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***Review article***

# A review of climate change-induced migration

**Abuzer ÇELEKLİ[1,2,*], Sidar YAYGIR[1], Özgür Eren ZARİÇ[1]**

[1]Deparmnet of Biology, Faculty of Art and Science, Gaziantep University, Gaziantep, Turkey
[2]Gaziantep University, Environmental Research Center (GÜÇAMER), Gaziantep, Turkey
*Corresponding author e-mail: celekli.a@gmail.com

**Abstract:** Humanity has been in constant motion since its emergence. The process of change and mobility, defined as "migration," is based on many economic, social, cultural, and political reasons. It is possible to count environmental issues among the reasons for migration. Due to climate change, one of the most critical global problems, climate migration has started. This link between the environment and migration has been exacerbated by climate change, which might have far-reaching consequences for millions of people. This review collected information about climate migration, climate change, global migrations, and their results; causes, results, and solutions to this problem are sought. This study focuses on the time, spatial, and severity dimensions that were crucial to understanding global problems.

**Keywords:** Climate Migration, Climate change, Migration, Sustainability.

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## Introduction

Climate and migration, two factors essential to comprehending human history, are important research subjects in evolutionary anthropology (Moore & Wesselbaum, 2022). Both of these factors have been the focus of research for decades. Migratory patterns also play an essential role in comprehending population structure and gene flow. Genetic research has been combined with information from languages and archaeology to reconstruct the historical migration paths of people worldwide. Migration studies may also be found in various other areas of the social sciences, such as sociology, geography, demography, history, economics, and political science (Hunter et al., 2015). This kind of movement is also called migration or dispersal, and it happens when a person moves from one place to another where they usually live. This definition focuses on the person, even though we know that people often move with others and that, at the population level, the movement of many people from one place to another can be seen as mass migration. Humans, like many other organisms, migrate in search of better living conditions, a more favorable climate, or just a change of scenery (Saltré et al., 2015). In wealthy nations during the past 30 years, migration has been the primary driver of population expansion (Götmark et al., 2018). The issue of climate refugees, which has surfaced in recent years along with the environmental deterioration brought on by climate change, appears to be heading toward becoming one of the most significant humanitarian disasters of our time (Dingle & Drake, 2007).

On the other hand, one of the most significant issues restricting study in this area is the international conceptual and legal ambiguities, policy shortcomings, and the challenges experienced by governments in monitoring and recording data on "environmental refugees" and "climate refugees" (Georgeson et al., 2017). In other words, accepting the idea of an environmental refugee and

clarifying the terms "environmental refugee" and "climate refugee" raises a variety of issues since it might entail accepting blame for the mass forced movement of people (Cooper, 2012). One of the two opposing viewpoints on environmental migration holds that weighing the risks of climate change in the decision to move is sufficient; furthermore, some immovable factors prevent people from staying in their homes, such as customs, environmental interactions, family structures, cultural traits, and demographic patterns. This study examines the concept of climate migration from a variety of angles by comparing various viewpoints on how the environment is degraded as a result of short- or long-term extreme weather events brought on by climate change, as well as various points of view and perspectives from the literature (Saltré et al., 2015; Cianconi et al., 2020). As a result, it has been determined that migration brought on by climate change will impact the whole planet; however, the severity of this impact will vary depending on socioeconomic conditions. In this context, human mobility is less in countries with sufficient economic power, effective adaptation policies, and political stability because these countries are less vulnerable to the risks of climate change; on the other hand, human mobility potential increases because of the rise in socioeconomic stress (Agrawal, 2008). On the other hand, the uncertainty of the international legal definition of the term "environmental refugee" and the absence of legal status of protection may cause many international legal conflicts in the future, notably in human rights (Piguet et al., 2011).

### *Climate Change*

Although climate change and global warming are used interchangeably, they have different meanings. Global warming is defined as an average increase in the temperature of the atmosphere near the earth's surface and the troposphere; Climate change refers to any significant difference in climate measurements (eg, temperature, precipitation, or wind) that persists over a long period (decades or longer) (Nda et al., 2018).

Based on the most recent data available from 1999 to 2018, Figure 1 shows how schools and districts are affected by weather-related loss events (storms, floods, heat waves, etc.) in the 2020 Global Climate Risk Index (Greenwatch, 2020).

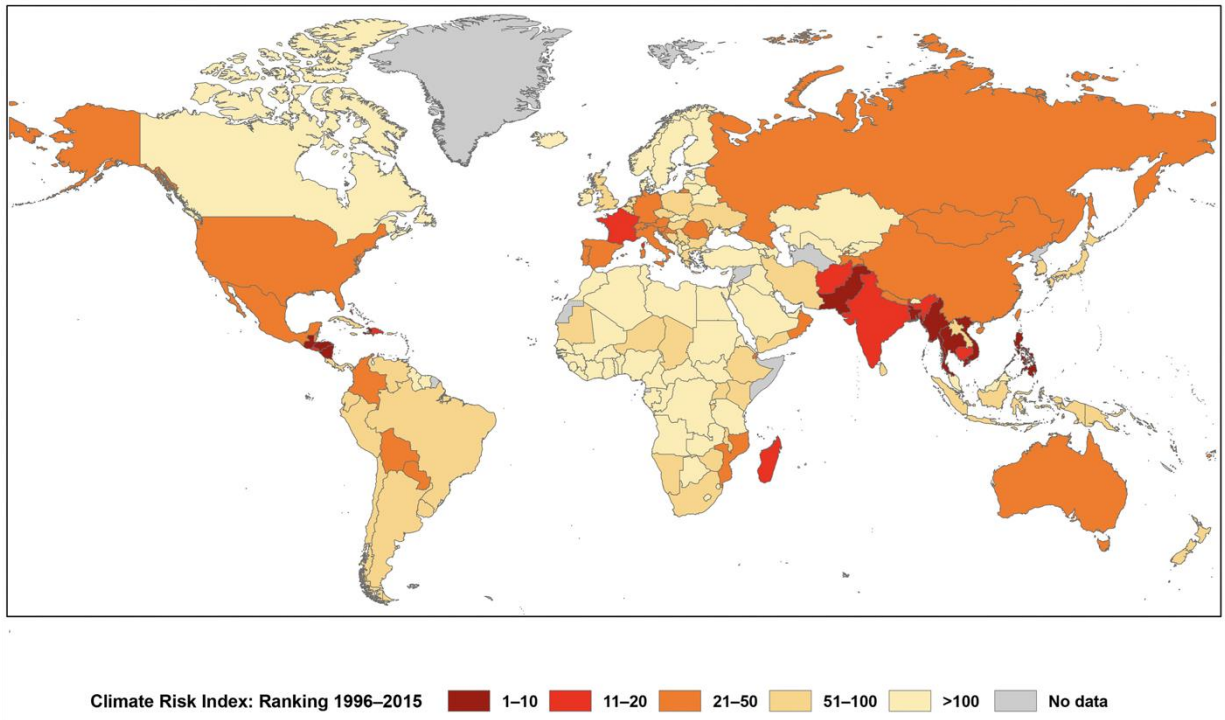


**Figure 1**. Climate Risk Index 2020 from 1999 to 2018 (Greenwatch, 2020).

### *Climate Migration*

During the post-industrial revolution period, environmental changes took on a new dimension. In this process, the destruction caused by human activities has revealed local environmental problems and problems that have begun to be effective on a global scale (Mansoor et al., 2022). Problems such as pollution at the local level and the depletion of natural resources; At the global level, as a

result of issues such as ocean acidification, desertification, deforestation, loss of fertile lands, reduction of biological diversity, and global climate change, people seeking livable areas and consumable resources have begun to migrate in line with the results of the changing climate (Brereton, 2022). Climate migration is moving from one place to another where it is more likely to be lived due to sudden climatic events that change with the climate situation in the long term. Individuals who must change their living space are called “climate refugees.” Based on the search terms "climate migration and human" in Google Scholar, the number of papers discussing human migration due to climate change between 1960 and 2023 is displayed in Figure 2. It can be seen that the number of articles, which began to an essential rise in the year 1990 and continued to do so until 2015 as J shaped trend. and then began to fall after this year.

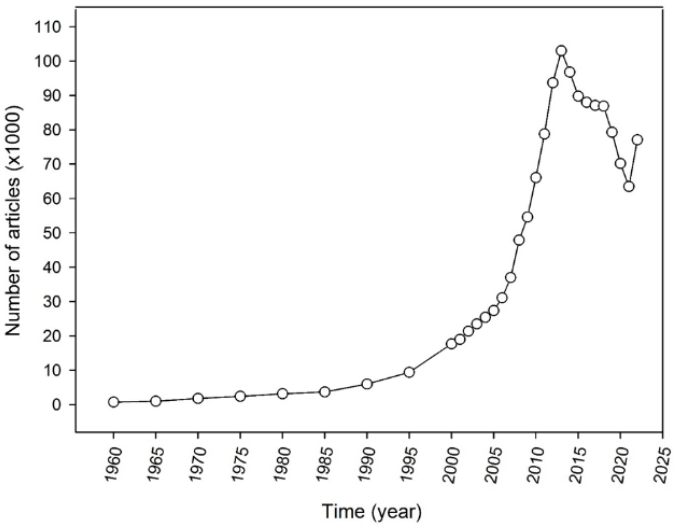


**Figure 2**. Number of articles on climate-induced human migration from 1960 to 2023.

The total number of articles published between 2000 and 2010 remained the same. However, there was an increase in inequality between 2010 and 2015. After that, the number of articles showed a decreasing trend until 2021. There was an increase again in 2022 (Figure 2).

### *Effects of Climate Change*

Climate has played a significant role in species' evolution, change, and diversity from the beginning of environmental life to the present day (Wisz et al., 2013). As a result of climate change, aquatic and terrestrial ecosystems undergo shifts, creating shifts in the biological balance of ecosystems.

### *Decreased Biodiversity*

Biodiversity is a dynamic system that expresses the diversity, harmony, and variability between living things and ecosystems (Ogunkunle et al., 2019). The size of living things in terms of species and numbers is expressed as biological diversity. In other words, “biodiversity” refers to the richness of living things in a region in terms of species and numbers. An ecosystem is formed by living things such as animals, plants, and microorganisms in their living spaces, such as soil, water, and air, living and non-living in functional interaction. Biodiversity is an accumulation that includes genetic, species, and ecosystem diversity, extending since the beginning of life. As a result of climate change, the adverse effects of water, land, and air affect the ecological balance and, thus, biological diversity. This situation causes habitat change, extinction, or migration of some species, while it causes population growth for others. The world's biological diversity has emerged due to a 3.2 billion-year change (Crist et al., 2017). Since the late 1980s in the Mediterranean, some species have migrated from the Eastern basin to the Western basin; tropical fish, such as day fish, is seen in the Mediterranean; fish that need cooler waters, such as sprat, leave the Mediterranean and migrate to the Atlantic Ocean. Profound changes occur in the breeding periods and quantities of some species, and it has been discovered that the cause of these changes is an increase in surface water temperature (Ilık, 2017). The last three decades have shown that the rising average earth temperature has begun to affect the climate distribution in terms of species, as evidenced by the delays of some species, like the white stork, in starting migration, the northward migration of insects and butterflies, and the similar northward migration of mammals (Ilık, 2017). Many physical and biological systems are showing signs of change.

For instance, many species have shifted their distributions towards the pole in the last 30–40 years, an average of 6 km per decade. On the other hand, seasonal events like flowering and spawning occur twice per decade in temperate regions of the Northern Hemisphere; 3 days of Species change and extinction have been a part of this process. Until today, it was thought that 99% of the existing living species were extinct due to this process.

However, while the number of naturally extinct species in a year is limited to one or two species, the number of extinct species due to human influence is estimated to be 1000 per year. The world's average is 15 degrees, and the temperature has increased by 0.6 degrees in the last century (Hughes, 2000). In 2100, this increase is thought to be in the range of 1.4 –5.8 degrees. As a result of the habitats shifting to the north with climate change, with an increase of 3 °C, the living areas of living things will rise 500 m on average and shift to a restricted area (Helmuth et al., 2006). With the increase in temperature in the polar regions and the melting of the glaciers, the habitats of the creatures in this region will increase. By 2100, more than 35% of the species diversity found in Northern Europe will be new to that region, while 25% of the species currently available in Southern Europe will disappear due to climatic conditions (Alkemade et al., 2011). At the same time, it is thought that 18% of plant species and 22% of mammal species will go extinct by 2100 if the average global temperature goes up by 2°C (Nunez et al., 2019).

***Rise in Sea Level***

With global warming, the oceans have absorbed 80% of this excess heat. As a result, sea levels have risen by about 23 cm since 1880, while about three inches of this elevation have been formed in the last 25 years (Griggs & Reguero, 2021). This figure can be explained by two main reasons for the rise in sea level: Thermal expansion: About 50% of the sea level rise in the last century is due to the expansion of the oceans, which have taken up more space, increasing temperatures.

Melting of the glaciers: Before global warming, the glaciers that melted a little during the summer months could return to their former state with the snow falling in the winter months (Bolch et al., 2012). However, the high temperatures caused by global warming have increased the number of melting glaciers in the summer months and reduced the snowfall in the winter months. Conversely, this imbalance raises the sea level due to the melting of the glaciers.

Loss of ice sheets in Greenland and Antarctica: As with mountain glaciers, increased heat is causing the sizable ice sheets covering Greenland and Antarctica to melt faster, raising the water level (Cazenave & Cozannet, 2014). The Intergovernmental Panel on Climate Change; states that with 1.5 degrees of warming in line with this scenario, the oceans will rise between 26 and 77 cm by 2100 (Valone, 2021). This represents a rise sufficient to submerge many cities on the west coast of America. Another analysis, based on NASA and European data, identified an increase of 65 cm by the end of this century.

***Impact on Human Health, Society, and Living Areas***

Urban spaces are the areas where the effects of climate change on people are most intense. With the growth in demand, urbanization, and population growth in urban economies, social carrying capacity is exceeded, and protection systems are weakened. Today, the ecological destruction of economic sectors: and excessive use of water, energy, and raw materials are increasing day by day (Zhang et al., 2022). Accordingly, the urban population's access to basic needs (water, food, energy, etc.) is threatened.

For instance, the heat felt in densely built-up parts of cities enhances the heat's disease-causing influence on human health as temperatures rise due to climate change (McMichael, 2013). Heat waves, stress, childhood nutritional disorders, malaria, and diarrhea are only some of the climate-related health issues. The elderly and people with respiratory and cardiac ailments are particularly vulnerable to the disease factors brought on by these climatic occurrences. Every year, 390 million people worldwide get the disease dengue, which is spread by mosquitoes and is most common in the tropics and subtropics (Nawas et al., 2016). One of the skin symptoms of dengue is a generalized morbilliform rash that can be itchy and heals with desquamation. In a camp for refugees close to Hargeysa, Somalia, dengue cases have been documented in 1985, 1986, and 1987 (Botros et al., 1989).

Dengue outbreaks occurred between August 2015 and February 2016 in 29 refugee camp clinics spread throughout four of the five Darfur provinces in Western Sudan (Ahmed et al., 2019). Although there was a dengue outbreak in eastern Sudan in the early 1900s, the Darfur states had just a few dengue cases documented up to 2014 (Ahmed et al., 2019). During the civil war and mass migration in Darfur, there were a lot of economic immigrants from eastern Sudan (Ahmed et al., 2019). Due to their dire living conditions, immigrants were more susceptible to dengue and other arboviral diseases (Ahmet et al., 2019). Dengue is treated using supportive and non-specific measures (Nawas et al., 2016). Brazil, Mexico, and the Philippines now employ a quadrivalent vaccination (Nawas et al., 2016, Aguiar et al., 2016). A dengue vaccine is a cost-effective public health intervention in Southeast Asia, according to a

comprehensive analysis of the economic evaluation of the practice (Supadmi et al., 2019). Vector management is still considered the most effective public health control strategy in endemic areas.

When we look at the effects of climate change on human health from the point of view of the health sector: health institutions and health workers are also adversely affected due to the increase in costs, occupancy rates, and infectious disease risks.

Experiencing extreme hot and cold days due to climate change, heavy rains and storms causes housing in areas where fragile populations live to become more resistant. In this context, occupational groups working on the climate-compatible transformation of city living spaces should focus on energy efficiency in housing, improvement of technical infrastructure, and transformation by green infrastructure, starting from areas where the fragile population lives. The ethical values of society and social consciousness have an essential effect on increasing public awareness of this issue.

***Climate Migration Around the World***

Climate migration started due to climate change and is a vital threat today. The fight against floods and overflows caused by the melting of glaciers due to climate change and the change in precipitation frequency and severity, causing damage to agriculture and grassland areas and rendering them unusable, enables people to find solutions by migrating. As the climate problem continues, rising sea levels are expected to threaten countries and cities close to sea level and high-altitude countries such as Nepal (Hoy, 2016). According to the RCP 4.5 scenario, which is the lightest of the 4 scenarios put forward by the IPCC (Intergovernmental Panel on Climate Change), if we express the projections of the Meteorology Headquarters (MGM) for Turkey according to their periods:

In the 2016 – 2040 period, the increase in temperatures will generally be around 2°C; the temperature will increase by 2-3°C in the Marmara and Western Black Sea regions in summer, an increase in the Aegean coasts, Eastern Black Sea, and Eastern Anatolia in winter precipitation, and the Aegean coasts and Eastern Anatolia in spring precipitation. Except for the eastern part of Turkey, decreases of around 20% will be seen.

Between 2041 and 2070, the temperature increase will be around 2-3 °C in spring and autumn, an increase up to 4 °C will occur in summer, and there will be a 20% decrease in winter precipitation in Eastern and Southeastern Anatolia and Central and Eastern Mediterranean regions. There will be a 30% decrease in summer precipitation in Eastern Anatolia and a decrease in autumn precipitation, except for the Aegean coasts and a small part of Central Anatolia.

In the 2071-2099 period, temperature increases exceeding 2°C in winter, 3°C in spring and autumn, and 4°C in summer on the Aegean coasts and South East Anatolia, during spring precipitation in the Coastal Aegean, Central Black Sea, and North East Anatolia. It is predicted that there will be a decrease of around 20% except for Anatolian regions, an increase of around 10% in winter precipitation, especially in the coastline, and decreases of up to 40% in summer precipitation, excluding the Aegean, Marmara, and Black Sea coasts, and decreases in autumn precipitation throughout Turkey (MGM, 2014, cited 6th Statement on Climate Change in Turkey, 2016). Figure 3 shows how the weather affects temperatures and how temperatures have changed over the previous half-century (NASA, 2023).

***Climate Refugees in the Global Climate Change and Migration***

Individuals; Migration from one region to another for social, economic, political, and many other reasons is a common phenomenon today (Virupaksha et al., 2014). One factor triggering the migration phenomenon is the change in the environment. Environmental changes such as desertification, loss of forest lands, erosion, and water, air, and soil pollution are considered within the scope of environmental migration. Based on the definition, it is possible to state that there are two main reasons for environmental migration. The first reason is natural disasters such as volcanic eruptions, landslides, and earthquakes. The second is human-induced causes, such as destroying ecosystems due to human activities and the deteriorating ecological balance (Sipahi & Tekin, 2016). It is possible to evaluate migrations due to global climate change within the scope of environmental migration. The Intergovernmental Panel on Climate Change reports list the direct or indirect effects of global climate change among the leading causes of migration (Naser, 2011). In the context of migration, the effects of climate change are classified in two ways. The first effect is climate processes, which include changes such as loss of agricultural land, melting of glaciers, rising sea levels, decreasing water resources, and drought. The second

effect related to migration is climate events, which include changes such as severe hurricanes and floods. These effects push individuals toward forced migration due to climate change. In terms of voluntary migration, climate change affects the local environmental conditions and is effective in the migration of individuals (McLeman, 2017).

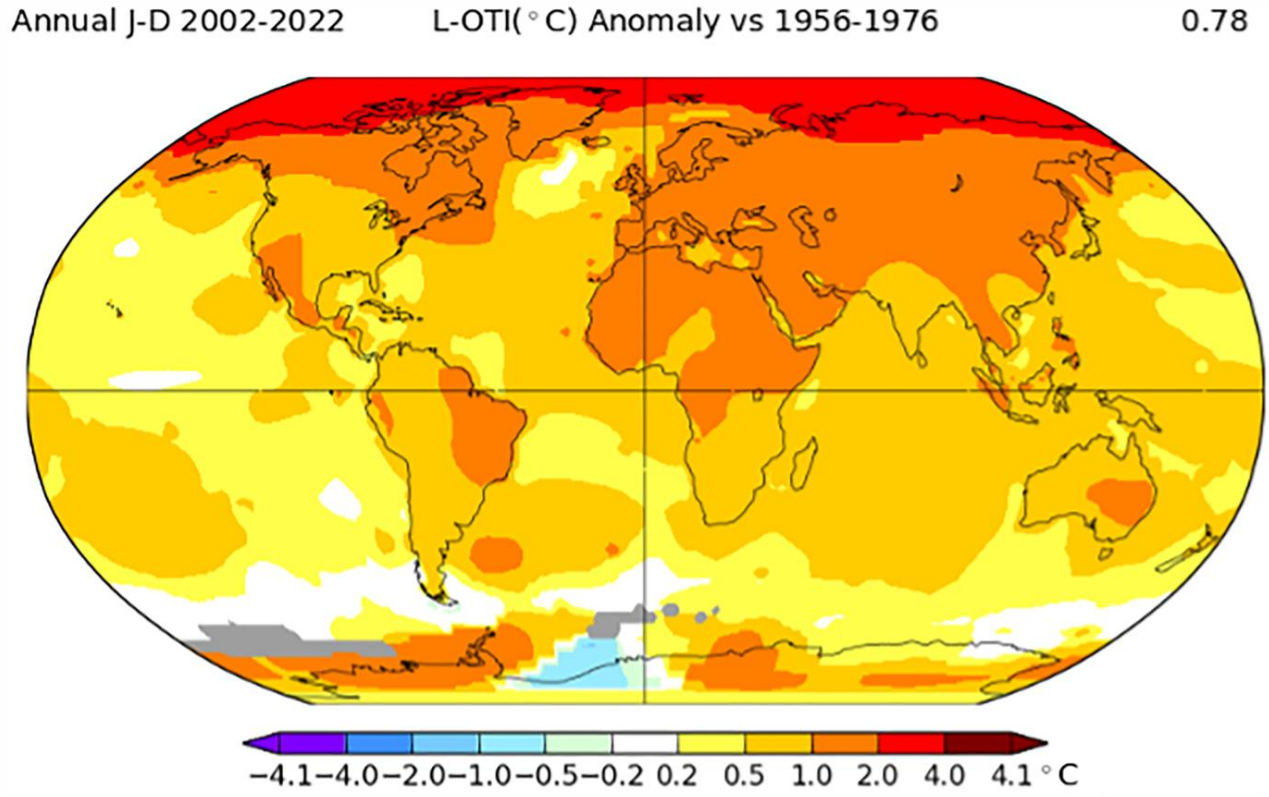


**Figure 3**. Base-state surface temperature anomalies from 1956 to 1976 compared to the 2002-2022 average (NASA, 2023).

The first effect of climate change on global migration is tropical storms and the resulting floods (McLeman, 2017). Storms and raids directly affect internal displacement and migration. Examples of this situation are the migrations after Hurricane Mitch (Central America, 1998), Hurricane Katrina (United States, 2005), Hurricane Aila (Bangladesh, 2009), and Typhoon Haiyan (Philippines, 2013). The second effect is sea level rise. Coastlines with high population density are directly affected by sea level rise. Developed countries, as in the case of the Netherlands, from the effects of uplift, such as coastal barriers and so on. They are protected by vehicles. However, this is different for less developed countries. Countries such as Bangladesh, whose lands are below sea level, are also due to salinization with the increase of agricultural lands; they face problems such as pollution of water resources. There are island countries located in the Indian and Pacific Oceans that are directly affected by sea level rise. In one of these, Tuvalu, approximately one-fifth of the people had to migrate. Again, there are migrations toward livable areas in the Maldives, which consists of many islands. The third effect of climate change on migration is the emergence of semi-arid and arid regions with the change in regional precipitation regimes. Famines in these regions force people to migrate (McLeman, 2017).

### *Climate Refugee Policies*

The term "refugee" is defined as follows in Article 1 of the 1951 Geneva Convention Relating to the Status of Refugees: For this Convention, a "refugee" is someone who is outside the country of his/her nationality and cannot benefit from that country's protection because of his/her thoughts, fears of being persecuted, or does not wish to benefit from it because of such fear, or does not have a nationality and is outside the country (UNHCR, 1951). According to the convention, refugees should reasonably fear being persecuted because of their religion, race, nationality, membership in a social group, or political opinion (Ekşi, 2016).

The Convention clearly defines the refugee concept and limits the content of persecution to those expressed in the definition (Ziya, 2012). The definition does not include

environmental issues such as droughts, floods, and desertification. However, it is undeniable that the scope of persecution has expanded to include environmental issues (Ziya, 2012). At this point, it is necessary to establish the conceptual framework of environmental and climate refugees.

The concept of an environmental refugee was first introduced by Lester Brown in 1976. The concept was later defined by El-Hinnawi in the 1985 United Nations Environment Program report. The concept is expressed in different ways in the literature (environmentally-induced displaced people, environmental refugees, environmentally-induced displaced persons (EDPs), environmental forced populations) (Terminski, 2012), including famine, desertification, deforestation, erosion, and water scarcity. They are individuals who have to leave their habitats due to unusual factors such as storms and floods (Myers & Kent, 1995). According to the United Nations Environment Program report dated 1985, environmental refugees must leave their current habitats due to human or natural environmental risks that endanger their existence or directly affect their quality of life (Biermann & Boas, 2010). On the other hand, the concept of climate refugees has a narrower meaning than the concept of environmental refugees. Global Governance Project climate refugees are individuals who have to leave their habitats due to environmental changes associated with the three effects of climate change (rise in sea level, extreme weather events, drought, and water scarcity). In the Global Political Geography Encyclopedia, “climate refugees” are expressed as individuals who have to relocate due to environmental disasters related to climate change (Terminski, 2012). The fact that environmental damage is not explicitly listed among the threats that should exist for refugee status in the Refugee Convention prevents individuals defined as “climate refugees” from being legally accepted as refugees (McAdam, 2012). International law has two different views regarding the definition of “climate refugees.” The first group advocates changing the scope of the 1951 Geneva Convention and creating a new convention for new categories of refugees. Another group proposes introducing a structure similar to the Guiding Principles on Domestic Residence, issued in 1998, by examining the existing legal mechanisms. The International Organization for Migration (IOM) and the United Nations High Commissioner for Refugees (UNHCR) use the term "environmentally displaced person” (EDPs) instead of the concepts of climate refugee or environmental refugee and treat refugees only within the scope of the 1951 Geneva Convention. However, it is seen that the United Nations Environment Program (UNEP) uses the concept of “environmental refugees.” The concept of climate refugees has begun to be accepted at the national and regional levels. While the Australian Workers Party (ALP) was in opposition, it opposed the government, which did not accept the concept of climate refugees. It called for an international meeting to accept people from island countries in the Pacific Ocean as climate refugees. In 2007, the Australian Green Party prepared a draft law on climate refugees (Biermann & Boas, 2010). The scope of the refugee concept has been widely discussed in the Organization of African Unity Convention and the Cartagena Declaration. Among the reasons for becoming a refugee under the Organization of African Unity Convention are cases where public order is seriously disturbed. The convention does not include the concepts of climate refugees and environmental refugees. However, the phrase “events that seriously threaten public order in a part or whole of its own country” allows environmental disasters caused by climate change to be evaluated within this scope. In the Cartagena Declaration, it is recommended to broaden the scope of the refugee concept. The concept of climate refugees and environmental refugees is not directly included in the declaration. The reasons to be accepted as a refugee are expressed as general violence, external pressures, internal turmoil, violations of human rights, and other factors directly disrupting public order. It is possible to indirectly expand the scope of the refugee definition by including environmental issues, among other elements (McAdam, 2012). Individuals who cannot return to their home country due to environmental disasters are provided with separate protection from refugee status, according to an article in the Swedish Foreigners Law (Ekşi, 2016). The amendment to refugee law in Australia includes the definition of “climate refugees” and empowers the Department of Immigration to issue visas to persons displaced by climate change-related disasters. On the other hand, New Zealand accepts people displaced by climate change under the name of the Pacific Access Category in annual numbers (McAdam, 2012). The European Union Temporary Protection Directive (EU Temporary Protection Directive) states that the article protecting migrations due to armed conflicts can also be applied to

those displaced due to climate change disasters (Ziya, 2012). Since the relevant article (Article 2/C) does not regulate the scope of the directive in detail, it is possible to include climate refugees in this scope as well status remains limited.

**Solution proposals**

Nature's solution to climate change one whale is worth thousands of trees for saving the planet. Scientific research indicates more clearly than ever that our carbon footprint—the release of carbon dioxide (CO2) into the atmosphere, which contributes to global warming through the so-called greenhouse effect—now threatens our ecosystems and our way of life. However, efforts to mitigate climate change face two significant challenges. The first is to find effective ways to reduce the amount of CO2 in the atmosphere or its impact on average global temperature. The second is to raise sufficient funds to put these technologies into practice. Many proposed solutions to global warming, such as capturing carbon directly from the air and burying it deep in the earth, are complex, untested, and expensive. What if there were a low-tech solution to this problem that is effective and economical and has a successful funding model? An example of such an opportunity comes from a surprisingly simple and essentially “no-tech” strategy to capture more atmospheric carbon: increase global whale populations. Marine biologists have recently discovered that whales—especially the great whales—play a significant role in capturing carbon from the atmosphere (Roman et al., 2014). Moreover, international organizations have implemented programs such as Reducing Emissions from Degradation and Deforestation that fund the preservation of carbon-capturing ecosystems. Adapting these initiatives to support international efforts to restore whale populations could lead to a breakthrough in the fight against climate change (Chami, 2014).

***Planned resettlement principle***

Storms, invasions, and famines are some unforeseen occurrences that people experience due to climate change (Degroot et al., 2018). However, voluntary relocation and resettlement programs could be made by studying how often and how these things affect people.

***Principle of resettlement instead of temporary asylum***

Long-term climate refugees (those who live on islands first submerged by sea level rise) will be unable to return to their natural homes in huge numbers. Resettlement rather than transitory asylum should thus be the focus of initiatives for climate refugees.

***The principle of collective rights for local communities***

The 1951 Geneva Convention's Article 1 establishes the refugee regime's person- and state-based nature. Communities' collective rights are irrelevant when it comes to refugees. In contrast, a climate refugee regime should include the whole country, including specific towns, cities, regions, or tiny island nations.

***The principle of international assistance to domestic measures***

Because climate refugees are generally under domestic protection and extreme weather events affect certain parts of the country, the international regime focuses less on the refugee issue. However, the international system should back programs to help people return to their home countries and set up a protection system.

***The principle of international burden sharing***

The most significant contributors to the rise of the global issue of climate change are industrialized nations (Moore, 2009). These countries should be involved in making policies for people who have to leave their homes because of climate change. During this process, joint relief funds can be set up for countries most hurt by climate change. All nations, especially affluent ones, are accountable for establishing the climate refugee system. As part of this process, it is also essential to provide tangible proof of the connection between security and climate migration, forecast the future using case study analysis, and assess the likelihood of conflict. With the collaboration of many players, including governments, the global civil society, and multinational corporations, on a common platform, an effective and efficient implementation regime for climate refugees may be established (Boas, 2015; McLeman, 2017).

**Design Suggestions**

***Biophilic Design***

Professor of social ecology Stephen Kellert invented the phrase "biophilic design" in the 1980s. Kellert used the phrase "assessment of the notion of biophilia for the design of the built environment" to refer to biophilic design. This strategy investigates how to maintain interactions between people and the natural world and the positive impacts of nature on the built environment. By reassessing the biophilic design principles created by

Stephen Kellert for architectural design from the standpoint of interior design, he helped create a guide. The biophilia theory, developed by biologist Edward O. Wilson, served as the foundation for this area, a subfield of ecological and sustainable design. The term "man's natural emotional connectedness to other living species" describes the biophilia idea.

***Spatial Design with Waste Water Conversion***

Blue and green infrastructure-oriented design is one of the spatial solutions applied to transform rapidly growing cities due to population growth into climate-sensitive sustainable cities. This approach, which aims to design sustainable, healthy, and resilient cities, reveals the creation of active green areas that allow each individual in society to use and access them by combining grey, blue, and green design elements (Parlak & Atik, 2020).

***Zero Carbon Cities***

Carbon emission has a large and significant share in climate changes experienced by global warming (Jorgenson et al., 2019). Carbon emission is the amount of carbon a person or group puts into the atmosphere. When you look at cities, you can see how their carbon emissions affect the climate by looking at energy use, transportation, waste management, building, and industrialization.

***Mitigating Climate Change***

To meet the goals of the Paris Agreement, every person on Earth must emit less than one ton of carbon dioxide. This agreement included the following:

Climate Change and Government Duties

Paris Agreement must be ratified

No aid allowance should be given to fossil fuels.

A carbon tax law should be enacted.

Restrictions should be placed on thermal power plants.

Protect coastal ecosystems and forests and plant trees. (This method can also reduce carbon by $20 per ton or less.

At the 21st Meeting of the Parties held in Paris at the end of 2015, 180 countries signed the Paris Agreement, which will come into effect after the Kyoto Protocol.;

Global warming mitigation entails releasing fewer greenhouse gases into the atmosphere and sucking GHGs from the atmosphere. Many things are needed. Most importantly, governments should drop fossil fuel subsidies, shut down coal-fired power plants, and use fewer natural gas-fired power stations.

**Conclusion**

One of the areas that climate change will directly or indirectly affect is security. Global climate change is a phenomenon that has the potential to penetrate every aspect of human life. Although the inclusion of the climate issue in the security issue is a matter of debate, if the current situation continues, climate change can potentially cause border disputes, conflicts over energy issues, social tensions, and mass migrations. Focusing on the global issue of climate change should be the first step in managing the issue of climate refugees and preventing the formation of security issues. At this point, it is crucial to lessen the consequences of climate change and recognize that nature has set boundaries for human activity. Identifying the international legal status of refugees is the first step in directly addressing climate refugees. In this sense, the statuses recognized in nations like Australia can be applied to international legal norms. The proposed resettlement of islanders in the Pacific is another action to be conducted shortly. Programs for temporary protection still need to be improved for those who have lost all their housing options. At this stage, it is vital to develop rules that offer long-term settlement while considering things like family, language, and previous settlement. Another measure is creating humanitarian funds for nations most negatively impacted by climate change. Climate refugees and global warming should be considered among the variables influencing national and international security strategies. The United Nations, governments, non-governmental groups, and multinational corporations must work together to establish an international framework for climate refugees. Climate migration will be lessened if the elements that lessen climate change and the models created in this context are used, and its financial costs will be avoided.

**Ethical Approval**

No need to ethical approval for this study.

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**Conflict of Interest**

The authors declare that they have no conflict of interest.

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