-0.09804
Government design program	Female	0.005	1.2572	-0.15887
	Male	0.009	1.4161	-0.15887

Source: Author's Elaboration based on collected data and SPSS analysis results (2020).

importance of green packaging in this article with previous articles indicates that responders are moderately likely to buy more expensive products if their packaging is more environmentally friendly. The results of the study showed that environmental or ethical product considerations could have a strong positive effect on consumer preferences and that the largest consumer group, one-third of consumers, favoured environmentally branded packaging as the most significant criteria in their decision (the average relative importance being 34%) (Rokka and Uusitalo 2008). According to the estimation results, even though most consumers have certain insufficient knowledge regarding green packaging,

they have a fairly strong willingness to pay for it. Additionally, it noted that consumers would like to attach greater importance to green packaging practicality, such as comfort, reusability, and protective capability, compared to green packaging's price and appearance (Hao et al. 2019).

Many factors cause environmental pollution, such as industrial activities, dumping of solid waste, plastic consumption, vehicles, and population overgrowth (Abdulrahman, Sebastine 2013; Aziz et al. 2019). This survey on causes of environmental pollution factors also asked about the government's need to enact a law to close factories from 1 to 3 days a week due to their effects. Most of the responders thought industrial activities are the biggest and most effective environmental pollution. In contrast, most of the responders thought that the industrial activities cause most of the environmental pollution as the responders chose two days a week to close factories to keep the environment clean, the mean differences for reasons of factors on environmental pollution and the p-values remained the same for both genders as values about 0.29856 and 0.039 respectively, while the mean differences for the law to close factories and the p-values are the similar for both genders as they were 0.22158 and 0.009 respectively.

As much as water pollution affects health, air pollution can have a serious effect on populations' health (Berglund et al. 1992); as the responders said yes, air pollution affected them and their families' health due to an increase in cancer. People experience a wide range of health effects from being exposed to air pollution. Effects can be broken down into short-term effects and long-term effects. The mean differences between dumping of factories' waste and air pollution matched these problems, and the values were -0.15846 and -0.08341 , respectively. However, the p-value was 0.010 and 0.315 for females, 0.016 and 0.324 for males.

The survey asked respondents which problem they think is the worst environmental problem facing our planet, such as ozone depletion, toxic waste, global warming, water pollution, and air pollution. Most of them said ozone depletion was the worst problem that was facing our planet. The atmosphere's ozone layer acts as a protective filter against (part of) the sun's damaging ultraviolet (UV) radiation. The depletion of the ozone layer, which has been detected on a global scale in recent decades, is most likely due to global halocarbon pollution, leading to an increase in ground-level UV radiation and thus to an increase in UV-related risks, such as the incidence of skin cancer (Chakraborty et al. 2017).

The result showed that the mean differences stayed the same for both genders, and the value was -0.04443 ; however, the p-value of 0.770 for the female when the p-value for male was 0.762 shows that the p-values were not statistically significant as it was greater than 0.05 for both genders.

One of the 21st century's major threats is climate change. Despite all their attempts over the last few decades to preserve nature, humans have only been able to take a few steps forward, not to the degree commendable. Nevertheless, the effects of the COVID-19 pandemic have, for a few months, effectively restored the atmosphere to a significant degree, which could certainly have a positive effect on global climate change. Naturally, this affects humans' everyday actions and the ecological environment around them (Verma, Prakash 2020). Responders of this survey thought that the spread of the COVID-19 pandemic and the reduction in traffic or closing of factories are largely helping the environment return to its previous state. The mean differences and the p-values are the same for both genders and values 0.01852 and 0.769 respectively, the p-values much greater than 0.05 and showed that statistically significant.

Lockdown and some of its effects in the Kurdistan Region

Overall economic growth has been halted, and stock prices have plummeted along with declining carbon emissions. However, in many cities across the globe, the lockdown of the COVID-19 pandemic caused better air quality and decreased water pollution in some parts of the world (Saadat et al. 2020). There are also some positive effects on the natural world from lockdown. Recent data released by National Aeronautics and Space Administration (NASA) and European Space Agency (ESA) suggest that pollution has decreased by up to 30 % in some of the epicentres of COVID-19 Wuhan, Italy,

Spain, USA, etc. (Mohammed et al. 2019). Worldwide studies suggest that environmental conditions, including air quality and water quality in rivers, are improving, and wildlife is blooming after the outbreak of COVID-19 (Lokhandwala, Gautam 2020). Additionally, air pollutants decreased, and air quality was improved throughout the COVID-19 lockdown in Erbil City (Aziz 2020).

Furthermore, in Figure 3 the authors made an observation of NO₂ gas over Iraq from ESA sentinel 5s data before and during the COVID-19 pandemic. Significant air quality improvement and environmental relief can be observed.

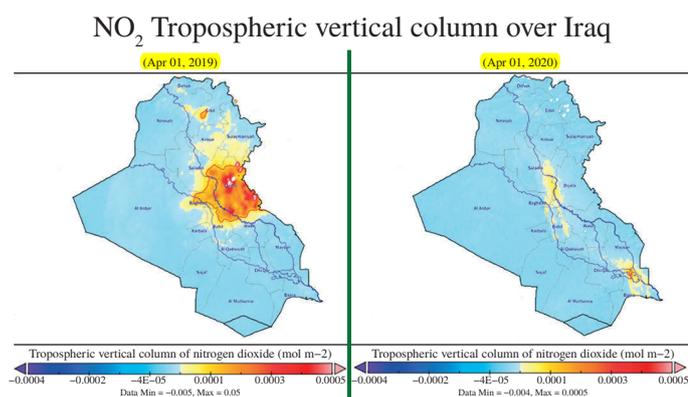


Fig. 3. Comparison of NO₂ tropospheric column of Iraq in April 2019 and April 2020
Source: Authors' contribution.

The government needs to take advantage of the quarantine and lockdown's opportunity to clean up more public places as most of the people stay at their homes to stay safe; the mean differences are the same for both genders with a -0.09804 value, as the p-value of 0.058 for the female when the p-value for male 0.071 which can indicate that the p-values were not statistically significant for both genders as values greater than 0.05.

Responders said to a high degree that the government authorities need to take advantage of the lockdown opportunity and design a powerful program that can serve the environment better, such as less vehicle use. The mean differences are the same for both genders with the value of -0.15887, a p-value of 0.005 for the female while the p-value for male was 0.009 which can show that the p-values were statistically significant as a result less than 0.05 for both genders.

Effects by Age

Table 2 revealed the comparison of different age groups and shows more attention to age groups for environmental issues. For concerns about environmental pollution, the people below the age of 20 pay more attention when compared to the age range groups between 20 to more than 40. It may be due to having more information about the risks of pollution due to full access to the internet which made them more informed than other groups which may not be spending as much time compared to them. Also, in the comparison between the 20 to 30 ages group with all of the other class ages, it showed that they pay more care when compared to other groups except less than 20 years old while in the comparison between 30 to 40 ages with other classes it showed that all of the other groups pay more attention for concerning about pollution than 30 to 40 ages. Whenever greater than 40 years old only pays more attention about pollution than 30 to 40 ages group.

As the questionnaire asked, "how many days in a week do you think the government should close factories to keep the environment clean?", most of the responders said that closing the factories for two days in a week would have a significant effect on reducing the damages that factories cause to

Table 2. Effect of age on the environmental awareness of the participants

Dependent Variable			Mean Difference	P-value	Dependent Variable		P-value
Concerning pollution	less than 20	20–30	0.01721	0.995	20–30	less than 20	0.362
		30–40	0.15363	0.362		30–40	0.334
		more than 40	0.04051	0.979		more than 40	0.727
Close of factories	less than 20	20–30	-0.01211	0.999	20–30	less than 20	1
		30–40	0.00594	1		30–40	0.999
		more than 40	-0.1117	0.874		more than 40	0.877
Dumping of factories and health	less than 20	20–30	0.18544	0.066	20–30	less than 20	0.173
		30–40	0.20181	0.173		30–40	0.997
		more than 40	0.0491	0.968		more than 40	0.539
Air pollution effect on family	less than 20	20–30	0.21216	0.15	20–30	less than 20	0.202
		30–40	0.25939	0.202		30–40	0.976
		more than 40	0.34083	0.082		more than 40	0.951
COVID-19 and environment	less than 20	20–30	-0.00467	1	20–30	less than 20	0.387
		30–40	-0.15926	0.387		30–40	0.279
		more than 40	-0.1027	0.782		more than 40	0.962
Government design program	less than 20	20–30	0.1447	0.148	20–30	less than 20	0.931
		30–40	-0.05413	0.931		30–40	0.05
		more than 40	-0.05074	0.954		more than 40	1
Dependent Variable			Mean Difference	P-value	Dependent Variable		P-value
Concerning pollution	30–40	less than 20	-0.15363	0.362	more than 40	less than 20	-0.04051
		20–30	-0.13642	0.334		20–30	-0.0233
		more than 40	-0.11312	0.727		30–40	0.11312
Close of factories	30–40	less than 20	-0.00594	1	more than 40	less than 20	0.1117
		20–30	-0.01805	0.999		20–30	0.09959
		more than 40	-0.11765	0.877		30–40	0.11765
Dumping of factories and health	30–40	less than 20	-0.20181	0.173	more than 40	less than 20	-0.0491
		20–30	-0.01638	0.997		20–30	0.13634
		more than 40	-0.15271	0.539		30–40	0.15271
Air pollution effect on family	30–40	less than 20	-0.25939	0.202	more than 40	less than 20	-0.34083
		20–30	-0.04723	0.976		20–30	-0.12867
		more than 40	0.08145	0.951		30–40	-0.08145
COVID-19 and environment	30–40	less than 20	0.15926	0.387	more than 40	less than 20	0.1027
		20–30	0.15459	0.279		20–30	0.09803
		more than 40	0.05656	0.962		30–40	-0.05656
Government design program	30–40	less than 20	0.05413	0.931	more than 40	less than 20	0.05074
		20–30	0.19883	0.05		20–30	0.19543
		more than 40	0.00339	1		30–40	-0.00339

Source: Author's Elaboration based on collected data and SPSS analysis results (2020).

the environment. As a result, a huge portion of climate change can be attributed to our reliance on industrial activities over the years. As a result, that gets from the responders due to the questionnaire in the comparison between the age classes, only 30 to 40 ages pay less attention to the closing of factories than the group age of people less than 20 years old. However, in a comparison between 20 to 30 ages, only more than 40 ages pay more attention to the closing of factories than the group age of 20 to 30. In comparison between 30 to 40 and more than 40 years old with other classes, it is shown that all of the other groups which include less than 20, 20 to 30 and more than 40, pay more attention to closing factories than 30 to 40 ages, but in contrast, the age groups of more than 40 years old pay more attention to closing factories more than all of the other age groups.

Factories also discharge wastewater directly into the field or into a community water supply, such as a river, lake, or stream, using chemicals and oils, sewage, and cafeteria waste. Waste deposited into the field can contaminate groundwater that provides other sources of water, such as wells and reservoirs, and directly impact the health of the population (Jailer et al. 2015). Peshang et. al (2020) showed that the Tanjaro river has been contaminated and it has become a source of danger to the people of darbandikhan town because it directly runs off to the Darbandikhan dam. The questionnaire results showed that fewer than 20 ages pay more attention to dumping factories' danger, while the 30 to 40 age classes pay less care than all of the other age groups. In the comparison between 20–30 age groups, they pay more attention than 30 to 40 ages, while more than 40 age groups pay more attention to the dumping of factories and its effects on health than 20 to 30 and 30 to 40.

Under the information on the damages and air pollution effects on family health, there are the comparisons between the age of groups for finding out which ages pay more attention to air pollution and its effects; it shows that less than 20 ages pay more attention more than all of the other age groups, however, when in the comparison between 20 to 30 ages with other groups, this group pays more care than 30 to 40 and more than 40 ages groups. Comparison for 30 to 40 with other groups shows that this group only pays more attention than more than 40 ages groups. For more than 40 ages, all of the other groups pay more attention than it.

The survey asked if the responders thought the spread of the COVID-19 and the reduction in traffic would help the environment return to its previous state. Most of the responders thought it is very effective to help the environment and reduce its damages due to the lockdown and stopping factories, in comparison for under the ages of 20 years finds out that all of the other groups pay more attention, while between the ages 30 to 40 years pay more attention when compared to other groups. For 20 to 30 years only they are paying more attention than those under 20 ages. In contrast, people who are more than 40 years old pay less attention than people between 30 and 40 years old.

Each country must have their design program to adjust factories' working days; responders said to a high degree that the government agencies need to take advantage of the opportunity of the lockdown during pandemics to design a powerful program to serve the environment better, to differentiate attentions depending on the age groups as divided into four groups. In contrast to each other, the ages between 20 to 30 years pay less care when compared to ages between 30 to 40 years old and pay more care when compared to the overall class of ages. Whenever under the age of 20, pay more attention when compared to ages between 20–30 years old only in different classes but 40 years old class pay less attention than between 30 and 40 years old only.

Effects by Academic Background

Levels of education significantly correlated to knowledge about environmental issues and related to energy and pollution (Debrah et al. 2021). Table 3 illustrated the collected data from responses and information from different academic backgrounds to find out which academic title holders pay more attention to ending environmental pollution and stopping its causes. For that, the academic backgrounds are divided into four groups which include Diploma, B.Sc., college, and M.Sc. with PhD.

Table 3. Effect of the education background on the environmental awareness of the participants

Dependent Variable			Mean Difference	-P-value	Dependent Variable	Mean Difference	-P-value	
Concerning pollution	College	B.Sc.	-0.04383	0.905	B.Sc.	College	0.04383	0.905
		Diploma	-0.31250*	0.028		Diploma	-0.26867*	0.048
		M.Sc., PhD	-0.52679*	0		M.Sc., PhD	-0.48296*	0
Close of factories	College	B.Sc.	-0.0479	0.957	B.Sc.	College	0.0479	0.957
		Diploma	0.42679*	0.046		Diploma	0.47469*	0.01
		M.Sc., PhD	0.16964	0.777		M.Sc., PhD	0.21754	0.563
Dumping of factories and health	College	B.Sc.	-0.02976	0.972	B.Sc.	College	0.02976	0.972
		Diploma	-0.23929	0.177		Diploma	-0.20952	0.219
		M.Sc., PhD	-0.58929*	0		M.Sc., PhD	-0.55952*	0
Air pollution effect on family	College	B.Sc.	-0.07065	0.87	B.Sc.	College	0.07065	0.87
		Diploma	-0.12679	0.859		Diploma	-0.05614	0.982
		M.Sc., PhD	-0.45536*	0.047		M.Sc., PhD	-0.38471	0.09
COVID-19 and environment	College	B.Sc.	0.06009	0.829	B.Sc.	College	-0.06009	0.829
		Diploma	0.13929	0.666		Diploma	0.0792	0.897
		M.Sc., PhD	0.125	0.785		M.Sc., PhD	0.06491	0.955
Government design program	College	B.Sc.	0.02065	0.987	B.Sc.	College	-0.02065	0.987
		Diploma	-0.2375	0.124		Diploma	-0.25815*	0.048
		M.Sc., PhD	-0.43750*	0.001		M.Sc., PhD	-0.45815*	0
Dependent Variable			Mean Difference	-P-value	Dependent Variable	Mean Difference	-P-value	
Concerning pollution	Diploma	College	0.31250*	0.028	M.Sc., PhD	College	0.52679*	0
		B.Sc.	0.26867*	0.048		B.Sc.	0.48296*	0
		M.Sc., PhD	-0.21429	0.461		Diploma	0.21429	0.461
Close of factories	Diploma	College	-0.42679*	0.046	M.Sc., PhD	College	-0.16964	0.777
		B.Sc.	-0.47469*	0.01		B.Sc.	-0.21754	0.563
		M.Sc., PhD	-0.25714	0.626		Diploma	0.25714	0.626
Dumping of factories and health	Diploma	College	0.23929	0.177	M.Sc., PhD	College	0.58929*	0
		B.Sc.	0.20952	0.219		B.Sc.	0.55952*	0
		M.Sc., PhD	-0.35	0.106		Diploma	0.35	0.106
Air pollution effect on family	Diploma	College	0.12679	0.859	M.Sc., PhD	College	0.45536*	0.047
		B.Sc.	0.05614	0.982		B.Sc.	0.38471	0.09
		M.Sc., PhD	-0.32857	0.4		Diploma	0.32857	0.4
COVID-19 and environment	Diploma	College	-0.13929	0.666	M.Sc., PhD	College	-0.125	0.785
		B.Sc.	-0.0792	0.897		B.Sc.	-0.06491	0.955
		M.Sc., PhD	-0.01429	1		Diploma	0.01429	1
Government design program	Diploma	College	0.2375	0.124	M.Sc., PhD	College	0.43750*	0.001
		B.Sc.	0.25815*	0.048		B.Sc.	0.45815*	0
		M.Sc., PhD	-0.2	0.489		Diploma	0.2	0.489

* The mean difference is significant at the 0.05 level.

Source: Author's Elaboration based on collected data and SPSS analysis results (2020).

The first question in the questionnaire asked about the level of responders concerned about pollution, which showed that college levels pay less attention than the other education levels, but the question will result in the statistically significant for diploma and other levels as their p-value less than 0.05; however, B.Sc. levels paid more attention than college levels but not more than Diploma and M.Sc. with PhD.

Same as previous the question will result in the statistically significant for diploma and PhD level as they are significantly less than 0.05, in the comparison between diploma with PhD education background and overall other backgrounds, it is shown that the diploma pays less attention with not significantly affected only when compared to PhD.; however, higher education background of PhD pay more attention compared to all other classes of education, and the p-values are significant for college and B.Sc.

When it comes to the closing of factories, the B.Sc. has more care when compared to all of the other educational backgrounds, and the p-value was only significant for diploma levels as the value was less than 0.05, but in contrast, the diploma has less care when compared to all of the other education levels and the p-value was significant for college and B.Sc. levels only. Also, college pays more attention than diploma and PhD and the p-value was only statistically significant for diploma levels. While PhD has more care than a diploma when compared with other levels and the p-value was not significant for none of the levels.

As mentioned before the dumping of the waste by factories might have a direct effect on family and population's health; it is important to compare education levels on such important topics; responses showed that college levels pay less attention than the rest of the other levels, as only the p-value for others are significant except B.Sc. level, same for p-value in the comparison between B.Sc. with others but here they pay more attention than college levels. However, diploma levels pay more attention than college and B.Sc. levels, and PhD compare with the rest paid more attention than all of the levels as the p-value for college and B.Sc. are significant.

Air pollution due to factories or loads of traffics will always affect family members' health and an increase in the rate of cancers such as lung cancers; results showed that college levels pay less attention than all of the other levels and the p-value was only significant for PhD, however in the comparison between PhD presented that they pay more attention than all of the other levels and the p-value for college was statistically significant, B.Sc. levels pay more attention than college levels but less than diploma and PhD. In comparison, diploma levels pay more attention than college and B.Sc. levels but less than others.

As the relations between lockdowns due to COVID-19 with the environments, they affect each other. In contrast, lockdowns reduce the vehicle, ship and plane use all of these helped the environment to return to its previous states and decrease the pollution, as it became an important topic nowadays also taking different academic levels opinion will be as much important. College levels pay more attention to the effects and relations between COVID-19 and the environment than other levels. In comparison, diploma levels pay less attention than all other levels, as B.Sc. levels pay less attention than college levels only; however, PhD levels pay more attention than diploma levels.

Finally, the last question in the questionnaire is about the responder's opinion on taking advantage of the government during the lockdowns due to pandemics to serve and design a powerful program to help the environment. B.Sc. levels pay attention to such topics less than all of the other groups as the diploma, and PhD p-values were statistically significant. On the contrary, other levels pay more attention than the rest of the groups as the M.Sc. and B.Sc. p-values were statistically significant, about M.Sc. levels they pay more attention than B.Sc.; however, less than diploma and PhD and others p-value was statistically significant, in a comparison between diploma with the rest showed that they paid more attention than M.Sc. and B.Sc.

Relation between Variables by Cross Tabulation Method

When conducting survey analysis, cross-tabulations (also referred to as crosstabs) are a quantitative research method appropriate for analyzing the relationship between two or more variables. Cross tabulations provide a way of analyzing and comparing the results for one or more variables

with another (or others). The axes of the table may be specified as being just one variable or formed from several variables. The resulting table will have as many rows and columns as codes in the corresponding axis specification. In many research reports, survey results are presented in aggregate only, meaning; the data tables are based on the entire group of survey respondents. Cross tabulations are simply data tables that present the results of the entire group of respondents and results from sub-groups of survey respondents. Cross tabulations enable you to examine relationships within the data that might not be readily apparent when analyzing total survey responses (Rengarajan et al. 2018).

Relation between Environmental protection law and Buy a little more expensive product

Table 4 presented the relation between two questions, questions are Environmental protection law and Buy a little more expensive product. The environmental protection legislation became one of the important points concerning the environment, and the government should pay more attention to reducing the rate of emissions in the next years (Schwarte 2003; Galbraith 2005). As it thought that by having a strict protection law from the government, people should follow it and go with the regulations to protect our surroundings as the survey asked respondents the degree of responder's ability to buy a little more expensive product.

The survey presented three choices for the environmental protection law as they said the government should pay more attention, about as much attention as they are now and pay less attention. While making a relation between those who said the government should pay more attention and responders' ability to buy a little more expensive eco-friendly products, it shows that for a total of 460 responders, 412 (89.6%) of them said the government should pay more attention, 33.3% of these responders said

Table 4. Environmental protection Act Buy a little more expensive product–Cross tabulation

Question	Options		Buy a little more expensive product			Total
			very	moderately	not at all	
Environmental protection law	Pay more attention	Count	137	231	44	412
		% within Environmental protection law	33.30%	56.10%	10.70%	100.00%
		% within Buy a little more expensive product	93.80%	90.60%	74.60%	89.60%
	About as the attention they are now	Count	8	16	12	36
		% within Environmental protection law	22.20%	44.40%	33.30%	100.00%
		% within Buy a little more expensive product	5.50%	6.30%	20.30%	7.80%
	Pay less attention to	Count	1	8	3	12
		% within Environmental protection law	8.30%	66.70%	25.00%	100.00%
		% within Buy a little more expensive product	0.70%	3.10%	5.10%	2.60%
Total	Count	146	255	59	460	
	% within Environmental protection law	31.70%	55.40%	12.80%	100.00%	
	% within Buy a little more expensive product	100.00%	100.00%	100.00%	100.00%	

Source: Author's Elaboration based on collected data and SPSS analysis results (2020).

very able to buy a little more expensive eco-friendly product. In contrast, 56.1% of them said moderately. Less rate 10.7% of them choose not at all, however, if it is compared to the minimum rate about 12 (2.6%) persons selected paid less attention, 8.3% said very while 66.7% said moderately and 25.0% said not able at all; However, 36 (7.8%) of them said about as much attention as they are now, 22.2% of these 36 responders choose a high degree for buying an eco-friendly product also said yes the government should pay more attention, 44.4% of them said moderately, and 33.3% of them said not at all.

Totally for the relation between these two questions, we can collect 460 responses to choose a degree of attention from the government to environmental protection law and responders' ability to buy a little more expensive products if it reduces surrounding pollution, 146 of total responders said to a high degree able to buy a little more expensive products, 255 to a moderate degree and 59 not able at all.

The Relation Between Recyclable Materials and Way to Get Rid of Plastic Waste

Table 5 revealed the relation between two other questions, as they were about ways to get rid of plastic waste, which include (burning, throwing away and recycling) with choosing the type of materials that were reused or recycled by the responders, it had different selections contain (paper–newspaper–magazine, glass, plastic, clothes and shoes, electrical and none of them).

Data showed the maximum rate of about 162 persons choosing clothes and shoes as a material to recycle, 40 (24.7%) of those selected burning to get rid of the plastic waste, 30 (18.5%) supposed to

Table 5. Materials to recycle versus Way to get rid of plastic waste–Cross tabulation

Question	Options		Way to get rid of plastic waste			Total
			burning	Throw away	Recycle	
Materials to Recycle	Paper (newspaper, magazine)	Count	7	2	12	21
		% within Materials to recycle	33.30%	9.50%	57.10%	100.00%
		% within Way to get rid of plastic waste	13.50%	5.10%	3.30%	4.60%
	Glass	Count	14	6	36	56
		% within Materials to recycle	25.00%	10.70%	64.30%	100.00%
		% within Way to get rid of plastic waste	26.90%	15.40%	9.80%	12.20%
	Plastic	Count	6	3	21	30
		% within Materials to recycle	20.00%	10.00%	70.00%	100.00%
		% within Way to get rid of plastic waste	11.50%	7.70%	5.70%	6.50%
	Clothes and shoes	Count	40	30	92	162
		% within Materials to recycle	24.70%	18.50%	56.80%	100.00%
		% within Way to get rid of plastic waste	9.60%	10.30%	10.30%	10.20%
	Electrical	Count	32	32	59	123
		% within Materials to recycle	26.00%	26.00%	48.00%	100.00%
		% within Way to get rid of plastic waste	1.90%	2.60%	1.40%	1.50%
	None	Count	4	3	61	68
		% within Materials to recycle	5.90%	4.40%	89.70%	100.00%
		% within Way to get rid of plastic waste	7.70%	7.70%	16.50%	14.80%
Total	Count	52	39	369	460	
	% within Materials to recycle	11.30%	8.50%	80.20%	100.00%	
	% within Way to get rid of plastic waste	100.00%	100.00%	100.00%	100.00%	

Source: Author's Elaboration based on collected data and SPSS analysis results (2020).

throw away, and 92 (56.8%) said recycling is the best among other ways. The minimum rate of about 21 people of the 460 responders chose paper, newspaper, and magazines as a material to recycle, 7 (33.3%) of these 21 persons chose to burn as a way to get rid of the plastic waste, 2 (9.5%) thought to throw away these wastes, and 12 (57.1%) said recycling. As the main material of concern about its waste and ways to get rid of it was plastic, 30 of the respondents chose plastic as a material to recycle to reduce damages that plastic causes to the environment, 6 (20.0%) of those also thought burning is the best way to get rid of the plastic waste, 3 (10.0%) supposed to throw away and most of them about 21 (70.0%) believed to recycling. Of those who believed that no material should be recycled, 68 of 460 responders choose no recycling materials. It may be due to lack of knowledge of the risk and damage of those materials to our surroundings, or due to having no special places to recycle properly, 4 (5.9%) of those who chose none of the above materials to recycle also chose to burn to get rid of the plastic waste, 3 (4.4%) said to throw away, and 61 (89.7%) chose recycling is the best among other ways, To minimize the demand for raw materials and reduce the quantity of waste going to landfill, policymakers have promoted recycling and reuse strategies. The GaBi 4 life cycle analysis method, which revealed the benefits of global warming and human toxicity, was an example of the value of mechanical recycling of plastics compared to landfilling and composting. Recycling is the preferred plastic waste management option since the Global Warming Potential (GWP), and Human Toxicity Potentials (HTP) indicators have a lower environmental effect on the specified impact categories (Al-Maaded et al. 2012).

Totally for the above two relations collected 460 responses to choose a type of materials to recycle with the ways to get rid of the plastic waste, 52 of the responders choose to burn, 39 persons choose to throw away, and most of the responders as they are 369 persons choose to recycle.

The Relation Between Worst Environmental Problem and Government's plan to Clean Public Places

Table 6 illustrated a relation between two questions, choosing the worst environmental problem in the above other problems with a different option: ozone depletion, toxic waste, global warming, water pollution, and air pollution. In contrast, the second question asked about taking advantage of the government to clean up more public places during the lockdowns due to the spread of pandemics, and it had different selections such as yes, no, and do not know.

Overall responders, the maximum rate of about 128 persons chose ozone depletion as the worst environmental problem, 114 (89.1%) of these responders chose yes meaning that the government should take advantage of the lockdowns to clean up more public places while 9 (7.0%) of respondents believed no and 5 (3.9%) of them said do not know. When it is compared to the minimum rate of about 19 persons selected for the water pollution option, 12 (63.2%) took yes while 5 (26.3%) selected no and 2 (10.5%) believed do not know was a correct answer.

For these two questions, collected 460 responses to choose a taking advantage of the government to clean up more public places and worst environmental problems, 392 of the total responders said yes to taking advantage, 43 supposed no, and 25 believed they didn't know.

CONCLUSIONS

After conducting the current research, the following conclusions were outlined:

1. Females participated more than males by 35.2%, and it indicated that females were more likely to care about environmental information than males.
2. Most of the responders were between 20 to 30 years as 53.5% of overall participants.

Table 6. Worst environmental problem and Government clean public places–Cross tabulation

Question	Options		Government clean public places			Total
			yes	no	Don't Know	
Worst environmental problem	Ozone Depletion	Count	114	9	5	128
		% within worst environmental problem	89.10%	7.00%	3.90%	100.00%
		% within Government clean public places	29.10%	20.90%	20.00%	27.80%
	Toxic water	Count	67	14	5	86
		% within worst environmental problem	77.90%	16.30%	5.80%	100.00%
		% within Government clean public places	17.10%	32.60%	20.00%	18.70%
	Global warming	Count	91	10	10	111
		% within worst environmental problem	82.00%	9.00%	9.00%	100.00%
		% within Government clean public places	23.20%	23.30%	40.00%	24.10%
	Water pollution	Count	12	5	2	19
		% within worst environmental problem	63.20%	26.30%	10.50%	100.00%
		% within Government clean public places	3.10%	11.60%	8.00%	4.10%
	Air pollution	Count	108	5	3	116
		% within worst environmental problem	93.10%	4.30%	2.60%	100.00%
		% within Government clean public places	27.60%	11.60%	12.00%	25.20%
Total	Count	392	43	25	460	
	% within worst environmental problem	85.20%	9.30%	5.40%	100.00%	
	% within Government clean public places	100.00%	100.00%	100.00%	100.00%	

Source: Author's Elaboration based on collected data and SPSS analysis results (2020).

3. Compared between different age groups, it may be because getting more information on the risks of pollution due to complete access to the internet made them more educated than other groups which may not spend as much time as younger ages to pay more attention when compared to the 20 to more than 40 age groups.
4. Most of the responders said closing the factories for two days a week would have a significant effect on reducing the damages that factories cause to the environment and this method would be a good way to relieve the air quality and improve it.
5. College levels pay more attention to the effects and relations between COVID-19 and the environment than other levels, while diploma levels pay less attention than all other levels.
6. Overall, 146 participants said to a high degree that they could buy a little more expensive products, while 369 persons choose one of the recycling ways to eliminate plastic waste.
7. The maximum rate of participants, about 128 persons chose ozone depletion as the worst environmental problem. Global warming takes second place. This is because people don't have basic knowledge regarding global warming and its threats.
8. The maximum per cent, 38.0%, chose the internet as an effective source to get information regarding the environment and pollution because it is easy to reach various sources and information worldwide using the internet and different website platforms.
9. From the geographical point of view, the participation ratio for the provinces were 28.48% in Sulaimani Province, 21.95% in Erbil Province, 17.61% in Duhok Province, 16.69% in Halabja Province, and 15.00% in Kirkuk province. High and low contribution levels of the participants are a reflection of the environmental awareness of the members, providing environmental services for the people, background and culture of the community, and stability of political, economical, and social matters of the province.

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Appendix 1

Questionnaire:

- 1 – Gender
 - Female
 - Male
- 2 – Age group
 - Under 20
 - 20–30
 - 30–40
 - Above 40
- 3 – Where do you reside
 - Sulaymaniyah
 - Erbil
 - Duhok
 - Kirkuk
 - Halabja
- 4 – Level of education
 - Graduated
 - College
 - School
 - Others
- 5 – How concerned are you about air pollution?
 - Very
 - Moderately
 - Not at all
- 6 – On which of the following platforms, have you heard about environmental pollution? Select all that apply:
 - Television
 - Newspaper
 - Internet
 - School/University
 - Government agencies/information
 - Friends or colleagues
 - Other
- 7 – How often do you recycle?
 - Always
 - About half the time
 - Never
- 8 – What materials do you recycle? (Tick All Applicable)
 - Paper – Newspaper-Magazine

- Glass
 - Plastic
 - Clothes and shoes
 - Electrical
 - None
- 9 – Which of these ways do you think is the best way to get rid of plastic waste?
- Burning
 - Throw away
 - Recycle
- 10 – The government should make the Environmental Protection Law ...
- Pay more attention to
 - About as attention as they are now
 - Pay less attention to
- 11 – How likely are you to buy a little more expensive product if its packaging is more environmentally friendly?
- Very
 - Moderately
 - Not at all
- 12 – Which of the following do you think impact and are the biggest causes of environmental pollution?
- Industrial activities
 - Dumping solid waste
 - Plastic consumption
 - Vehicles, ships and planes
 - Population overgrowth
- 13 – How many days a week do you think the government should close factories to keep the environment clean?
- One day
 - Two days
 - Three days
 - None
- 14 – How much do you think the dumping of factories into water resources has affected your health?
- Very
 - Moderately
 - It has not affected my health
- 15 – Has air pollution affected your family or friends' health (such as an increase in cancer)?
- Yes
 - No
 - I don't know
- 16 – Which of the following do you feel is the worst environmental problem facing the planet?
- Ozone depletion
 - Toxic waste
 - Global warming
 - Water pollution
 - Air pollution
- 17 – How much do you think the spread of the Covid-19 virus and the reduction in traffic will help the environment to return to its previous state?
- Very
 - Moderately
 - Slightly
- 18 – Do you think that viruses and diseases can be transmitted through water and sewage?
- Yes
 - No

- I don't know
- 19 – Do you think the government needs to take advantage of this opportunity to clean up more public places?
- Yes
 - No
 - I don't know
- 20 – To what degree do you think the government agencies need to take advantage of this opportunity to design a powerful program to better serve the environment such as (less car use...)
- Very
 - Moderately
 - Slightly
- 21 – How much do you think the global viruses and epidemics affect farmers and farmland due to declining market demand?
- Very
 - Moderately
 - Slightly