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One Step Before Disaster: Determining Individuals' Perceptions of Global Warming and Climate Change in terms of Different Demographic Variables

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Abstract

Aim of study: The friendship between humankind and nature ended with the mechanization process initiated by the Industrial Revolution. Today, we are faced with the problems of global warming and climate change due to human factors such as fossil fuel consumption and the destruction of vegetation. These two problems promise us a warmer world, melting glaciers, burning forests, and thousands of dead people in the future. Research indicates that people's awareness is the most important factor in combating the disastrous consequences of global warming and climate change. Based on this fact, this study aims to examine individuals' perceptions of global warming and climate change in terms of various variables.

Material and methods: The research was conducted with 2022 participants in line with the screening model. A perception scale on global warming and climate change was used as a data collection tool. The obtained data were analyzed with descriptive statistics, Mann Whitney U, and Kruskal Wallis Tests.

Main results: As a result of the research, it has been determined that female participants have a positive attitude towards global warming and climate change compared to male participants, and as the age level of individuals increases, their perceptions of global warming and climate change increase.

Research highlights: Awareness of people is the most important factor in the fight against the consequences of global warming and climate change. As a result of the data collected from 2022 participants, it was determined that female participants' perceptions of global warming and climate change were more positive than male participants.

Keywords: Global Warming, Climate Change, Perception, Individual

Felakete Bir Adım Kala: Bireylerin Küresel Isınma ve İklim Değişikliğine İlişkin Algılarının Farklı Demografik Değişkenler Açısından Belirlenmesi

Öz

Çalışmanın amacı: İnsanoğlu ve doğa arasındaki dostluk sanayi devriminin başlattığı makinalaşma süreci ile son bulmuştur. Fosil yakıt tüketimi, bitki örtüsünün tahribatı gibi beşeri etkenler ile birlikte bugün geldiğimiz noktada küresel ısınma ve iklim değişikliği sorunları ile yüz yüzeyiz. Bu iki sorun gelecekte bizlere daha sıcak bir dünya, eriyen buzullar, yanan ormanlar ve ölü binlerce insan vadetmektedir. Araştırmalar küresel ısınma ve iklim değişikliğinin felaket sonuçları ile mücadelede insanların farkındalıklarının en önemli etken olduğunu söylüyorlar. Bu gerçekten yola çıkarak hazırlanan araştırmada, bireylerin küresel ısınma ve iklim değişikliğine ilişkin algılarının çeşitli değişkenler açısından incelenmesi amaçlanmaktadır.

Materyal ve yöntem: Araştırma tarama modeli doğrultusunda 2022 katılımcı ile gerçekleştirilmiştir. Küresel ısınma ve iklim değişikliğine ilişkin algı ölçeği veri toplama aracı olarak kullanılmıştır. Elde edilen veriler betimsel istatistikler, Mann-Whitney U ve Kruskal Wallis Testleri ile analiz edilmiştir.

Temel sonuçlar: Küresel ısınma ve iklim değişikliğine yönelik kadın katılımcıların erkek katılımcılara göre olumlu bir tutuma sahip oldukları, bireylerin yaş düzeyi arttıkça küresel ısınma ve iklim değişikliğine yönelik algılarının arttığı tespit edilmiştir.

Araştırma vurgular: Küresel ısınma ve iklim değişikliğinin sonuçlarıyla mücadelede insanların farkındalığı en önemli faktördür. 2022 katılımcıdan toplanan veriler sonucunda, kadın katılımcıların küresel ısınma ve iklim değişikliğine ilişkin algılarının erkek katılımcılara göre daha olumlu olduğu tespit edilmiştir.

Anahtar Kelimeler: Küresel Isınma, İklim Değişikliği, Algı, Birey

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Introduction

The Industrial Revolution, which started in England in the second half of the 18th century, was an important turning point in the relationship of human beings with nature until those years. The mechanization process, which started with the industrial revolution, has given the damage that mankind has not done to nature for millions of years, in a very short time. In particular, the uncontrolled use of fossil wastes such as oil and coal has damaged the natural environment and living things, leading to the deterioration of the ecological balance (Durkaya & Durkaya, 2018). In the second half of the 20th century, this destruction started to increase with the increase in the world population and the developments in science and technology. The environmental problems we face today have reached their final stage. The beginnings of these problems are global warming and climate change.

Global warming and climate change are terms that are often used interchangeably (Whitmarsh, 2009). However, these two concepts are two different environmental problems that trigger each other and are directly related to each other. At this point, it would be useful to include the definition of both concepts to avoid conceptual confusion. Jones & Wigley (1990) briefly describe global warming as the uneven increase in average temperature as a result of the accumulation of carbon dioxide in the atmosphere and the deterioration of the greenhouse effect, which is a natural process. The greenhouse effect is the ability to keep the heat generated by the sun's rays at a certain temperature, thanks to gases such as CO2, CH4, N2O, O3, and CFC in the atmosphere. Thanks to the greenhouse effect, the earth remains at a certain temperature, and the freezing of the seas and oceans is prevented (Harvey, 2000; Hulme, 1993; Akın, 2006). If there were no greenhouse gases in the atmosphere, it is estimated that the average temperature of the earth would be 33°C colder than today. The developments after the Industrial Revolution caused more carbon dioxide to accumulate in the atmosphere. The resulting global warming has become an important problem threatening our planet and our future (Özdemir, 2018). Many natural and human factors cause global warming. Fossil fuel consumption and the destruction of vegetation are the leading factors among these factors (Akın, 2006; Nart, 2009; Özdemir, 2018). Global warming, which is caused by the deterioration of the greenhouse effect, causes climate change, another important global problem of our time. Climate change is the change of climates due to increasing temperatures and the occurrence of unexpected climatic events (Johnson & Tversky, 1983). Climate change has many negative effects on daily life. The most important of these effects is the change/confusion of the life cycle. The migration of animals, the flowering of plants, and the transformation phases of insects are changing due to climate change. As a result of climate change, it is thought that "dengue fever", which is a febrile and contagious disease, will spread all over the world. It is estimated that the delta and the coasts will be flooded with the rise in the water level in the seas, and thus 200 million people living in these areas will be adversely affected. Besides, it is stated that another global problem that climate change will bring will be forest fires (Güney et al., 2016).

Scientists state that global warming and climate change have a series of consequences that will negatively affect all humanity and nature (Fischhoff et al., 1981; Johnson & Tversky, 1983). They predict that many people will die in the flood disaster with the change in the rainfall pattern. They expect that increasing temperatures will reach their peak in the next 50 years and these temperatures will cause forest fires, drying up of streams, and salinization of groundwater (Shepardson et al., 2012). Kışlalıoğlu & Berkes (2014) express the effects of global warming and climate change in the following sentence: "We are moving towards a warmer earth, but the warmer world that awaits us is definitely not paradise…". To avoid these disasters that await all humanity and to leave a livable world to future generations, not only scientists or politicians, but everyone should be conscious and take responsibility (Aydın, 2010; Brody, 2003).

It is an important factor for people to be aware of these problems to take precautions against global warming and climate change. The more people become aware of the brutal consequences of these two problems, the more responsibility they will take. For this reason, especially after 2000, these issues are frequently encountered in our daily lives through popular culture elements such as movies, TV series, or magazines, leaving the dimension of academic or political discussion. For example; the melting of glaciers is mentioned in the animated movie "Ice Age 2: Melting Begins", which was released in 2006 and made a very high box office worldwide (The-numbers, 2021). There is no doubt that many of the viewers, especially children, were worried about the consequences of global warming and climate change thanks to this entertaining animated film (Kellstedt et al., 2008).

Another event that prompted people to think and talk about global warming and climate change was that 16-year-old Swedish climate activist Greta Thunberg called on world leaders to take action for a greener future at the World Economic Forum in Davos in 2019 (Iowa State University Archives of Women's Political Communication, 2019). Although this speech by Greta was criticized by some people, it helped to bring global warming and climate change to the world agenda. In Türkiye, in 2020, the Delegation of the European Union to Türkiye and the United Nations Development Program launched the "Climate is Us, We Will Change" campaign during the Türkiye Climate Diplomacy Week, which aims to raise people's awareness and fight against these problems. Within the scope of the campaign, dozens of famous names from national athletes to artists "And 1.5 Degrees!" He called on everyone to promise to keep the global temperature rise at 1.5 degrees (European Union Delegation to Türkiye, 2020). The main purpose of these examples is to raise awareness among people about global warming and climate change. Because the first step in the fight against global warming and climate change is to increase public awareness (Albayrak & Atasayan, 2017; Pandve, 2008; Rankoana, 2016).

At the international diplomatic level, several studies continue to increase people's awareness of global warming and climate change. It is known that many countries have developed national climate strategies (Intergovernmental Panel on Climate Change [IPCC], 2004; World Bank [WB], 2008; European Commission [EC], 2009). In clause 12 of the Paris Agreement, which is a legally binding international agreement on climate change; emphasis is placed on climate change education, training, public awareness, public participation, and provision (United Nations Framework Convention on Climate Change [UNFCCC], 2015). In this context, the Türkiye government has also prepared a plan called "Climate Change Strategy of the Republic of Türkiye 2010-2023" and is working in this direction. In this plan, it is emphasized that one of the important ways to deal with the effects of climate change is to make people understand the effects of climate change (Ministry of Labor and Social Security, 2011). Considering the importance of people's awareness in the fight against global warming and climate change, scientific studies to be conducted on people's awareness have an important role in drawing the way of struggle (Randall, 2009; Westerhoff & Robinson, 2013). Studies have been conducted to determine people's awareness (Dunlap & Mertig, 1995; Kennedy & Lindsay, 2015; Inglehart, 1995; Chhokar et al., 2011; Yazdanparast et al., 2013; McCright, 2010; O'Connor et al., 1999). In Türkiye, studies have been carried out to determine the level of knowledge and perceptions within the scope of global warming and climate change. However, these studies are limited in number. In addition, it is seen that the studies conducted generally include studies involving primary school, high school, and university students (Atik & Doğan, 2019; Gökçe & Kaya, 2009; Karadağ & Acar, 2020; Şen & Özer, 2018; Tetik & Acun, 2015). In many of these studies, it has been determined that people's awareness of global warming and climate change is at a low level. In studies that reveal people's awareness level or normal results, they also stated that people have incomplete information about these problems (Bahar & Aydın, 2000; Eroğlu & Aydoğdu, 2016;

Ergin et al., 2017). This study is aimed to examine the awareness of a wider audience, rather than only high school or university students, in line with various variables. Therefore, this study will primarily be an important support for the fight against global warming and climate change. It is also expected to make a modest contribution to the literature.

The research is aimed to determine the perceptions of individuals on global warming and climate change in terms of different variables. For this purpose, answers are sought for the following sub-problems:

1. Do individuals' perceptions of global warming and climate change differ according to their gender?
2. Do individuals' perceptions of global warming and climate change differ according to their age?
3. Do individuals' perceptions of global warming and climate change differ according to their socio-economic levels?
4. Do individuals' perceptions of global warming and climate change differ according to geographical regions?
5. Do individuals' perceptions of global warming and climate change differ according to their settlements?
6. Do individuals' perceptions of global warming and climate change differ according to housing types?

Material and Method

In this study, a survey model was used to determine whether individuals' perceptions of global warming and climate change (questions about global warming and measures to reduce the effects of climate change, questions to determine concerns about global warming and climate change) differ according to various variables. The survey model is defined by the researcher as research that describes the existing situation as it is and within the framework of its conditions, without changing the event, object, or individual, without any experimental effect on them (Karasar, 2012).

Population and Sample of the Research

The population of the research consists of individuals over the age of 18 in Türkiye (There are approximately 56635077 persons over the age of 18 in Türkiye. This group constitutes approximately 59% of the total population). No distinction was made while selecting the sample group for individuals to represent the universe. In this context, the maximum diversity sampling method, one of the sampling methods, was used to determine the sample of the research and to determine what kind of similarities there are between the various situations (Yıldırım & Şimşek, 2016).

The sample group was randomly selected based on the maximum sampling method and voluntariness. While determining the sample size in the study, it was calculated that a questionnaire should be applied to 1067 individuals with a 3% margin of error at the 95% confidence interval for 100000000 non-homogeneous populations (Can, 2014). For this reason, data were collected by reaching 2022 individuals to reflect the truth of the data results. The demographic characteristics of the individuals constituting the sample of the study are presented in Table 1.

When Table 1 is examined, 51.7% of the research sample is female and 48.3% is male, with a total of 2022 participants. 20% of the research sample is 18-25 years old, 14.5% is 26-30 years old, 17.8% is 31-35 years old, 16% is 36-40 years old, 21.2% is 41- 50 years old and 10.5% are 51 years old and over. According to the regions where the research was conducted, 4.8% of the participants were from the Mediterranean, 8.6% from Eastern Anatolia, 5.1% from Aegean, 3.9% from Southeastern Anatolia, 20.3% from Central Anatolia, 42% of which are located in the Black Sea region and 15.3% in the Marmara Region. In addition, 68.7% of the participants are in the city center, 26.5% are in the district center and 4.7% are in rural settlements. In addition, 85% of the participants live in an apartment, while 15% live in a detached house. When analyzed in terms of socio-economic level, 16% of the participants have low income, 33.4% have middle income and 50.5% have a high income.

Table 1. Demographic characteristics of individuals participating in the study

Demographic variables	Groups	*N*	%
Gender	Female	1046	51.7
	Male	976	48.3
Age	18-25 age difference	404	20.0
	26-30 age difference	294	14.5
	31-35 age difference	360	17.8
	36-40 age difference	324	16.0
	41-50 age difference	428	21.2
	51 years and older	212	10.5
Geographic Region	Mediterranean	98	4.8
	Eastern Anatolia	174	8.6
	Aegean	102	5.0
	Southeastern Anatolia	78	3.9
	Central Anatolia	410	20.3
	Black Sea	850	42.0
	Marmara	310	15.3
Settlement	City	1390	68.7
	District	536	26.5
	Rural	96	4.7
Socio-economic level	Lower	324	16.0
	Medium	676	33.4
	Upper	1022	50.5
Housing type	Apartment	1718	85.0
	Detached house	304	15.0

Data Collection Process and Analysis

The data collection process of the research was carried out between January 6, 2023, and February 25, 2023, using the personal information form prepared by the researchers and the perception scale for global warming and climate change developed by Gülsoy (2018). The scale developed by Gülsoy (2018) consists of 31 items. The scale has a five-point Likert-type feature: I completely agree (5), partially agree (4), undecided (3), partially disagree (2), completely disagree (1). The Cronbach's alpha reliability coefficient of the scale was calculated as 0.83. In the current study, the scale's Cronbach Alpha reliability coefficient was found to be 0.85. Data were collected online with a questionnaire form.

The analysis of the data obtained from the research was made with the SPSS 22.00 package program regarding the determining variables. First, the total scores were calculated. Analyzes were made on these scores. Normality distribution analysis was examined to decide whether to use parametric or non-parametric tests in the analysis of the sub-problems of the research. The Kolmogorov-Smirnov test was used to obtain information about the normal distribution in studies with 30 or more participants (Can, 2014). Since the number of participants in this study was 2022, when the results of the Kolmogorov-Smirnov test were examined, it was determined that the p-value was 0.00 ($p<.05$), and non-parametric tests were used because the data set did not show a normal distribution. Mann-Whitney U Test calculations were made to determine whether the total scores of the participants from the scale differ according to the variables of gender and housing type. Kruskal Wallis Test calculations were made to determine whether it differs according to age, geographical region, settlement, education, and socio-economic level variables.

Results and Discussion

The findings regarding whether the total scores of individuals obtained from the global warming and climate change perception scale differ according to the gender variable are given in Table 2.

Table 2. Mann-Whitney U results calculated for gender and global warming and climate change perception

Gender	N	Ranking Value Average	Sum of Rank Values	Mann Whitney U	*p*
Female	1046	1071.67	1120963.00	447514.000	0.000
Male	976	947.02	924290.00		

When Table 2 is examined, it is seen that there is a significant difference between the perceptions of individuals regarding their gender, global warming, and climate change (U=447514.000; $p<0.05$).

According to the test results, this difference is in favor of female participants. According to this finding, it can be said that female participants have more positive attitudes towards global warming and climate change than male participants.

The results of the Kruskal Wallis test, which was conducted to determine whether the total scores of individuals obtained from the global warming and climate change perception scale differ according to their age levels, are given in Table 3.

Table 3. Kruskal Wallis results for the differences in the individual's global warming and climate change perception levels by age

Age Level	N	Rank average	sd	Chi-Square	*p*	Significant difference
(1) 18-25 age difference	404	976.01	5	13.041	0.023	5-1 6-1
(2) 26-30 age difference	294	960.08				5-2 6-2
(3) 31-35 age difference	360	1006.26				
(4) 36-40 age difference	324	979.22				
(5) 41-50 age difference	428	1069.21				5-4 6-4
(6) 51 years and older	212	1092.16				

When Table 3 is examined, it is seen that there is a significant difference in the global warming and climate change perception levels of individuals according to the age variable (x2=13.041; $p<0.05$). Mann Whitney U tests, which were carried out to determine which group the difference originated from, were found between individuals aged 18-25 and individuals aged 41-50, and individuals aged 51 and over;

Among individuals aged 26-30 years, individuals aged 41-50, and individuals aged 51 and over; It shows that there is a difference between individuals aged 36-40 years and individuals aged 41-50 years and individuals aged 51 and over. In this case, it can be said that as the age levels of individuals increase, their perceptions of global warming and climate change also increase.

The findings regarding whether the total scores obtained by individuals from the global warming and climate change perception scale differ according to their education levels are given in Table 4.

Table 4. Kruskal Wallis results for the difference in individuals' scores on global warming and climate change perception levels according to their socioeconomic level

Socioeconomic level	N	Rank average	sd	Chi-Square	*p*	Significant differences
(1) Lower	324	1036.55	5	10.498	0.005	2-3
(2) Medium	676	1061.18				
(3) Upper	1022	970.70				

When Table 4 is examined, it is seen that there is a significant difference in the perception levels of individuals on global warming and climate change according to the socioeconomic variable ($x^2=10.498$; $p<0.05$). Mann Whitney U tests, which were conducted to determine from which group the difference originated, show that there is a

difference between individuals at middle and upper-income levels. In this case, it can be said that as the socioeconomic levels of individuals increase, their perceptions of global warming and climate change also increase.

The findings regarding whether the total scores obtained by individuals from the global warming and climate change perception scale differ according to geographical regions are given in Table 5.

Table 5. Kruskal Wallis results for the differences in the individual's global warming and climate change perception levels according to geographical regions

Geographical Regions	N	Rank Average	sd	Chi-Square	*p*
Mediterranean	98	983.32			
Southeastern Anatolia	78	975.91			
Aegean	102	1065.85			
Eastern Anatolia	174	1060.30	5	5.563	0.474
Central Anatolia	410	964.77			
Black Sea	850	994.19			
Marmara	310	1026.89			

When Table 5 is examined, it is seen that there is no significant difference in the global warming and climate change perception levels of individuals according to geographical regions (x^2=5.563; p>0.05).

The findings regarding whether the total scores obtained by individuals from the global warming and climate change perception scale differ according to the settlements are given in Table 6.

Table 6. Kruskal Wallis results for the differences in individuals' scores on global warming and climate change perception levels according to settlements

Settlement	N	Rank Average	sd	Chi-Square	*p*
City Center	1390	1010.07			
District Center	536	1017.01	5	0.085	0.969
Rural	96	1001.44			

When Table 6 is examined, it is seen that there is no significant difference in the perception levels of individuals on global warming and climate change according to their settlements(x^2=0.085; p>0.05). In this case, it can be said that the perceptions of individuals living in the city center, district center and rural areas regarding global warming and climate change are at the same level.

The findings regarding whether the scores obtained by individuals from the global warming and climate change perception scale differ according to the type of residence variable are given in Table 7.

Table 7. Mann-Whitney U results calculated for housing type and global warming and climate change perception

Housing Type	N	Ranking Value Average	Sum of Rank Values	Mann Whitney U	*p*
Apartment	1718	1007.76	1731335.00	254714.000	0.493
Detached house	304	1032.63	313918.00		

When Table 7 is examined, no significant difference was found between individuals' perceptions of global warming and climate change by type of residence (U=254714.000; p>0.05). In this case, it can be said that the perceptions of individuals living in an apartment and a detached house on global warming and climate change are at the same level.

Conclusion

Within the scope of the study, it was aimed to determine the perceptions of individuals on global warming and climate change in terms of different demographic variables. Perceptions and knowledge play an important role in the emergence of individual and collective responses to climate change. Raising awareness is seen as the first stage of combating global warming and climate change (Hansen et al., 2012). Therefore, it is very important to examine the perceptions of individuals on global warming and climate change.

According to the results of the research, it has been determined that the attitudes of female participants towards global warming and climate change are scientifically positive compared to male participants. It has been determined that this situation is similar to some studies in the literature (O'Connor et al., 1999; Tetik & Acun, 2015; McCright, 2010; Korkmaz, 2018; Şen & Özer, 2018; Alaca, 2019; Ağıralan & Sadioğlu, 2021). However, in some studies, no difference was found regarding the gender variable (Chhokar et al., 2013; Aydın, 2014; Yılmaz & Güleç, 2021). On the other hand, in similar studies on global warming and climate change, it has been determined that men's awareness is higher than women's or that women's climate change perception levels are not sufficient (Besnili Memiş, 2019; Chhokar et al., 2011; Yazdanparast et al., 2013).

According to another result of the research, it was determined that as the age level of the individuals increased, their perceptions of global warming and climate change also increased. Especially in studies conducted with participants aged between 14-18 years, it was determined that the knowledge level of participants on global warming and climate change was low and limited (Ayvacı & Çoruhlu, 2009; Kılınç et al., 2008; Pekel et al., 2007; Shealy et al., 2017; Atik & Doğan, 2019). On the other hand, in studies conducted with participants aged 18 and over, it was determined that the level of knowledge of the participants on global warming and climate change was moderate (De-urioste-Stone et al., 2016; Şen & Özer, 2018; Ay & Erik, 2020). As it can be understood from the studies, as the age level of the individual increases, their perceptions of global warming and climate change also increase. The results of the studies carried out are similar to the results of the current study. On the other hand, there are different studies such as Korkmaz's (2018) study, which also reveals that there is no significant relationship between age and the perception of climate change.

As a result of the research, it was determined that the perception levels of individuals on global warming and climate change differ according to their income levels. In this case, it can be said that individuals with middle socioeconomic status have high perceptions of global warming and climate change. Considering the level of income and awareness of global warming and climate change, on the one hand, there are studies suggesting that people's concern about the consequences of climate change and their perception of climate change increase as the income level decreases (Dunlap & Mertig, 1995; Kennedy, 2015), on the other hand, there is an increase in the income level. similarly, studies showing that climate change awareness has increased are noteworthy (Korkmaz, 2018; Inglehart, 1990 as cited in Ağıralan & Sadioğlu, 2021). In addition to these results, it is seen that there is no significant difference in the global warming and climate change perception levels of individuals according to geographical regions, settlements, and type of residence.

When the data obtained in the study are examined, it is seen that female participants have a positive attitude toward global warming and climate change compared to male participants, that as the age level of individuals increases, their perceptions of global warming and climate change increase, and that people with a certain socioeconomic level have a higher perception of global warming and climate change. When the results obtained from the research are examined, the higher the awareness about the effects of global warming and climate change, the higher the will be to eliminate the risks and ensure adaptation. In this context, periodic publications and advertising materials can be developed to increase the

awareness and knowledge of individuals about global warming and climate change. To provide appropriate knowledge, skills, and values to young individuals on this subject; and to make adults feel the awareness that they are a part of the development of the world; It is recommended to develop similar studies. If no action is taken regarding this issue, worse results may be encountered in the future.

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Ethics Committee Approval

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Peer-review

Externally peer-reviewed.

Author Contributions

Conceptualization: M.T.Ö., F.B.D., İ.D.; Investigation: M.T.Ö., F.B.D., İ.D., K.T.; Material and Methodology: F.B.D.; Supervision: M.T.Ö.; Visualization: M.T.Ö., F.B.D., Writing-Original Draft: M.T.Ö., F.B.D., İ.D., K.T.; Writing-review&Editing: M.T.Ö., All authors have read and agreed to the published version of manuscript.

Conflict of Interest

The authors have no conflicts of interest to declare.

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