Final Report of the Project for Preparation of Corporate Energy and Climate Action Plan

DECEMBER 2022

Ümit Nysal Belediye Başkanı

İklim ve her şey

Covenant of Mayors for Climate & Energy EUROPE

ICLEI Local Governments for Sustainability

MURATPAŞA Belediyesi
ANTALYA

Preface

Everything that surrounds us... the sky, the blue seas, the bird in the air, the green tree, and the plowed land has a future. But we are now facing an acute climate crisis and environmental problems. The problem is no longer behind Mount Qaf, in an unknown future. The problem manifests itself in the flower that blooms out of season, in the snow that falls in May, in the absence of the expected summer/ winter. One side of our country is struggling with fires and the other with floods. All these problems are blatantly in front of us and the damage they cause is incomparable to the past.

'Environmentalism' is no longer a state of social sensitivity. The climate crisis and environmental problems directly threaten our lives. And for this reason, it is time to do what we can together.

In the Mediterranean basin, of which Antalya is a part, the consequences of the climate crisis are very evident. Drastic changes are taking place both in our vegetation, marine life and water source graphs. We have to enforce planned actions that get direct results. We have to determine the ways and methods of this struggle by exchanging information with our scientists.

I would like to express our openness and readiness to cooperate as a local government on the climate crisis and environmental problems, which we have identified as our main areas of work.

In line with these principles, our aim is to revise strategic plans by determining greenhouse gas emissions resulting from municipal unit activities, and to create and adopt a climate-resilient approach in municipal services. We concretely demonstrate our goals by committing to reduce emissions from our municipal activities within the borders of Muratpasa district by 40% by 2030.

I hope that our study will serve as a guide for

climate-sensitive and resilient urban planning and demonstrate our determination in this regard, and I would like to thank all the representatives of institutions, our esteemed professors and my colleagues from Muratpasa Municipality for their contributions and opinions.

I sincerely believe that our neighbours in Muratpasa will provide all the support to combat global climate change by relying on their environmental sensitivity.

Ümit UYSAL
Mayor of Muratpasa Municipality

MURATPASA MUNICIPALITY

Ümit Uysal, Mayor of Muratpasa Municipality

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Republic of Turkey Ministry of Agriculture and Forestry
Antalya Provincial Directorate of Agriculture and Forestry
Republic of Turkey Muratpasa District Governorate
Muratpasa District Directorate of Agriculture and Forestry
13th Regional Directorate of State Hydraulic Works
4th Regional Directorate of Meteorology in Antalya
Antalya Metropolitan Municipality (AMM) Antalya General Directorate of Water and Wastewater Administration (ASAT)
AMM Department of Environmental Protection and Control
AMM Department of Climate Change and Zero Waste
AMM Department of Zoning and Urbanization
AMM Department of Transportation Planning and Rail System
AMM Department of Urban Aesthetics
AMM Department of Parks and Gardens
AMM Department of Agricultural Services
TMMOB Chamber of Environmental Engineers
TMMOB Chamber of Electrical Engineers
TMMOB Chamber of Food Engineers
TMMOB Chamber of Civil Engineers
TMMOB Chamber of Mechanical Engineers
TMMOB Chamber of Architects
TMMOB Chamber of Forest Engineers
TMMOB Chamber of Landscape Architects
TMMOB Chamber of Urban Planners
TMMOB Chamber of Agricultural Engineers
TMMOB Chamber of Geological Engineers
TBB (Turkish Bars Association) Antalya Bar Association
TTB (Turkish Medical Association) Antalya Medical Chamber
Akdeniz Elektrik Dagitim A.S.
Antalya Urban Council
Antalya Regional Directorate of Forestry
Western Mediterranean Agricultural Research Institute (BATEM)
Kepez Municipality
Konyaalti Municipality
Aksu Municipality

Internal Stakeholders

Abdullah Sevimcok Civil Society and Innovation Center (ASSIM)
Directorate of Press and Publication
Directorate of Information Processing
Directorate of Environmental Protection and Control
Directorate of Support Services
Directorate of Foreign Affairs
Directorate of Real Estate and Expropriation
Directorate of Survey and Project
Directorate of Public Works
Directorate of Public Relations
Directorate of Zoning and Urban Planning
Directorate of Enterprises and Subsidiaries
Directorate of Urban Design
Directorate of Nursery
Directorate of Culture and Social Affairs
Directorate of Financial Services
Directorate of Parks and Gardens
Directorate of Plan and Project
Directorate of Licenses and Inspections
Directorate of Health Affairs
Directorate of Social Support Services
Directorate of Social Welfare Affairs
Directorate of Sports Affairs
Directorate of Strategy Development
Directorate of Cleaning Services
Directorate of Veterinary Affairs
Directorate of Building Control
Directorate of Municipal Police

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1. EXECUTIVE SUMMARY

1.1. Purpose and Summary of the Study

Today, it is scientifically proven that climate change is caused by greenhouse gases released into the atmosphere as a result of human emissions. However, technological developments in recent years have shown that it is possible to both slow down and stop this change without significant changes in our quality of life.

In our country, per capita greenhouse gas emissions are well below the world average. However, this does not mean that there is no harm in increasing our dependence on fossil fuels, which we generally procure from abroad with greenhouse gas emissions. What we need to do is to build resilience in energy supply and use, eliminating fossil fuel-related air pollution and vulnerabilities by using green energy sources. Regardless of whether we are responsible for it or not, climate change adversely affects our current life and quality of life. What needs to be done in this regard is to correctly identify the risks on the basis of climate change and to build resilience against them. The aim of this study is to determine how Antalya Muratpasa Municipality will be affected by the threats arising from climate change as an institution, to mitigate the impact with action plans and to draw a roadmap with ongoing projects within the framework of a plan until 2030 regarding the reduction of greenhouse gases that cause climate change.

In our study, firstly, the extent to which directorate will be affected by climatic threats that will cause Muratpasa Municipality Antalya to be unable to fulfil its municipal activities has been determined with the workshop attended by internal and external stakeholders. Then, actions to develop resilience against these climatic factors were identified. Finally, in the light of the data received from the municipal directorates, a roadmap was prepared for reducing the emission values of the gases causing climate change by at least 40% by 2030 compared to 2019, which was selected as the reference year in accordance with the Convenant of Mayors-CoM for Climate and Energy.

In the study, emission factors are obtained from the Intergovernmental Panel on Climate Change (IPCC), national greenhouse gas inventory datasets and literature, and calculations are performed with the Tier 1 method.

1.1.1. Genel Sonuçlar

In the first phase of the study, Muratpasa Municipality Antalya held a workshop with internal and external stakeholders, and it was determined to what extent which directorates of the municipality could be affected by excessive precipitation and flooding, extreme weather events, wave of cold air, sea level rise, wave of hot air and drought, forest fires, water pollution and infectious diseases caused by climate change. In this workshop, stakeholders were informed about the fields of activity of the directorates and the factors observed in the city centre of Antalya due to climate change. In the workshop, it was determined that the activities of the directorates will be disrupted mostly due to infectious diseases. Excessive precipitation and flooding, extreme weather events and water pollution are other climatic parameters that will affect the activities of the directorates. In the light of the activity data of the directorates between 2018 and 2021, the corporate greenhouse gas emissions of Muratpasa Municipality Antalya were calculated separately for three scopes as carbon dioxide equivalent using the Global Protocol for Local Greenhouse Gas Emissions (GPC). The first scope includes emissions from natural gas consumption and motor vehicle fuels that cause greenhouse gas emissions through direct consumption, the second scope are emissions associated with the purchase of electricity from the grid, and the third scope are emissions associated with water supplied from the grid. The results are presented in Table 1.1. It was determined that emissions decreased in 2020 and 2021, as in the whole world, especially as a result of the COVID-19 Pandemic, which also affected our country in March 2020. In 2019, it was determined that the most important emission sources consisted of stationary combustion and purchased electricity. The per capita emission calculated by performing a Business-As-Usual (BAU) scenario study based on the emissions in 2018 and 2019 will decrease by 47.6% from 30 kgCO2e in 2019 to 15.0 kgCO_2e by 2030 with the implementation of mitigation and adaptation action plans (Figure 1.1).

Table 1.1. Corporate carbon dioxide equivalent emissions of Antalya Muratpasa Municipality between 2018-2021 by sub-divisions

Kapsam ($kg CO_2e$)		2018	2019	2020	2021
Kapsam 1	Sabit Yakma Kaynakları	3.276.382	4.216.257	2.974.529	2.471.493
	Mobil Kaynaklar	3.871.052	3.872.306	3.756.670	3.678.442
Kapsam 2	Satın Alınan Elektrik	5.096.207	4.639.708	3.892.788	3.987.665
Kapsam 3	Su Tüketimi	1.885.319	1.882.125	1.485.810	1.394.361
	Toplam Salınım	14.128.960	14.610.397	12.109.796	11.531.961
	Nüfus	495.688	510.368	513.035	521.183
	Kişi Başı Salınım ($kgCO_2e$/kişi)	**28,5**	**28,6**	**23,6**	**22,1**

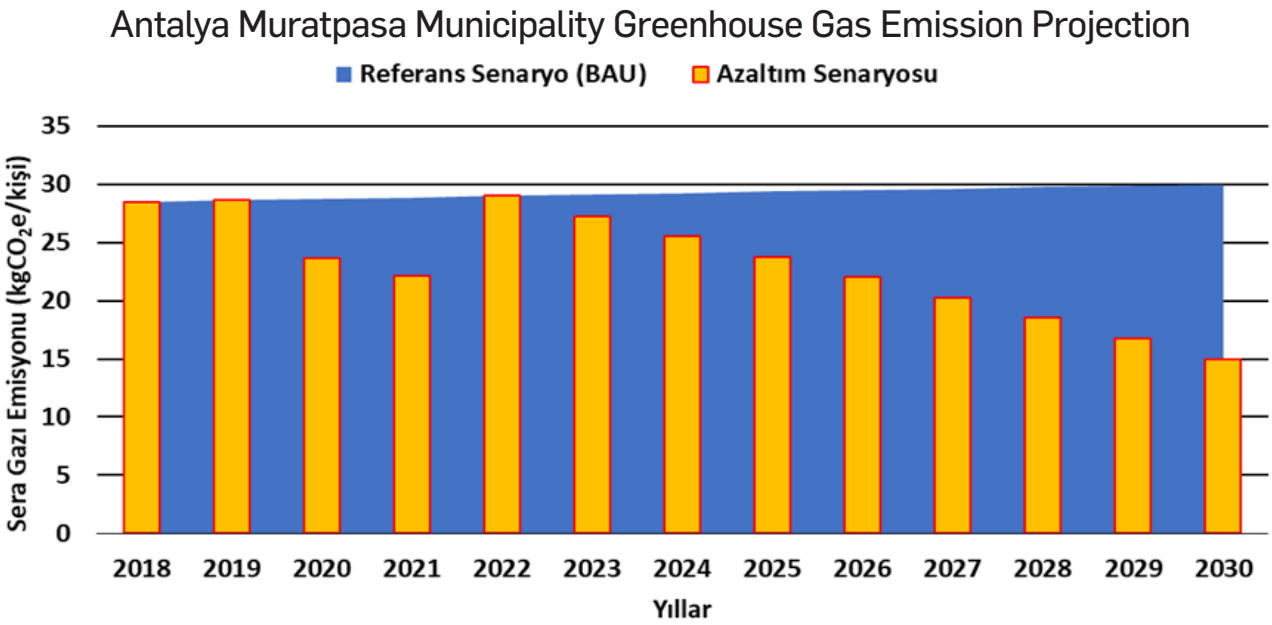

Figure 1.1. Antalya Muratpasa Municipality Greenhouse Gas Emission Projection

1.1.2. Mitigation and Adaptation Actions

Mitigation and adaptation action plans have been prepared by taking into account the data set created in line with the mitigation scenario calculations, meetings held with the relevant directorates and internal and external stakeholder workshop data.
Actions are gathered in 48 items under 9 sub-headings, 10 of which are mitigation and 38 of which are adaptation action plans. Mitigation actions fall under the energy sub-heading and the main objective is to provide resilience to the municipality in terms of energy supply by eliminating vulnerabilities due to fossil fuels. Among the adaptation actions, 4 are on land use, 9 on disaster management, 7 on buildings, 2 on energy, 1 on food security, 4 on institutional, 4 on health, 6 on water and waste management and 1 on transport.
The Corporate Sustainable Energy and Climate Action Plan, prepared for the first time in Turkey with a focus on corporate actions, will be a complementary guide to Muratpasa Municipality's efforts to become a municipality resistant to climatic threats and in harmony with nature.

2. GLOBAL CLIMATE CHANGE AND TURKEY'S ROADMAP

2.1. Global Climate Change

Climate is the average state of all weather conditions experienced or observed in any part of the earth over many years, or, more systematically, the synthesis of weather conditions in a given area, defined by long-term statistics such as variability and average values of atmospheric elements. The Earth is 4.6 billion years old and its climate is constantly changing. It has been observed that the global average surface temperature has changed between 15^0 C and -5^{0}C in the last 60 million years compared to the values between 1850 and 1900 (Figure 2.1). Especially for the last 1 million years, the global average temperature has remained below the values between 1850 and 1900. With the industrial revolution, a rapid increase in temperatures has been observed.

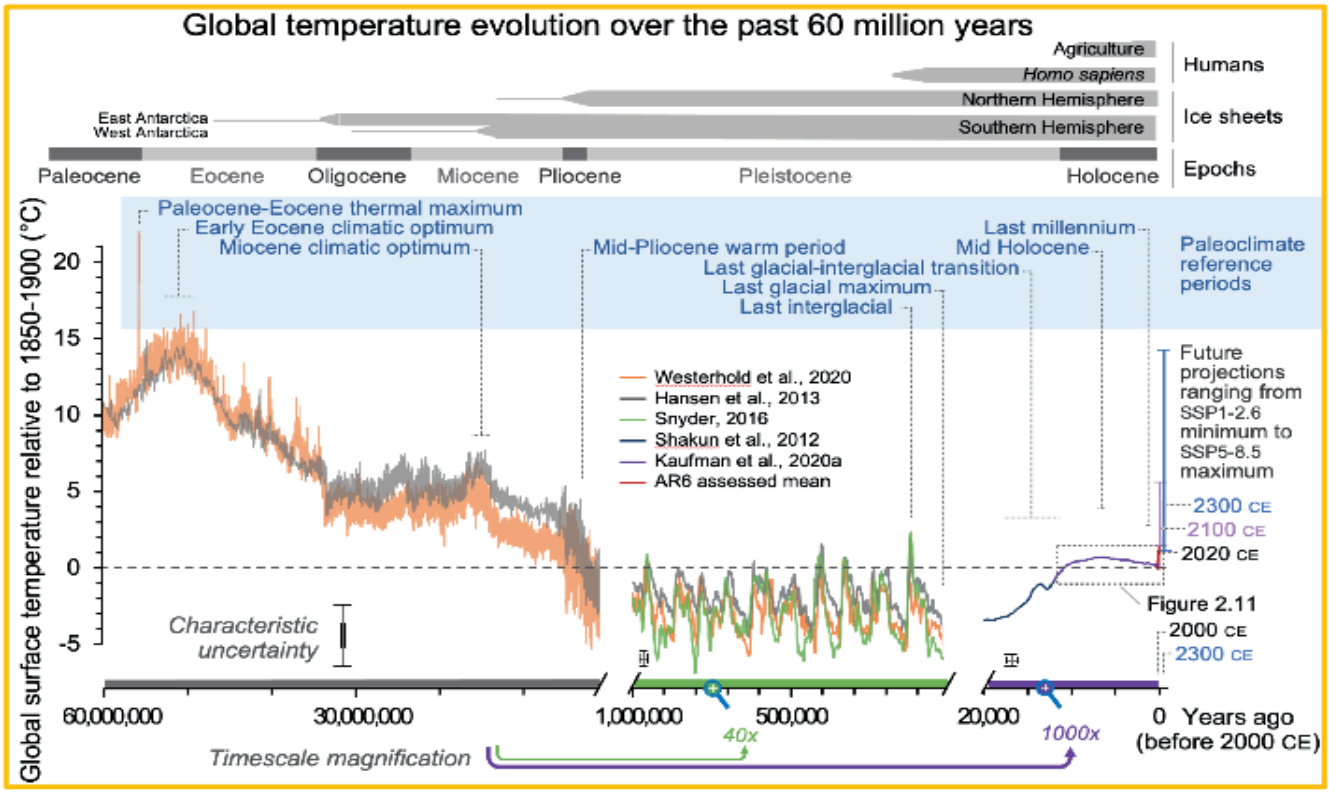

Figure 2.1. Global temperature development over the last 60 million years (IPCC, 2021)

The global climate is a very complex system with five main components, namely the atmosphere (air sphere), hydrosphere (water sphere), ice sphere, lithosphere (stone sphere) and biosphere (life sphere), and the interactions between these components, and is also referred to simply as the climate system. This system changes gradually over time, either under the influence of its own internal dynamics or due to changes in external factors (so-called forcings). External forcings include natural events such as volcanic eruptions and solar variations, and anthropogenic changes in the composition of the atmosphere (Türkeş, 2019). The rays coming from the Sun to the Earth are the power source of the climate system. There is a general balance between the rays coming to the Earth from the Sun and the rays reflected back from the Earth. The elements that provide this balance, also described as climatic drivers, are shown in Figure 2.2. Some of the short wavelength

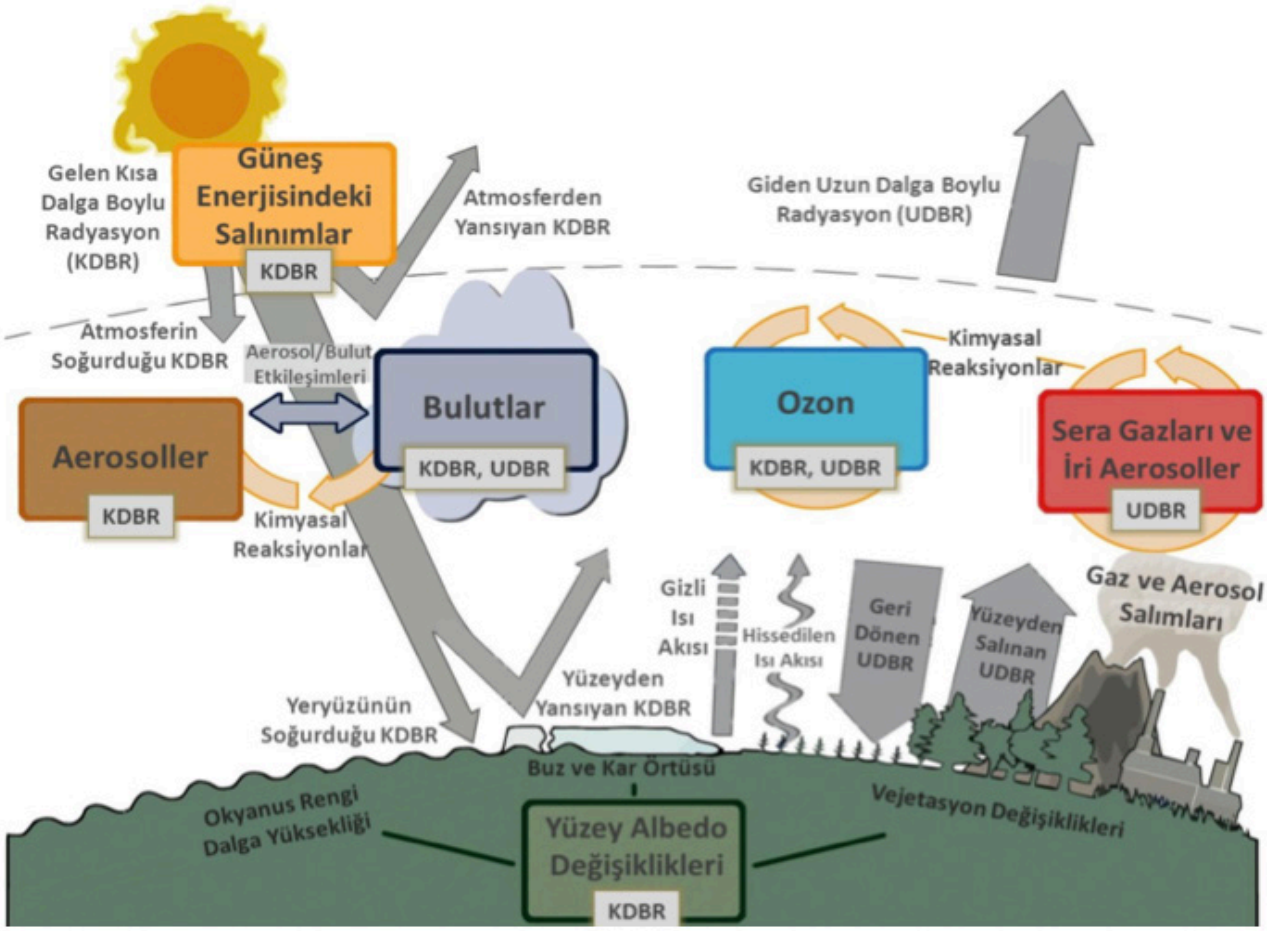

Figure 2.2. Main drivers of climate change (Türkeş, 2019)

radiation (SWR) from the sun is reflected back from the atmosphere, some of it is absorbed in the atmosphere and the remaining part reaches the earth. Long wavelength radiation (LWR) is emitted from the Earth. Some of the LWR is captured by various components of the atmosphere, some is reflected back to the Earth and some is reflected into space. Climate drivers that retain and reflect SWR away from the Earth cause the Earth to cool, while drivers that retain and reflect LWR back to the Earth cause the Earth to warm and hence increase the temperature. Gases that retain LWR and reflect it back to the Earth are called greenhouse gases. Carbon dioxide, methane, nitrous oxide, halogenated hydrocarbons, aerosols and ozone observed at ground level are known as the main greenhouse gases (Türkeş, 2019).

The issues that affect the radiation balance of the Earth and thus change the climate can be analysed under seven headings (IPCC, 2021).

2.1.1. Change in solar radiation

The leading cause of the change in radiation from the Sun to the Earth is the solar flares. Due to these flares, the eruptions occurring in the Sun affect the total radiation coming from the Sun. It generally proceeds in 11-year radiative cycles. The change in solar radiation in the recent past is shown in Figure 2.3.

The global average climatic forcing on solar activity is in the range of -0.06 to +0.08 W/m^2.

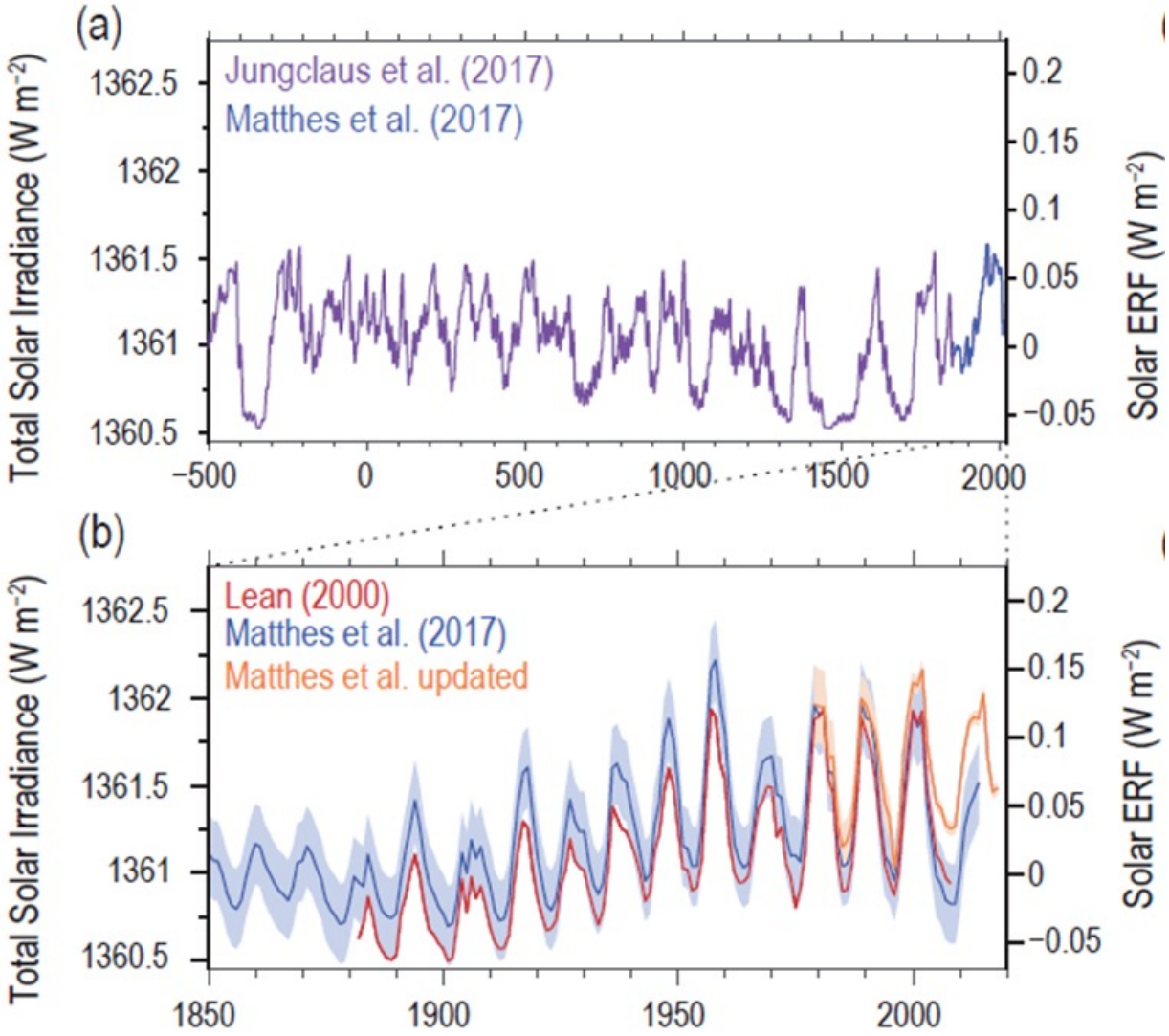

Figure 2.3. Solar radiation by year (left axis) and its effect on climatic forcing (right axis) (IPCC, 2021)

2.1.2. Change in Earth's orbit

The long-term, cumulative effects of changes in the Earth's position relative to the Sun have been found to be a strong driver of the Earth's long-term climate, influencing the onset and end of glacial periods. Three types of variations in the Earth's orbital motion are analysed to determine how much solar radiation reaches the top of the Earth's atmosphere, where the insolation reaches, and how this insolation is affected.

These cyclic orbital motions, known as Milankovitch cycles, have been found to cause up to 25 per cent changes in the amount of incoming insolation in the Earth's mid-latitudes (areas of our planet between about 30-60^0 north and south of the equator). The shape of Earth's orbit, known as eccentricity; the angle Earth's axis is tilted with respect to Earth's orbital plane, known as obliquity; and the direction Earth's axis of rotation is pointed, known as precession. Figure 2.4 shows the climatic forcing created by each cycle.

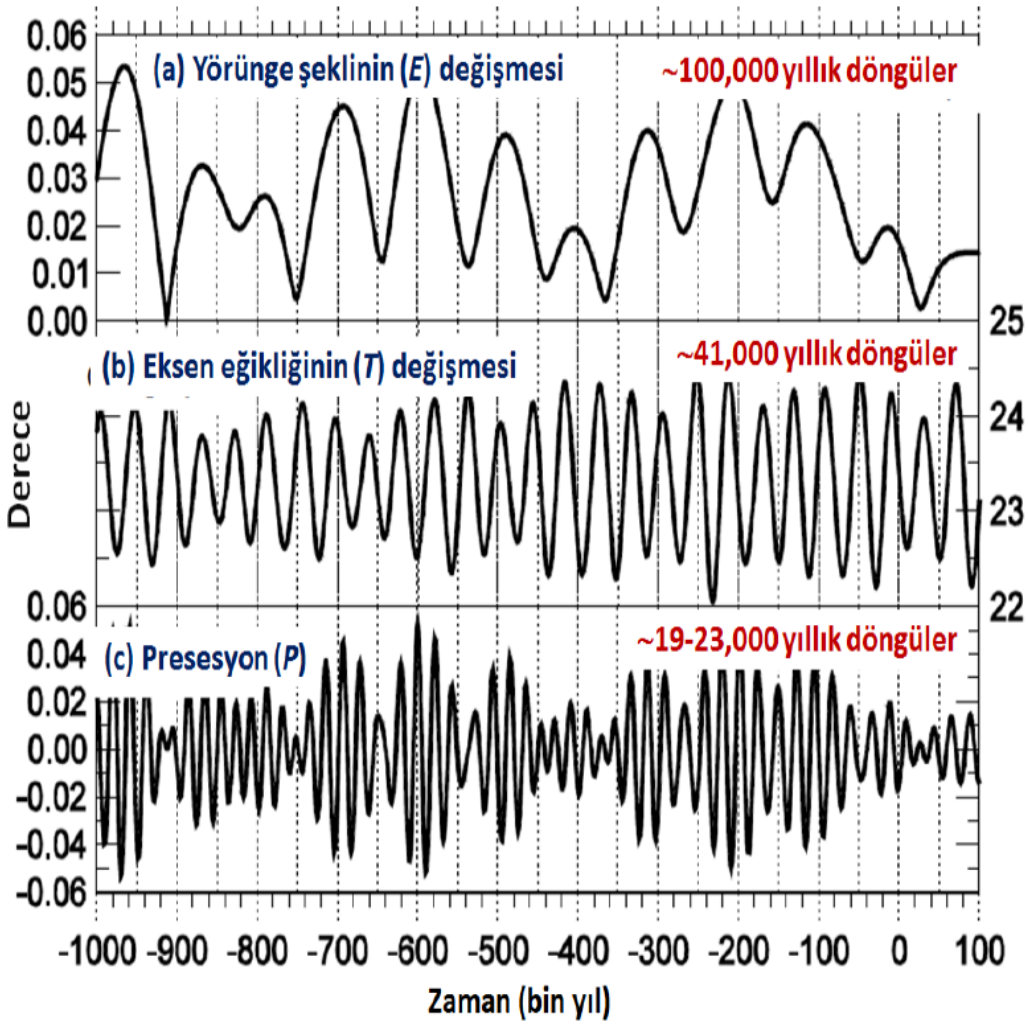

Figure 2.4. Changes in the Earth's eccentricity (a), axis tilt (b) and climatic precession (c) over the last 1 million years and the next 100 thousand years (Year 0 corresponds to 1950 AD) (Türkeş, 2019)

2.1.3. Aerosols released into the stratosphere by volcanic emissions

After large volcanic eruptions, a significant amount of aerosol (dust) is released into the Stratosphere, the second layer of the atmosphere closest to the ground. The lifetime of an aerosol in the Stratosphere exceeds a few years, since the air mass transition between the Troposphere and the Stratosphere, where we live, is not frequent due to the temperature profile. Due to their size, these aerosols retain both the rays coming from the Sun and the rays reflected back from the Earth. The net radiative effect of these aerosols is to cool the Earth. This effect lasts for several years after the volcanic eruption. The amount of aerosols observed in the Stratosphere as a result of volcanic eruptions in the last 2500 years and the radiative forcing determined in connection therewith this are shown in Figure 2.5.

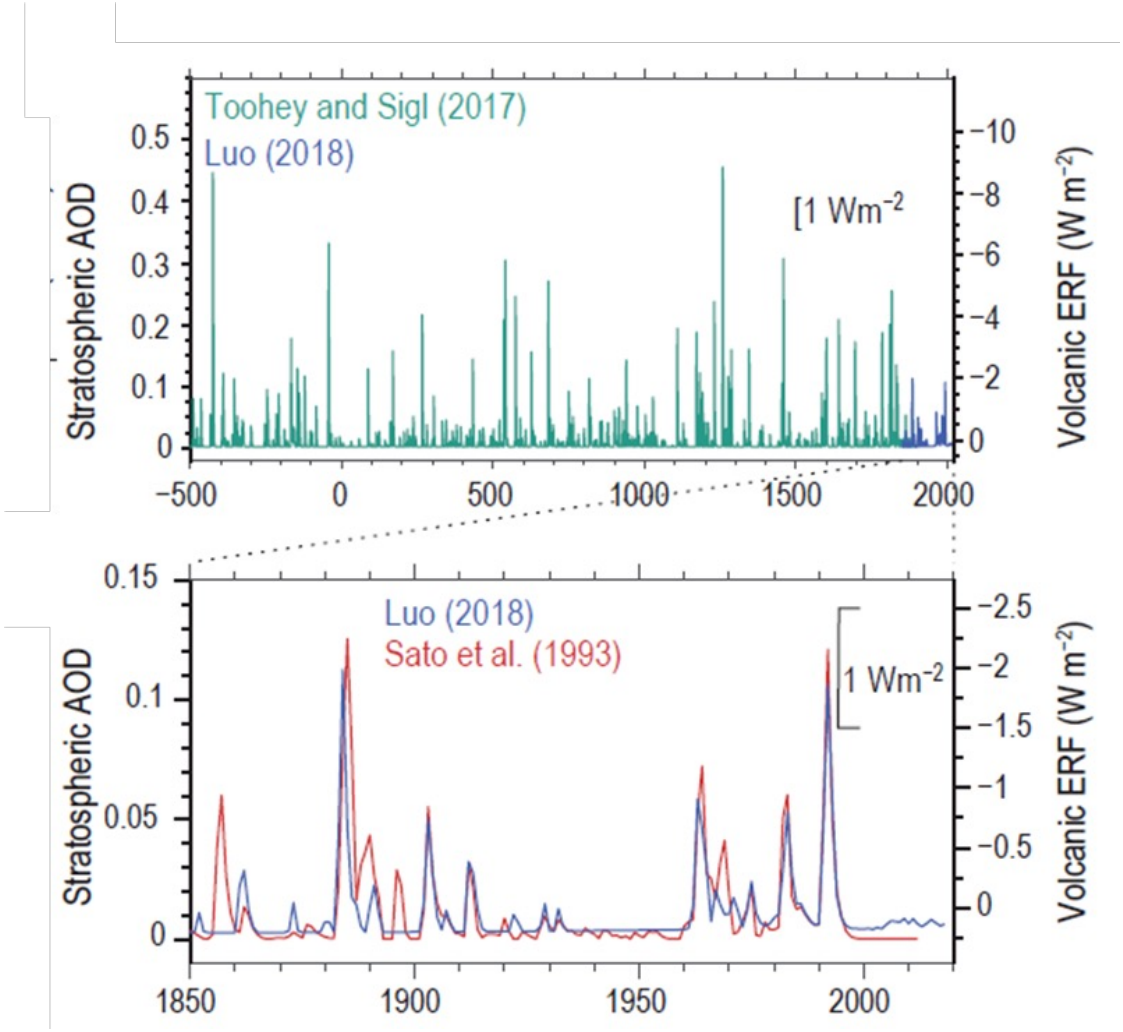

Figure 2.5. Aerosol concentration in the Stratosphere as a result of volcanic eruptions over the last 2500 years (left axis) and the climatic forcing caused by this aerosol concentration (right axis) (IPCC, 2021)

2.1.4. Greenhouse gases that mix well in the atmosphere

Greenhouse gases that mix well in the atmosphere are carbon dioxide, methane and nitrous oxide gases. These gases have both natural and human-induced emissions. While the mixing ratio of carbon dioxide in the atmosphere was at the level of 1750 ppm 350 million years ago, it has changed approximately 150-250 ppm between the last 800 thousand years and the industrial revolution. While it was 280 ppm in 1750, it increased to 415 ppm in 2022 faster than ever before in history (Figure 2.6). The situation is similar for other well-mixing greenhouse gases. While the mixing ratios of methane and nitrous oxide were 0.750 ppm and 0.270 ppm before the industrial revolution, today's mixing ratios have reached 1.9 ppm and 0.335 ppm. Although the mixing ratios of these two gases are lower than carbon dioxide, it has been determined that a methane molecule has 28 times more greenhouse effect than a carbon dioxide molecule and a nitrous oxide molecule has 273 times more greenhouse effect than a carbon dioxide molecule. Although the greenhouse effect caused by carbon dioxide and other greenhouse gases in the atmosphere has been known since the 1990s, the rate of increase in the mixing ratios has continued to increase over the years (Figure 2.7). As of 2019, the climatic forcing by carbon dioxide, methane and nitrous oxide was determined as 2.16, 0.54 and 0.21 W/m2, respectively (IPCC, 2021).

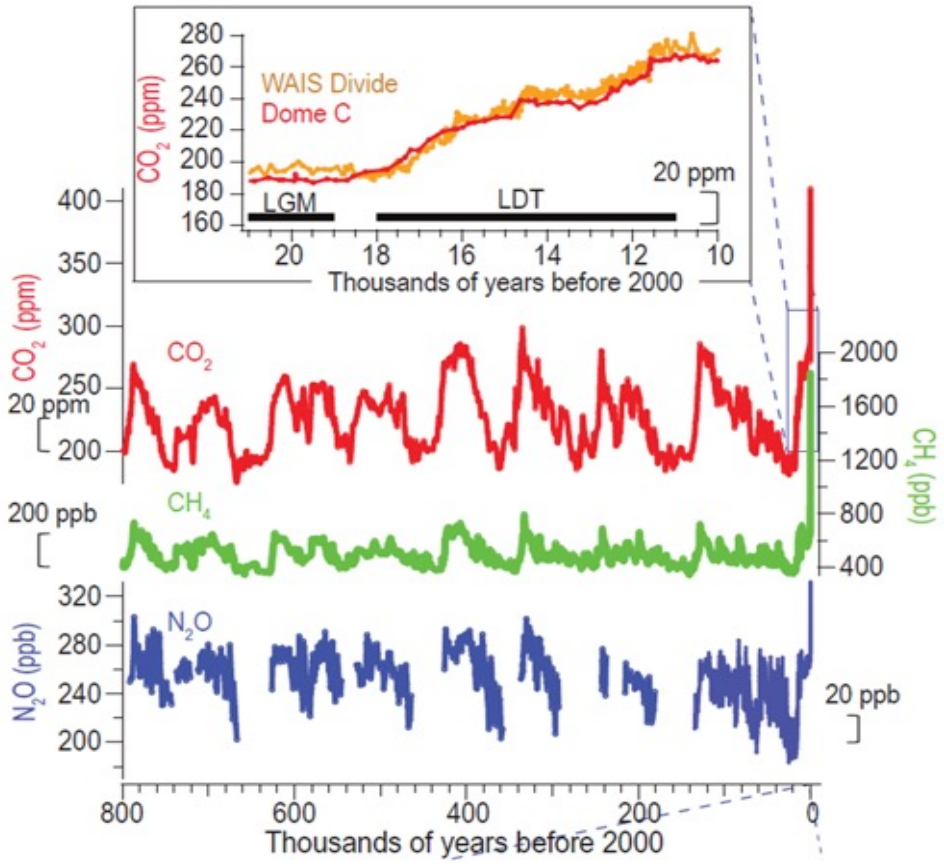

Figure 2.6. Changes in the mixing ratios of greenhouse gases that mix well in the atmosphere (IPCC, 2021)

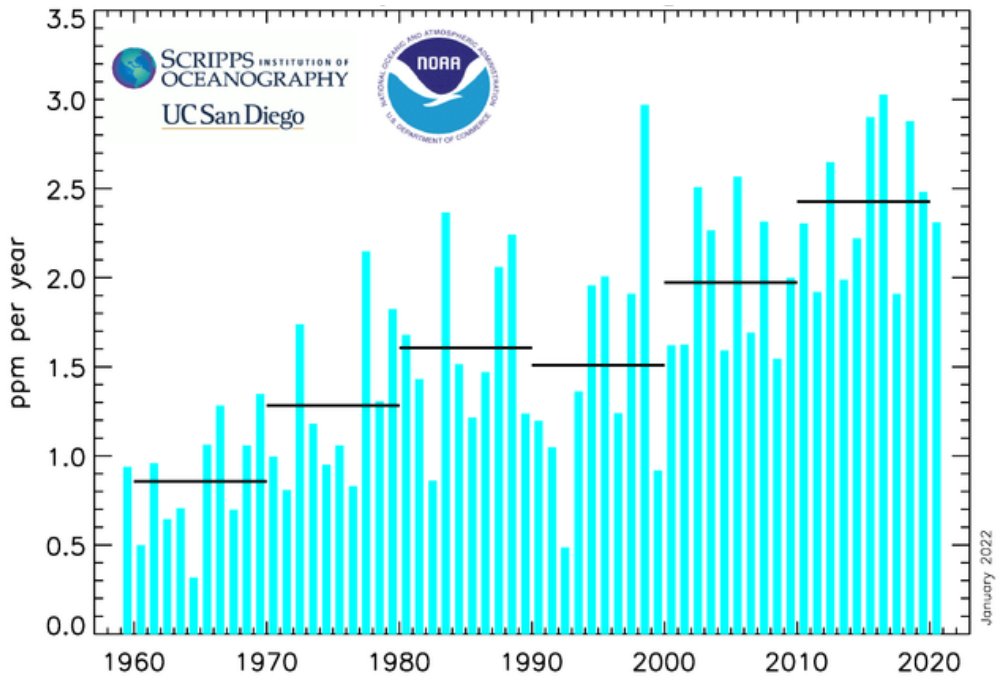

Figure 2.7. Annual rate of increase of carbon dioxide mixing ratio in the atmosphere (blue bars) and decadal averages (black lines) (NOAA, 2022)

2.1.5. Halogenated greenhouse gases

Halogenated gases consist of chlorofluoro-carbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) and other halogenated gases, most of which can deplete stratospheric ozone and warm the atmosphere. CFCs were first synthesised in 1928 as safer chemicals for refrigerators used in large commercial applications. They were used as solvents and refrigerants in the production of aerosol sprays, blowing agents for foams and packaging materials.
In response to controls on production and consumption mandated by the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and its amendments, the atmospheric mixing ratio of most CFCs has continued to decline since 2014. However, the mixing ratios of HFCs, fluoro-carbons and other halogenated compounds increased by up to 350% in the period between 2011 and 2019. In 2016, the Kigali Amendment was made to the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and it was decided to phase out the mixture ratio of HFC gases. Direct radiative forcings from CFCs, HCFCs, HFCs and other halogenated greenhouse gases were calculated as a total of 0.41 W/m2 in 2019 (IPCC, 2021).

2.1.6. Short-lived climate forcers

Stratospheric water vapour, tropospheric ozone and aerosols stand out as short-lived climatic forcers. It has been claimed that water vapour carried into the Stratosphere as a result of some large-scale air movements causes an increase in temperature in the lower part of the Stratosphere and affects the chemical reactions there, causing more water vapour to be transported to the region. However, today's measurements have determined that although the water vapour observed in the Stratosphere as a result of some meteorological events shows periodic increases, it will not have a triggering effect on climate change on a global basis. It is estimated that there is a 0.05 W/m2 climatic forcing caused by Stratospheric water vapour resulting from the oxidation of methane only in the Stratosphere (IPCC, 2021).
Tropospheric ozone is formed in the Troposphere as a result of the chain reaction of nitrogen oxides, volatile organic compounds and sunlight released into the atmosphere.
It has been determined that the global tropospheric ozone concentration has increased by around 40%. The climatic forcing caused by tropospheric ozone is calculated to be 0.25 W/m2 (Rowliston et al., 2018).
Aerosols are the element with the greatest uncertainty since 1750 in terms of climatic forcing. The elemental composition of the aerosol, the amount of compounds, gases and water in its content are important in changing this uncertainty. Studies have shown that there were significant aerosol emissions from Europe and Russia between 1950 and 2000. These particles particularly accelerate cloud formation. Clouds reflect back the radiation from the sun. However, refractory (absorbing) black carbon aerosol, especially released from various incomplete combustion processes, can heat the atmosphere. These light-absorbing aerosols accelerate snow melting when they settle on snow (IPCC, 2021).

2.1.7. Changes in land use

Since the early 1980s, about 60% of all land cover changes have been directly attributed to human activities and also to spatial patterns emphasising the regional character of land use and land management, including tropical deforestation, temperate afforestation, intensification of cropland and increasing urbanisation. Currently, about three-quarters of the ice-free land surface is somehow under control of human use, mainly in agriculture and forest management. The change in land use results in a more efficient reflection of the Sun's rays back

into space. The best estimate of the climatic forcing from the increase in global backscatter is -0.12 W/m2 since 1850 (IPCC, 2021).

2.2. Global Mitigation and Adaptation Actions

Following the establishment of the Intergovernmental Panel on Climate Change (IPCC) in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO), studies on climate change have been officially initiated globally. The main task of the IPCC was to conduct a comprehensive research on the science of climate change, to prepare recommendations in line with the results of the research, to determine the socioeconomic impacts of climate change and possible response strategies, and to prepare an international climate convention that could enter into force in the future. IPCC has established three working groups to fulfil this task: (i) the main task of the first working group is to investigate the physical basis of climate change and to build knowledge, (ii) the task of the second working group is to determine the possible impacts of climate change and to monitor adaptation and vulnerability analysis policies, and (iii) the task of the third working group is to propose and/or carry out activities to reduce the impact of climate forcers that cause climate change. IPCC working groups have so far prepared six progress reports in line with their tasks. The Meeting of the Parties is organised every year to ensure that the studies are carried out in line with global climate justice and the United Nations Sustainable Development Goals.

The UN Framework Convention on Climate Change (UNFCCC), which was opened for signature at the United Nations (UN) Conference on Environment and Development held in Rio de Janeiro in 1992, was the first step taken in the international arena against the climate impacts of global warming caused by human-induced activities as revealed by the progress reports of the IPCC. Signatories to the UNFCCC are encouraged to reduce greenhouse gas emissions, cooperate on research and technology, and protect greenhouse gas sinks (e.g. green spaces, oceans, lakes). The Convention is based on the principle of "common but differentiated responsibilities and relative capabilities" and on the idea that "some countries should take more responsibility for the fact that they emit more greenhouse gases that cause climate change after the industrial revolution than other countries". The Convention takes into account the development priorities and special conditions of countries for the reduction of greenhouse gas emissions and envisages their contribution to this global effort within their socio-economic conditions. In order to strengthen the quality of the existing Convention, the parties to the UNFCCC (191 countries and the EU) held the 3rd Conference of the Parties in 1997 and adopted the Kyoto Protocol (KP) and the protocol entered into force in 2005. The objective of the KP is to reduce the total greenhouse gas emissions of the countries with emission reduction or controlled increase obligations by 5 per cent below the 1990 level in the first commitment period between 2008 and 2012. In order to achieve this overall target, the Parties have undertaken GHG emission reduction/limitation obligations at different rates.

In order to determine the second commitment period, the Parties failed to reach an agreement at the 15th Conference of the Parties held in Copenhagen in 2009, and then an agreement was reached at the 18th Conference of the Parties held in Doha in 2012 and the second commitment period of the Protocol was determined as 2013-2020. With the "Doha Amendment" established in the second commitment period of the Protocol (2013-2020), it was decided to reduce greenhouse gas emissions at the level of at least 18% in 2020 compared to 1990. The Doha Amendment was accepted by 135 countries as of 10 December 2019, but could not enter into force as it had to be accepted by 144 contractual countries. At the 21st Conference of the Parties to the UNFCCC held in Paris in 2015,

the Paris Agreement, which sets the framework for the post-2020 climate change regime, was adopted. The Agreement entered into force as of 4 November 2016, as a result of meeting the condition that at least 55 parties, which account for 55% of global greenhouse gas emissions, ratify the agreement as of 5 October 2016. The Paris Agreement envisages a system based on the contributions of all countries. The Agreement is based on the understanding that all countries, regardless of country classification, should assume responsibility for combating climate change with the principle of "common but differentiated responsibilities and relative capabilities". No criterion has been set for the classification of developed/developing countries and no differentiation has been made. The main objective of the Paris Agreement in the post-2020 period is to strengthen global socio-economic resilience against the threat of climate change. The long-term goal of the agreement is to keep the global temperature increase as much as possible below 2°C compared to the pre-industrialisation period. In order to achieve this, it is necessary to encourage the use of renewable energy and to gradually reduce the use of fossil fuels (oil, coal). The framework established under the Agreement includes implementation procedures on national contributions, mitigation, adaptation, loss/damage, financing, technology development and transfer, capacity building, transparency and overall situation assessment. The Agreement envisages that primarily developed countries should provide financing, technology transfer and capacity building opportunities in order to increase the adaptation and resilience capabilities and greenhouse gas emission reduction capacities of developing countries in need, especially the least developed countries and small island states, which are exposed to the adverse effects of climate change. However, it is stated in the agreement that developed countries should maintain their absolute emission reduction targets, while developing countries should raise their emission reduction targets and adopt new, increased targets that will cover the whole economy over time in accordance with their different national conditions (Republic of Turkey Ministry of Foreign Affairs, 2022).

At the 26th Conference of the Parties to the UNFCCC held in Glasgow in 2021, the parties made a commitment to limit the temperature increase to 1.8°C compared to the pre-industrial revolution as the 2100 target. In addition, a total of 450 financial institutions from 45 countries participating in the conference made emission reduction commitments so that all their assets will be compatible with the net zero emission target in 2050. Although 44 countries, including the UK, have pledged to phase out coal and countries responsible for most global emissions have expressed their willingness to co-operate over the next 10 years, there is no clear commitment to phase out coal. The Conference took two further important steps to reduce greenhouse gas emissions: (i) the Global Methane Commitment (30% reduction in methane gas emissions by 2030) and (ii) the Glasgow Leaders' Declaration on Forests and Land Use (to prevent biodiversity loss and combat deforestation) (SDG Turkey, 2021).

Finally, the 27th Conference of the Parties to the UNFCCC, held in Sharm El Sheikh in 2022, resulted in a commitment by the Parties to limit the global temperature increase to 1.5°C above pre-industrial levels. The decision package prepared envisages to strengthen countries' actions to reduce greenhouse gas emissions and adapt to the impacts of climate change, as well as to increase the financial, technological and capacity building support needed by developing countries. It was decided to establish a special fund for developing countries to cover losses and damages. The Conference also agreed to establish a "Transition Committee" at the next UNFCCC 28th Conference of the Parties to advise on new financing arrangements and the phasing of the fund's operationalisation. The first meeting of the transition committee is expected to be held by April 2023. Parties also agreed on institutional arrangements that will operationalise the Santiago Loss and Damage Network in order to accele-

rate technical assistance to developing countries (United Nations Climate Change, 2022).

2.3. Turkey's Current Climate Policy

Turkey acceded to the UNFCCC, which entered into force on 21 March 1994 and to which 196 countries and the EU are parties, on 24 May 2004. There are two Annex lists in the UNFCCC: (i) Countries listed in Annex I are obliged to limit greenhouse gas emissions, to protect and develop greenhouse gas sinks, to report the measures they have taken and the policies they have followed to prevent climate change, and to communicate their current greenhouse gas emissions and data on emissions, (ii) In addition to the obligations set out in Annex I, countries listed in Annex II are obliged to take all steps to transfer environmentally compatible technologies, in particular to Parties defined as developing country, or to encourage, facilitate and finance access to such technologies. Turkey's accession to the UNFCCC was delayed due to the fact that Turkey was included in the Annex II list instead of Annex I when the Convention was signed and that Turkey was already in the status of a developing country. In 2004, this problem was overcome and Turkey was included in Annex I. Turkey became a party to the Kyoto Protocol in 2009, which was adopted in 1997. The other countries (non-Annex countries), which are parties to the Protocol, but are not included in the list of countries with emission reduction or controlled increase obligations, do not have quantitative obligations for greenhouse gas emission reductions. Turkey, which was not a party to the UNFCCC when the Protocol was adopted, has no quantified emission limitation/reduction commitments since it is on the list of non-Annex countries (Republic of Turkey Ministry of Foreign Affairs, 2022).
Turkey's Climate Change Adaptation Strategy and Action Plan (2011-2023) was prepared in 2010-2011 (Republic of Turkey Ministry of Environment, Urbanisation and Climate Change, 2022).
Our country signed the Paris Agreement together with 175 country representatives at the High-Level Signature Ceremony held in New York on 22 April 2016, and in our National Declaration it was emphasised that we signed the agreement as a "developing country" (Republic of Turkey Ministry of Foreign Affairs, 2022).
In 2021, the declaration of good intention made in accordance with the Paris Agreement was announced as a 21% reduction from the increase for 2030. However, at the 27th Conference of the Parties to the UNFCCC held in 2022, the reduction rate for 2030 was increased to 41% within the framework of the new Declaration of National Contribution (Republic of Turkey Ministry of Environment, Urbanisation and Climate Change, 2022).

2.4. Climate Actions at Local Level

Muratpasa Municipality has developed different projects to raise awareness against climate change. The first of these is the "Environmental Neighbour Card" project launched in April 2016 with the slogan "Don't throw, save, let's win". The project is Turkey's first and only award-winning recycling project, which also forms the basis of the 'Zero Waste' project carried out by the Ministry of Environment, Urbanisation and Climate Change. Within the scope of the project, packaging wastes, waste electrical and electronic equipment, vegetable waste oils, textile wastes are collected from households 6 days a week on the specified day and time, and money is transferred to the citizens' cards in return for the collected wastes (Figure 2.8). In addition, citizens bring their wastes on Sundays to 14 fixed points determined and ensure that a higher amount of money is transferred to their Environmental Neighbour Cards. The money transferred on the cards is used in stores with POS devices and in internet shopping or in cash (www.cevrecikomsu-kart.com). Within the scope of the Environmental Neighbour Card project,

agreements have been signed to provide citizens who present the project card with discounts in 6 Private Hospitals and 1 Dental Clinic in order to expand the use of the card, and the works are ongoing (Figure 2.9). Within the scope of the project, 20,528 tonnes of waste was collected until November 2022 and a total of 8 Million 102 Thousand TL was deposited into the accounts of citizens. Since the start of the project until today, 114,815 kWh of electricity and 72,421 litres of water have been saved, 164,153 trees have been saved from being cut down and 872,062 square metres of forest have been preserved. A total of 660,768 kgCO2 emission was prevented with the Environmental Neighbour Card Project. Muratpasa Municipality became the first "Zero Waste" certified district of Antalya within the scope of the Zero Waste project (January 2021). In addition, "Basic Level Zero Waste Certificates" were obtained for all units of Muratpasa Municipality. Within the scope of the circular issued by the Ministry of Environment, Urbanisation and Climate Change on independent waste collectors, studies were carried out on the integration of waste collection activities into the municipal system and a regulation on the Procedures and Principles of Independent Waste Collectors' Activities was established.

Figure 2.8. Photographs of the Environmental Neighbour Card application implemented by Muratpasa Municipality

Figure 2.9. Images of the Signing Ceremonies for the Agreements on Discounts provided within the Scope of the Environmental Neighbour Card application implemented by Muratpasa Municipality with Health Institutions

Regular trainings on environmental pollution, recycling and climate crisis are organised in schools within the borders of Muratpasa district. Within the scope of the activity, it is aimed to contribute to raising generations with high environmental awareness. In addition, Muratpasa Municipality organises the Environment Festival every year. Within the scope of the festival, non-governmental organisations active in the country and carrying out activities related to the environment and companies producing in the field of environment take part. Interviews, workshops, events, concerts, documentary presentations are organised in the festival. In addition to these activities, technical trips to waste collection and sorting facilities with students and nature walks with non-governmental organisations are carried out (Figure 2.10).

Figure 2.10. Images from Muratpasa Municipality Environment Festival

Muratpasa Municipality, which received its first Blue Flags in 2017 with Erdal Inonu, Mobil and Inciralti cliff beaches, also received Blue Flags for 5 other beaches (Erenkus, Erdal Inonu, Inciralti, Mobil and Konserve Koyu) in 2022 (Figure 2.11 and Figure 2.12). For Blue Flag assessment, 33 criteria must be fulfilled in the areas of environmental education and information, aquatic water quality, environmental management and life safety and services (Blue Flag, 2022). Regular seabed cleanups are carried out by professional divers twice a year at the Blue Flag beaches and yacht harbour of Muratpasa Municipality, and cliff cleanups are carried out on the cliff rocks (Figure 2.13 and Figure 2.14).

Figure 2.11. Some images from the blue flag beaches operated by Muratpasa Municipality

Figure 2.12. Images of the Blue Flag ceremony at beaches

Figure 2.13. Images from seabed cleanup

Figure 2.14. Images from cliff cleanup

+0.5 Future of the Mediterranean Climate Change Workshops were held in 2021 and 2022 with national and international participants in order to draw attention to the issue of global warming and climate change among local stakeholders and citizens and to raise awareness (Figure 2.15). With the meeting attended by the coordinators of 29 Eco-Schools within the borders of Muratpasa District, the +0.5 Future of the Mediterranean "Eco-School Workshop" was held on the same topic.

Figure 2.15. An image from the +0.5 Future of the Mediterranean Climate Change Workshop held in 2022

In line with the Zero Waste Regulation, it is planned to produce food to support the food needs of stray animals and animals in the Muratpasa Municipality Temporary Care and Rehabilitation Centre for Stray Animals by utilising organic wastes obtained from Muratpasa Municipality units. Trial productions have started to be carried out for this project.
On March 2, 2022, Muratpasa Municipality joined ICLEI - Association of Sustainable Cities, which is committed to sustainable development. ICLEI assists local governments by providing methods to reduce greenhouse gas emissions that cause both climate change and a decrease in air quality, and guides local governments in developing various projects to achieve the set targets. Muratpasa Municipality can share all its projects and activities in the ICLEI network with the world through international platforms.
Muratpasa Municipality signed the Covenant of Mayors for Climate and Energy (Covenant of Mayors-CoM) on 6 May 2022. With the signing of the Covenant, it has committed to reduce greenhouse gas emissions in our region, increase resilience and create measures against the negative effects of climate change by providing economic, safe and sustainable energy (Figure 2.17).

In order to save water and reduce urban water consumption in the district, 300,000 water saving devices (aerators) were started to be distributed free of charge to citizens and used

in municipal units in 2022 (Figure 2.18).

Muratpasa Climate Portal, which is a website where all studies on environmental protection and climate change are gathered under one umbrella, started to be published in 2022. The climate portal includes information about the Environment Festival, videos of workshops on making natural products, inventories of the works carried out and workshop announcements. (https://iklim.muratpasa-bld.gov.tr/; Figure 2.19.)

Figure 2.16. Images from the +0.5 Future of the Mediterranean Eco School Workshop held in 2022

"Climate Marathon in Muratpasa - Local Climate Workshop" was held with the participation of approximately 40 young people in order to raise awareness of young people on climate, develop local climate policies, and promote climate advocacy and ecological literacy (Figure 2.20). As an output of the workshop, Muratpasa Young Climate Volunteers team was formed with the aim of ensuring that young people have a say in the environment and increasing their visibility, and climate volunteer young people prepared the Final Declaration of Muratpasa Young Climate Action Plan.

Figure 2.17. signing the Covenant of Mayors by Muratpasa Mayor Atty. Ümit UYSAL

Figure 2.18. Images of Muratpasa Municipality's water saving apparatus distribution

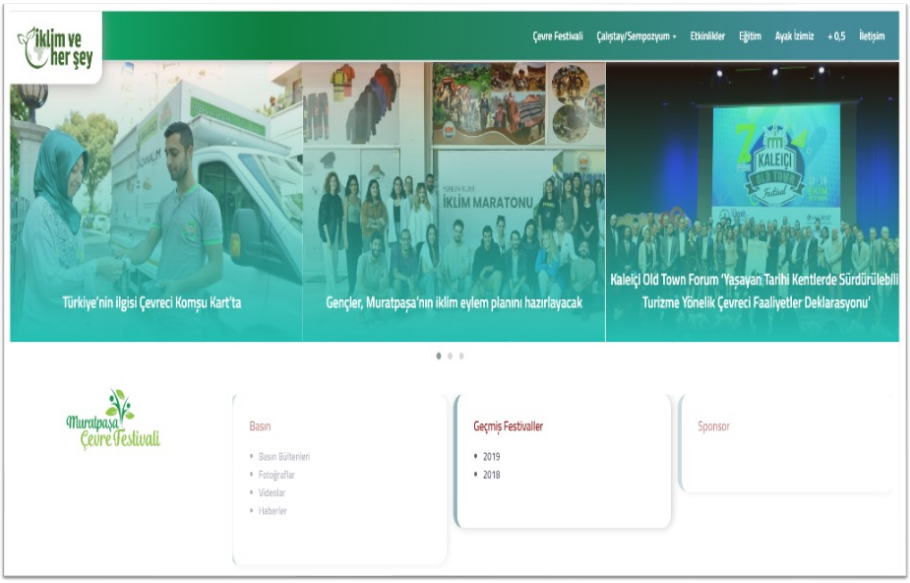

Figure 2.19. An image from the Muratpasa Municipality climate portal

Figure 2.20. Images from the "Climate Marathon in Muratpasa - Local Climate Workshop" held by Muratpasa Municipality

As a result of the studies carried out within the Muratpasa Municipality Directorate of Parks and Gardens on water and energy reduction, the smart irrigation automation project was implemented. The project is integrated into 70 municipal parks and managed remotely via mobile application. As a result of the project, it is stated that 30% savings were achieved in electricity and water use within one month (Figure 2.21).

Muratpasa Municipality replaced the lighting apparatus in the Main Service Building with energy-saving lamps in order to reduce corporate electricity consumption in 2022. Electricity consumption data for 2022 obtained from the Directorate of Study and Project Directorate was compared with 2018 and 2019 data. Data on consumption in the first nine months are presented in Figure 2.22. Accordingly, 14% and 12% savings were achieved in electricity consumption in the first nine months of 2022 compared to 2018 and 2019, respectively.

In addition, in order to reduce the production of plastic waste, the installation of dispensers on the floors of the Main Service Building was completed and glass water bottles were distributed to municipal personnel.

Figure 2.21. Images related to the use of smart irrigation automation project implemented by Muratpasa Municipality Directorate of Parks and Gardens

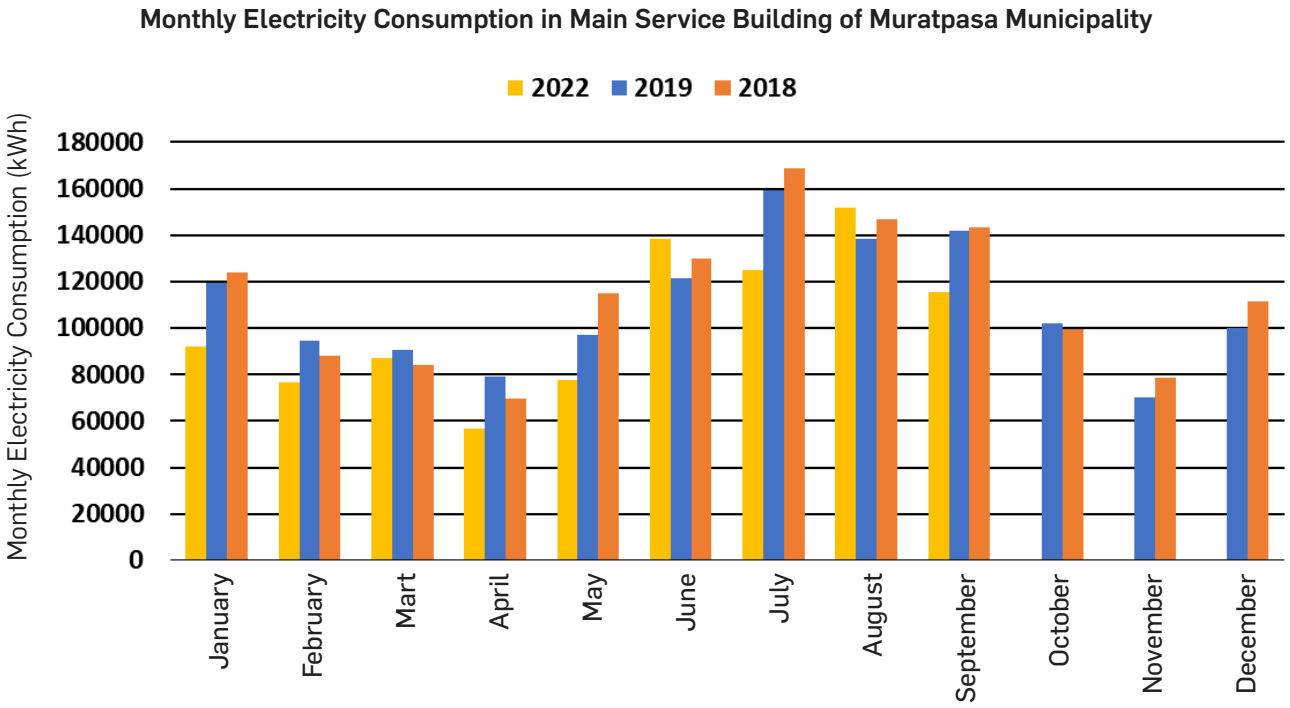

Figure 2.22. Effect of Using Energy Saving Lamps in Main Service Building of Muratpasa Municipality on Monthly Electricity Consumption

Antalya Metropolitan Municipality prepared and publicised its sustainable energy action plan in 2021 and sustainable energy and climate action plan in 2022. In the sustainable energy action plan report prepared, the emissions of Antalya province in 2019, including industry, were examined and total energy consumption in the province was calculated as 28,623,531 MWh and greenhouse gas emissions were calculated as 10,683,551 tCO2e. In the total inventory, emissions from fuel and electricity consumption of buildings (including industry) accounted for 47.1% (40.9% buildings and 6.1% industry), emissions from transport accounted for 30.2%, emissions from agriculture and animal husbandry accounted for about 6%, emissions from power generation accounted for 8.5% and emissions from solid waste and wastewater processes accounted for 8.2% (Figure 2.23). With the actions defined in the same report, it is foreseen that a reduction of approximately 40.12% can be achieved by 2030 compared to the baseline year 2019 in per capita emissions. Mitigation actions have been created separately for buildings, energy, transport and other sectors to reduce energy consumption and greenhouse gas emissions. As a result of these actions, energy consumption and greenhouse gas emission reduction is targeted in the amounts shown in Table 2.1 on a sectoral basis (Antalya Metropolitan Municipality, 2021).

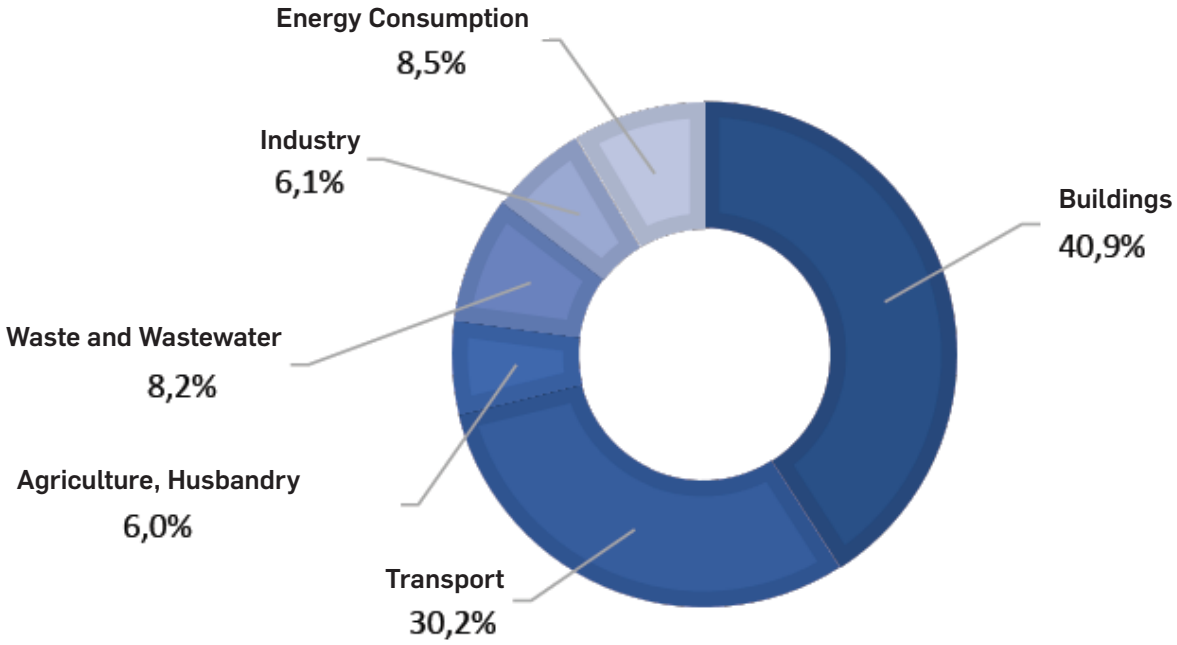

Figure 2.23. Sectoral greenhouse gas inventory of Antalya province (Antalya Metropolitan Municipality, 2021)

Table 2.1. Sectoral mitigation targets in Antalya province for 2030 (Antalya Metropolitan Municipality, 2021)

	MWh Mitigation by 2030	Tonnes of CO2e Mitigation by 2030
Emission Mitigation by Buildings	10.372.980	4.576.934
Renewable Energy Emission Mitigation	744.000	377.208
Transport Emission Mitigation	8.849.734	2.009.046
Waste-Wastewater and Other Emission Mitigation	224.157	923.349
Total Mitigation	**20.190.870**	**7.886.537**

3. MURATPASA AND CLIMATE CHANGE

This chapter consists of two parts and in the first part, the physical and social characteristics of Muratpasa district are evaluated in terms of its location, administrative boundaries, population and socio-economic development. In the second part, climate change scenarios for the Mediterranean Region and Antalya are examined: the current situation in terms of temperature increase and drought, sea level rise, meteorological disasters, floods, tornadoes, storms and forest fires risks.

3.1. Physical and Social Characteristics of Muratpasa District

Muratpasa district is surrounded by Aksu district in the east, Kepez district in the north, Konyaalti district in the west and the Mediterranean Sea in the south, and has an administrative boundary of 96 km2. Although Muratpasa district is the smallest district in terms of area, it is one of the most populous districts in terms of population density (Figure 3.1). Socio-economic Development Ranking Survey of Districts published by the Republic of Turkey Ministry of Industry and Technology (2022) (SEGE-2022), 973 districts across Turkey were evaluated with 56 variables under the main headings of demography, employment and social security, education, health, finance, competitiveness and innovation quality variables. Thus, socio-economic development index scores were produced for these districts, and the ranking and levels of the districts were determined according to their development scores. Accordingly, 3 of Antalya's 19 districts are in Tier 1 (Index Value ≥ 1,632), with Muratpasa district ranking first with an index value of 3,173, Konyaaltı district (2,465) ranking second and Alanya district (1,676) ranking third (Republic of Turkey Ministry of Industry and Technology).

Figure 3.1. Location of Antalya districts

The population of the district, which has 56 neighbourhoods in total, is 513,035 people according to TURKSTAT 2020 data (Table 3.1). Looking at the district in general, there are 5344 people per km^2, and when the neighbourhood-based density map of Antalya province prepared according to 2020 data is examined, it is seen that Muratpasa district is an extremely dense district. (AFAD, 2021) (Figure 3.2).

Table 3.1. Population data of Antalya province and Muratpasa district

	2016	2017	2018	2019	2020
Muratpaşa	486 408	488 670	495 688	510 368	513 035
Antalya	2 328 555	2 364 396	2 426 356	2 511 700	2 548 308

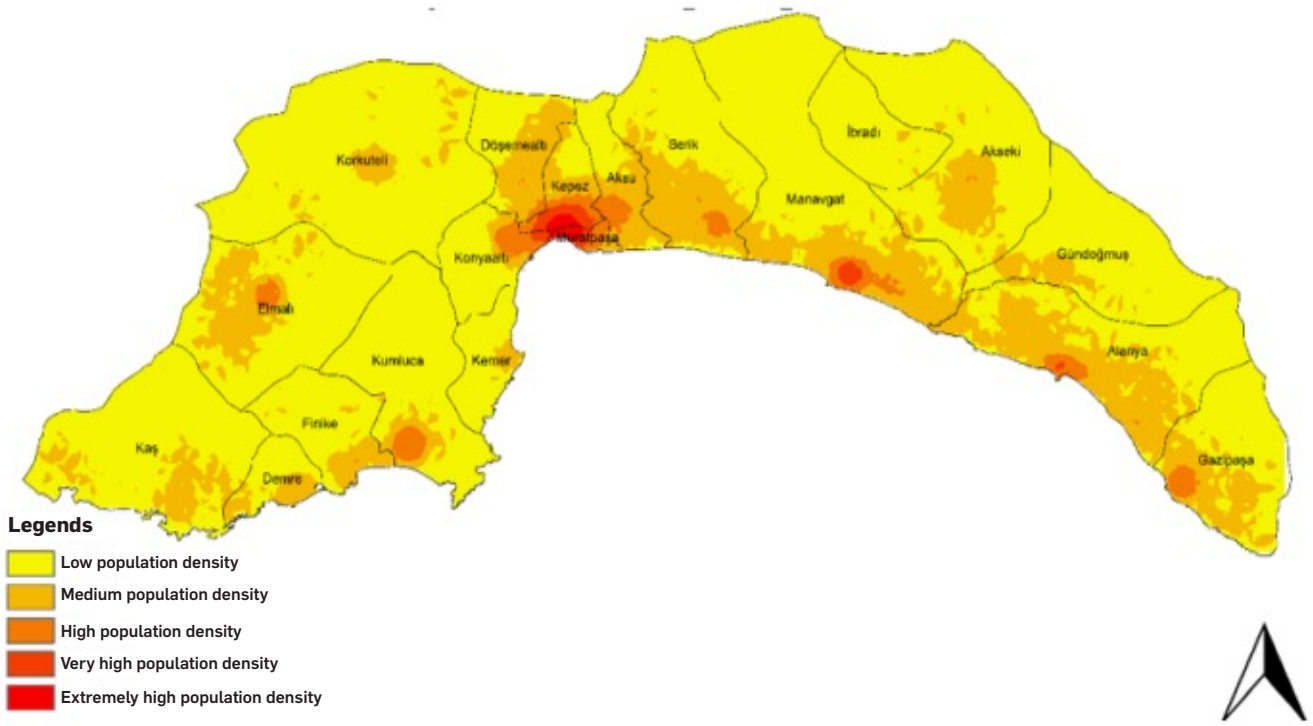

Figure 3.2. Population density map by neighbourhoods in Antalya province, data from 2020 (AFAD, 2021)

When the general view map of the district presented in Figure 3.3 is examined, it is seen that a significant portion of the population is located in Meltem, Sirinyali, Yesilbahce, Altindag, Bahcelievler, Balbey, Barbaros, Caglayan, Elmali, Tahilpazari, Hasim Iscan, Kisla, Memur Evleri, Soguksu, Ucgen, Yesilbahce, Etiler, Fener, Genclik, Guvenlik, Muratpasa, Sinan, Yildiz, Zerdalilik neighbourhoods. The neighbourhoods with agricultural nature and less population are Zumrutova, Guzeloluk, Kircami, Yesilova, Tarim, Mehmetcik, Topcular, Doguyaka, Yesildere, Guzeloba, Ermenek, Güzelbag, Altınova Yenigol and Kizilarik (Figure 3.3).

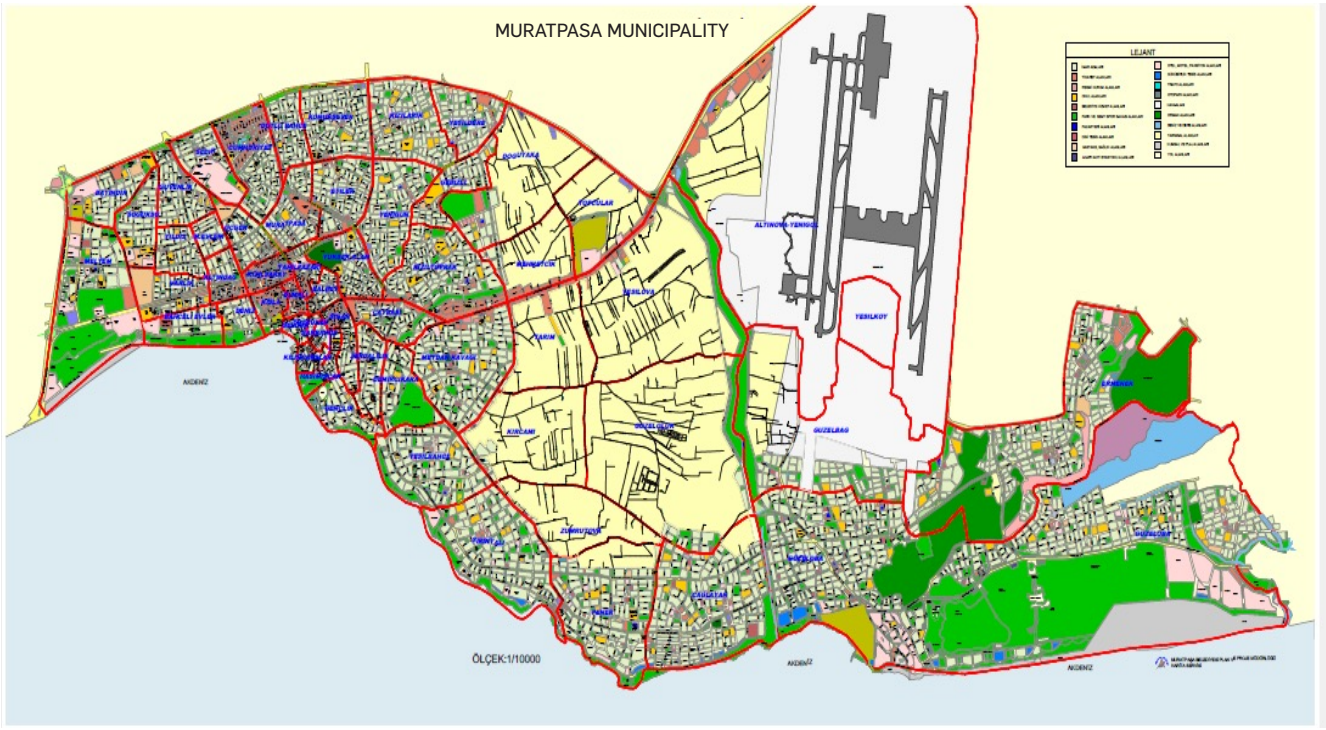

Figure 3.3. General view of Muratpasa District

Muratpasa district is in a central location where all financial institutions and public institutions, private and public health institutions, and economic, commercial, cultural and social activities are carried out. The contribution of the district to greenhouse agricultural production is around 1.5% (AFAD, 2021). Muratpasa district is the most important attraction centre of the province in terms of tourism. Kaleici and Kundu Districts in the centre of the district serve local and foreign tourists for 12 months of the year. Antalya Airport, which provides domestic and international connections of the city, is located just north of the district borders (Figure 3.4). The population living in the district covers 81 provinces in terms of diversity and is one of the central districts where foreign nationals have settled in recent years.

3.2. Climate Change Scenarios for the Mediterranean Region and Antalya

3.2.1. Temperature Increase and Drought

In the drought map for 2021 in the report published by the General Directorate of Meteorology (2022), it is seen that there is increasing drought from the inland areas to the south-eastern border throughout the country (Figure 3.4). When the drought risk in the Western Mediterranean Region is analysed, it is seen that there is severe-very severe drought in the eastern coastal areas of Antalya and moderate drought in the western coastal areas. Muratpasa district is located in a transition zone between mild drought and moderate drought.

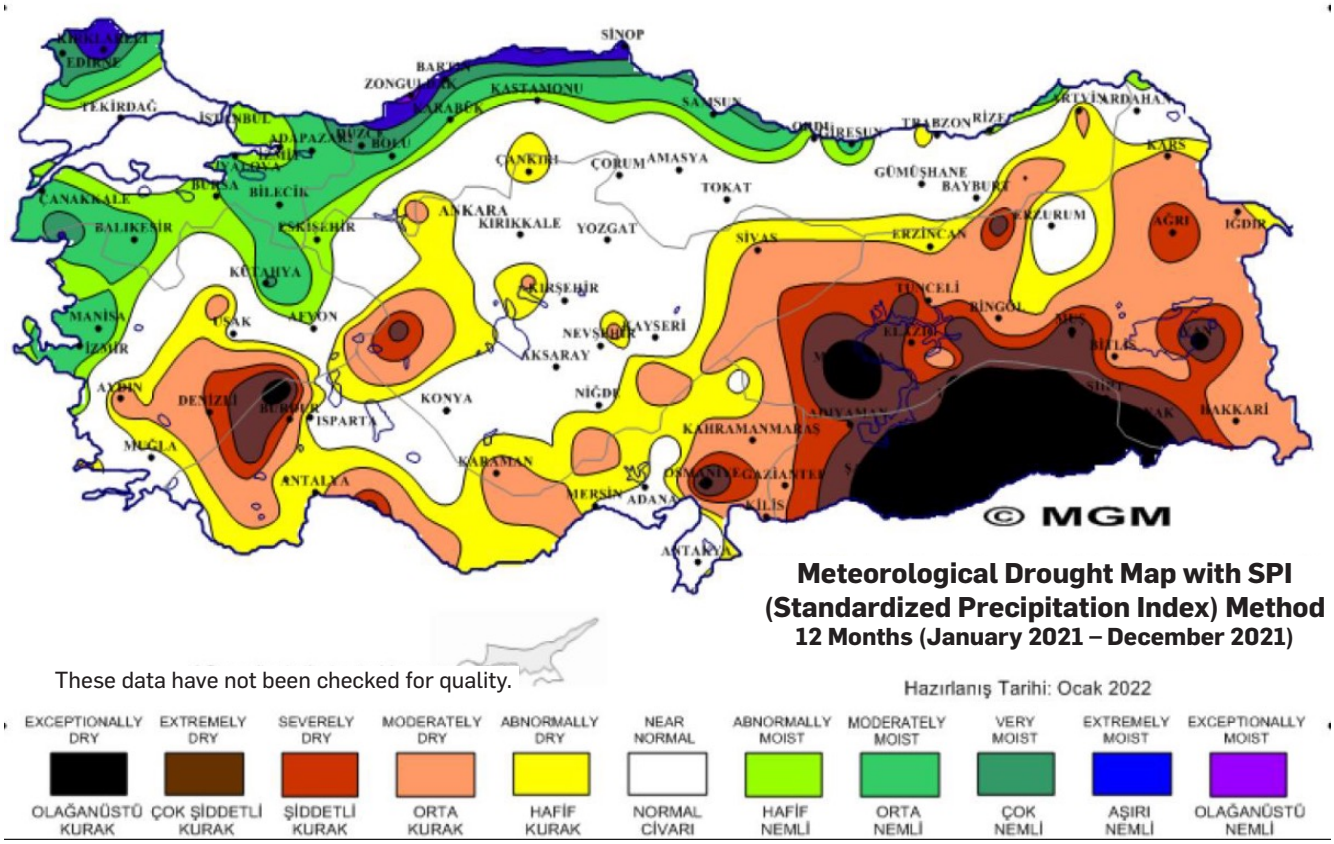

Figure 3.4. Turkey's meteorological drought map for 2021

3.2.2. Rise in Sea Level

It is presented in the IPCC 6th Assessment Report that the amount of sea level rise, which is one of the long-term consequences of climate change on a global scale, has reached 20 cm. Accordingly, sea level rise, depending on the emission rates, may increase from 20 cm to 1 m or even more by 2100.

It has been found that it will not be sufficient to determine the zero point by observing the changes in sea level at random times and places around the world and that long-term observations are needed. In order to make these observations, water level measuring stations called mareographs were established in suitable places on the coasts. The first mareograph station in Turkey was established in Antalya in 1935. Afterwards, mareograph stations were established in Izmir- Karsiyaka (1936), Karadeniz Ereglisi (1948), Iskenderun (1952), Trabzon (1956), Samsun (1961), Bodrum (1967), Edremit, Izmit/Golcuk (1979) and Mersin. The observations, which were initially carried out by the General Command of Mapping, were later started to be carried out by the General Directorate of Meteorology. In 1984, this duty was transferred back to the General Command of Mapping. At present, very few of these stations carry out observation activities, and continuous observations are carried out at the mareograph station established by the Institute of Marine Sciences of the Middle East Technical University in Mersin. In addition, on a global scale, data from mareograph stations in Antalya in Turkey, Marseille in France, stations in Germany and in cities of some northern countries such as Amsterdam are used in determination and assessment of the sea level (Hoşbaş, 2021).

Figure 3.5 shows the sea level measurement values made at Antalya Mareograph Station between 1986 and 2005. When the linear completed data representing the annual mean values are analysed, it is seen that the sea level increased by 8.88 mm per year during the 19-year observation period (Hoşbaş, 2021). With the continuous and active use of Antalya Mareograph Station, important data flow will be provided in both local and national long-term sea level rise monitoring studies.

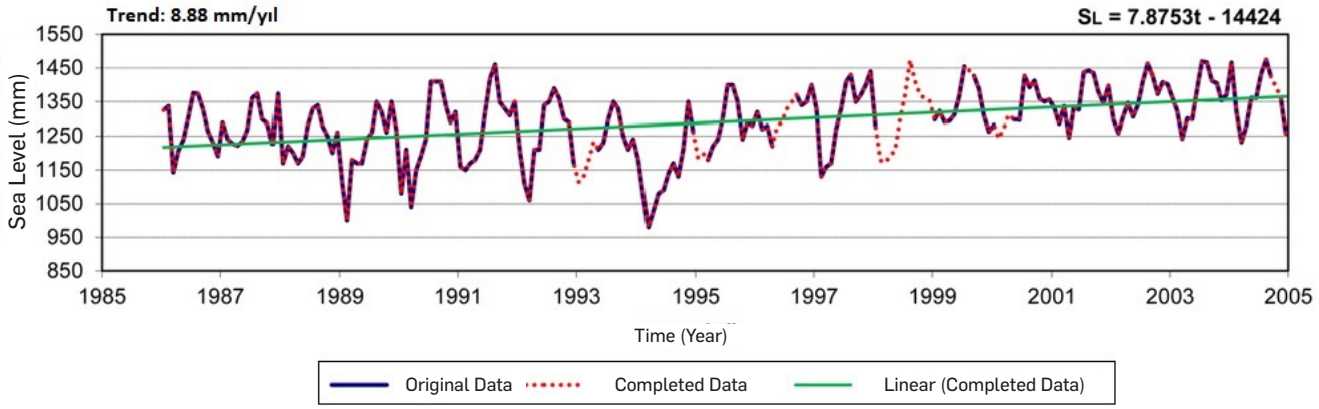

Figure 3.5. Average water level records of Antalya Mareograph station between 1986-2005

3.2.3. Extreme Precipitation and Weather Events

According to the report published by the General Directorate of Meteorology (MGM), the most common meteorological and natural disasters in our country in 2021 were storms (40%), floods with heavy rainfall (28%), avalanches (13%) and heavy snowfall (7%), respectively. The distribution of meteorological disasters that occurred in our country between 2010 and 2021 by provinces is presented in Figure 3.6, and it is seen that Antalya is the province with the highest number of disasters.

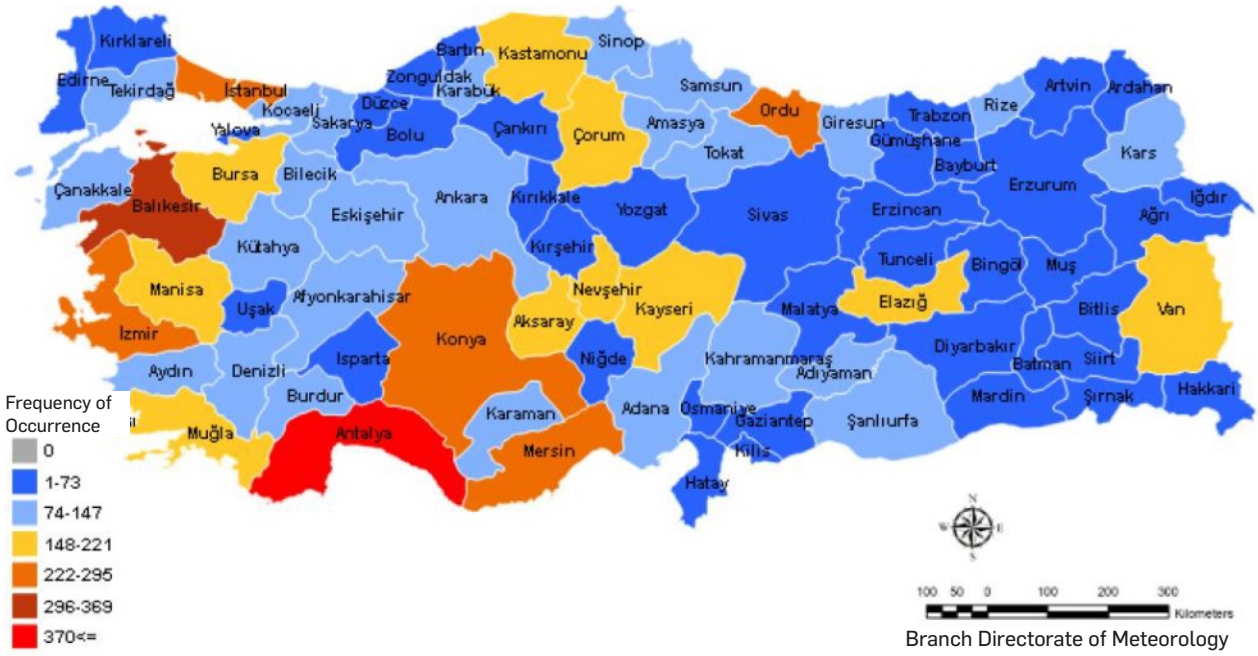

Figure 3.6. Distribution of meteorological disasters occurring in Turkey between 2010 and 2021 by provinces

13th Regional Directorate of State Hydraulic Works analysed and reported the flood disasters that occurred in Antalya province (on district and stream basis) between 1975 and 2020. As a result of the district-based analysis, it was observed that the highest frequency of flood disasters occurred in Konyaalti, Muratpasa, Kepez, Aksu and Dosemealti districts and 28% of the total 50 disasters occurred in the central districts (Figure 3.7). As can be seen from the map, the districts with the highest risk of flood disasters are the districts bordering the Mediterranean Sea, and these districts are frequently exposed to severe weather events due to atmospheric sea-land interaction (AFAD, 2022).

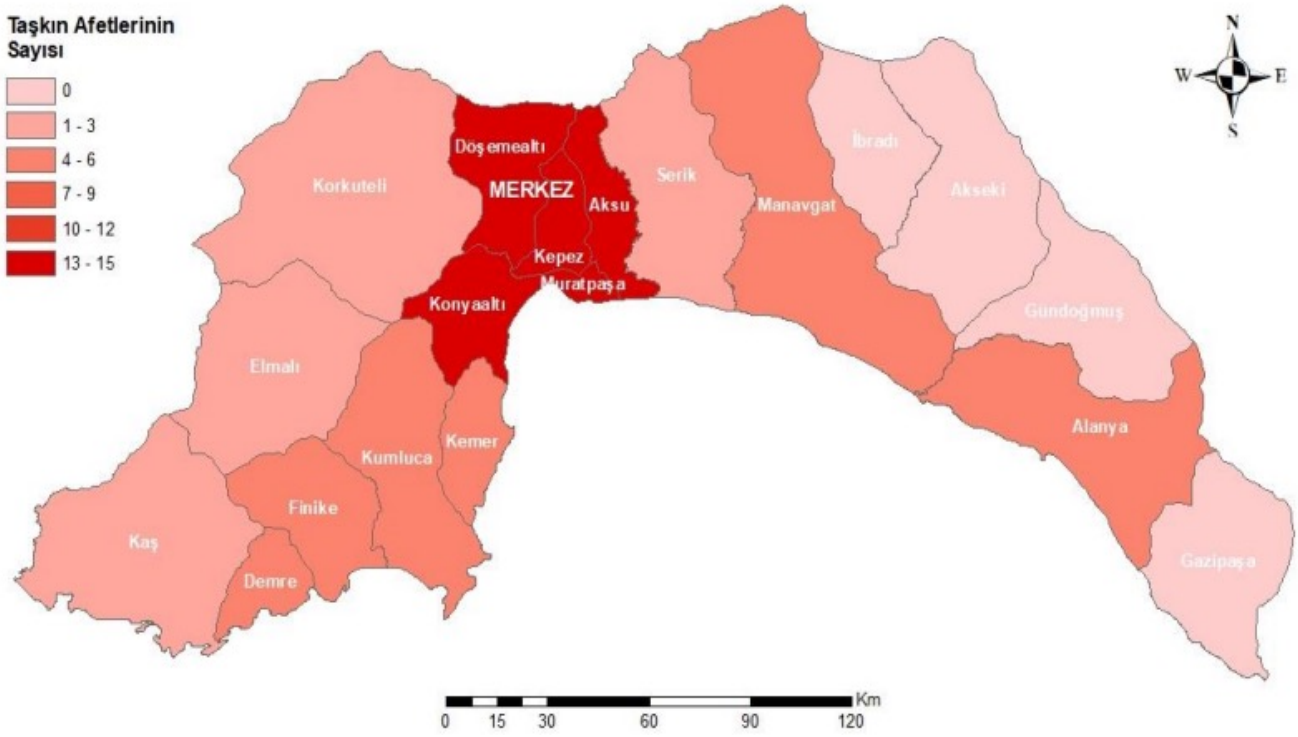

Figure 3.7. Numerical distribution of flood disasters occurring in Antalya province between 1974 and 2020 by districts (AFAD, 2022)

The 13th Regional Directorate of State Hydraulic Works (DSI) has determined the rivers and flood boundaries throughout the province of Antalya with the HEC - RAS model and flood propagation maps have been prepared within the specified boundaries. It has been determined that the Q100 value of Duden Stream, which flows into the Mediterranean Sea within the borders of Muratpasa district, is 216 m3/s and the area under possible flood risk is 869 ha; the Q500 value is 267 m3/s and the area under possible flood risk is 2592 ha. The map showing the boundaries of Duden Stream and the areas under flood risk under the specified flow rates is given in Figure 3.8 (DSİ, 2021).

Accordingly, in case of a possible flood, many neighbourhoods of Muratpasa district are at risk of being flooded.

It has been determined that the Q100 value of Aksu Stream is 1764 m3/s and the area under possible flood risk is 13764 ha; the Q500 value is 2316 m3/s and the area under possible flood risk is 14630 ha. The map showing the boundaries of Aksu Stream and the areas under flood risk under the specified flow rates is given in Figure 3.9 (DSI, 2021). Accordingly, in case of a possible flood, there is a risk of flooding, especially in the tourism region and some neighbourhoods of Muratpasa district.

Figure 3.8. Flood risk map of Duden Stream

Figure 3.9. Flood risk map of Aksu Stream

Flood disasters occur frequently in the province due to excessive precipitation. The average annual total precipitation of our province was measured as 1085 mm, and approximately 80% of the average monthly total precipitation is 100 mm or more in November, December, January and February. Therefore, short periods of heavy rainfall, which often occur during the winter months, have a high potential for flooding.

According to the data measured in our province, it is reported in the Sudden Change Reports prepared by the 4th Regional Directorate of Meteorology that the highest value of 24-hour total precipitation measured in the provincial centre is 330 mm. Figure 3.10 shows that 57 of the 179 flood disasters that occurred in our province between 1975 and 2020 occurred in the central districts, including Muratpasa district (AFAD, 2021).

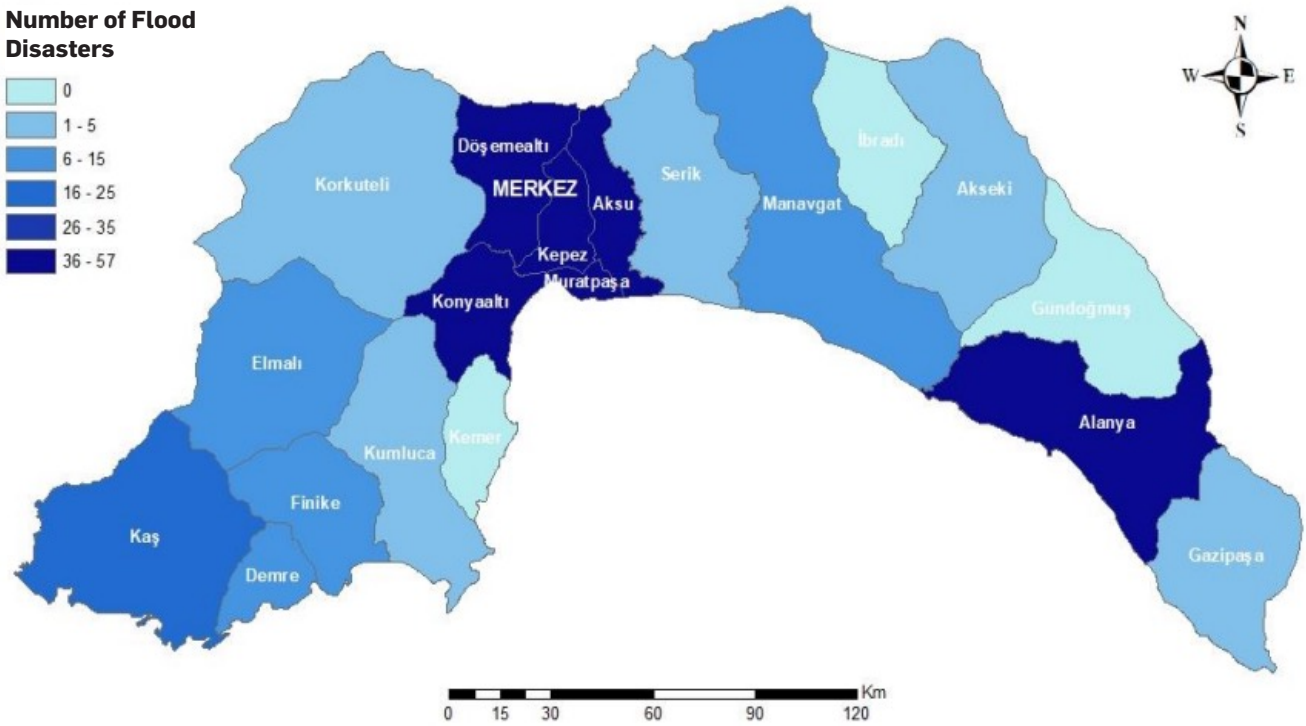

Figure 3.10. Numerical distribution of flood disasters that occurred in Antalya province between 1975 and 2020 by districts (AFAD, 2022)

Due to its geographical location, topographical features, regional atmospheric systems and sea-land interaction, tornado disasters are frequently experienced throughout the province. When the numerical distribution of the tornado disasters that occurred in Antalya between 2000 and 2020 according to the districts given in Figure 3.9 is examined, it is seen that 51 tornadoes occurred in Alanya, 36 in the central districts, and 27 each in Kumluca and Finike. Especially the parts of Muratpasa district close to the coast are affected by tornado disasters.

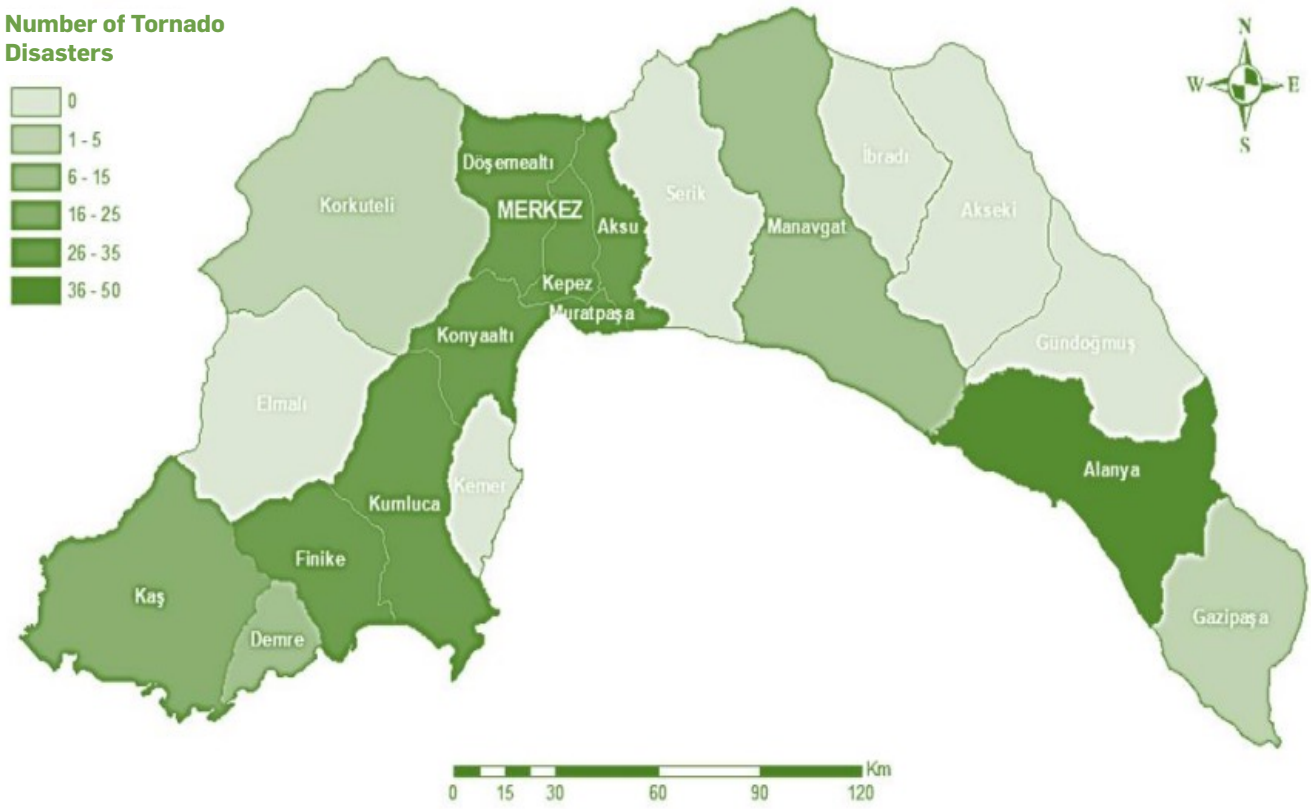

Figure 3.11. Numerical distribution of tornado disasters that occurred in Antalya province between 2000 and 2020 by districts (AFAD, 2022)

According to the records of the 4th Regional Directorate of Meteorology, storm disaster caused by strong winds is one of the frequently occurring disasters in our province. The wind speed that can be considered as a storm is 60 km/h and above, and the highest wind speed measured in Antalya Centre is 155 km/h. Between 1975 and 2020, the distribution of storm disasters occurring throughout the province on the basis of districts is given in Figure 3.10. Accordingly, the highest number of storm disasters is 51 in Alanya and 28 in the central districts including Muratpasa district (AFAD, 2022).

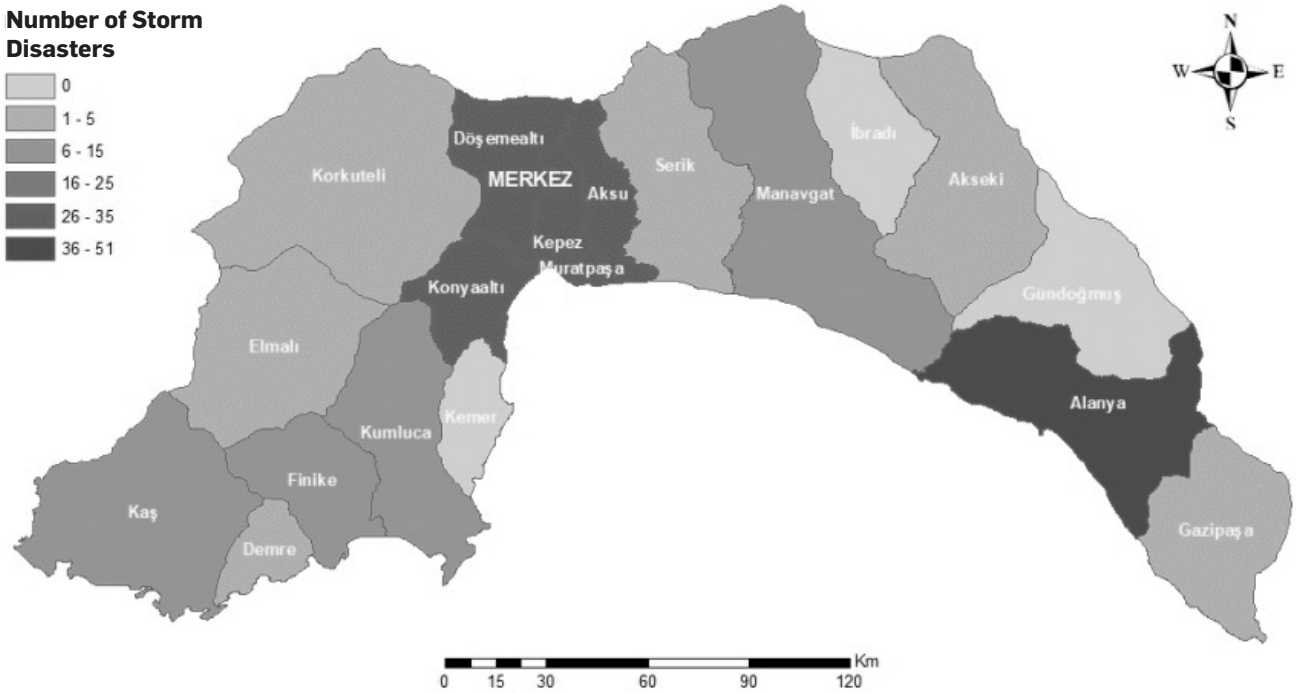

Figure 3.12. Numerical distribution of storm disasters that occurred in Antalya province between 1975 and 2020 by districts (AFAD, 2022)

Karabacak et al. (2019) used spatial statistical analyses to examine the fires in the forests of Antalya province and to determine and rank forest fire risk zones. According to their results, although all of the forests in Antalya province are under fire risk, only 4 per cent of them are under low risk, while 76 per cent of them are under high risk in terms of forest fires (Figure 3.13). According to the map, Muratpasa district is also located in the high risk area in case of a possible fire.

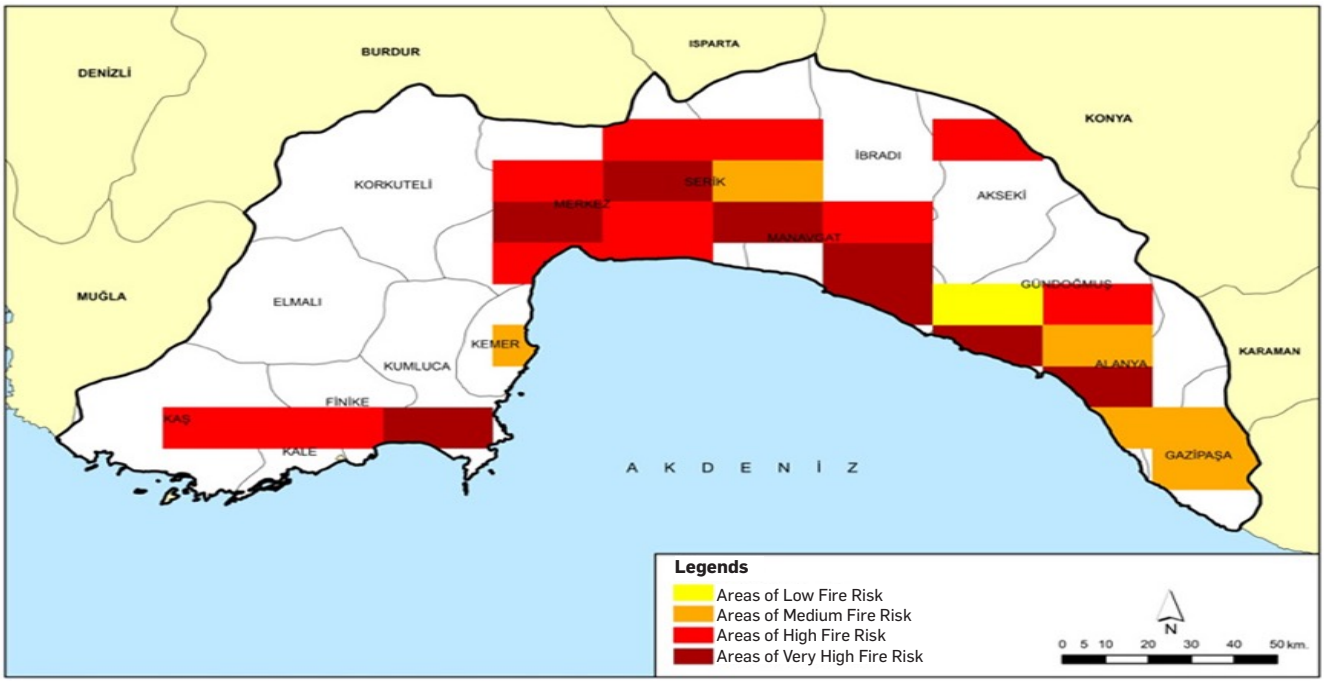

Figure 3.13. Fire risk areas in Antalya province

4. GREENHOUSE GAS INVENTORY AND RISK ANALYSIS

4.1. Study Method

The study was carried out under two separate headings. The first one is to analyse the factors that cause greenhouse gas emissions in the four-year period between 2018 and 2021, to find the baseline year, to set a mitigation target accordingly and to define the action plans to be made in order to adhere to this target. The data to be used in the study were requested from the relevant directorates and the emission inventory was calculated for three different scopes using the Tier 1 approach. Within the scope of Scope 1, total emissions of stationary combustion values due to natural gas use, within the scope of Scope 2, greenhouse gas emissions associated with the purchase of electricity from the grid and within the scope of Scope 3, greenhouse gas emissions due to water consumption were calculated. Emission factors other than the emission factors from water consumption used in the Tier 1 approach were obtained from IPCC handbooks and Turkey 2020 Emission Inventory book. Emission factors from water consumption were taken from the literature by considering the parameters related to Antalya water resources. In the light of the results obtained, 2019, the last year before the COVID-19 pandemic, was selected as the baseline year and the total greenhouse gas emissions obtained according to the number of residents served were normalised. According to CoM commitments, the amount of per capita emissions in 2030 should be reduced by at least 40% of the baseline year. For this purpose, firstly, the population of 2030 was calculated according to Bank of Provinces methodology. Afterwards, the emission mitigation actions that will cause at most 60% of the per capita emission values in 2019, which is the baseline year, were evaluated according to the available technological possibilities and institutional capacity.

In the second stage of the study, the risks of excessive precipitation and flooding, extreme weather events, wave of cold air, sea level rise, wave of hot air and drought, forest fires, water pollution and infectious diseases caused by climate change were assessed with internal and external stakeholders. In the light of the findings, vulnerability assessment was carried out and action plans were prepared with the participation of the relevant directorates in order to eliminate vulnerabilities.

4.2. Results of Corporate Emission Inventory

Antalya Muratpasa Municipality corporate greenhouse gas emission amount is calculated as 14,610,397 kg CO_2e for 2019. Percentage contribution values by sub-divisions between 2018 and 2021 are shown in Figure 4.1. As can be seen from Table 1.1, there has been a significant decrease in emissions after the COVID-19 pandemic. In particular, GHG emissions from stationary combustion sources decreased by 29% in 2020 compared to 2019, GHG emissions associated with the purchase of electricity in Scope 2 decreased by 16%, and GHG emissions from water consumption in Scope 3 decreased by 20%. The stationary combustion values arising from the use of natural gas, which are evaluated within the scope of Scope 1, are determined to be between 21% and 29% of the total emissions. The facilities that consume the most natural gas are the Asphalt Plant unit within the Directorate of Public Works (41-63%), Suleyman Erol Swimming Pool within the Directorate of Enterprises and Subsidiaries (35-58%) and the Main Service Building (1.7-3.5%).In 2020, it was determined that a decrease of 29% observed in 2020 was due to a decrease of 875,000 kgCO_2e and 374,000 kgCO_2e in the emissions of the

Directorate of Enterprises and Subsidiaries and the Directorate of Public Works, respectively. During the COVID-19 pandemic period, especially limiting the use of the swimming pool played an important role in this significant reduction. In the same period, the Asphalt Plant unit of the Public Works Directorate emitted approximately 23.5% less CO_2e.
Another subheading within Scope 1 is greenhouse gas emissions from motor vehicles. These emissions constitute between 27% and 32% of total emissions. The Directorate of Cleaning Services realises 63-65% of these emissions for the collection of solid wastes. Other directorates that make a significant contribution to motor vehicle emissions are the Directorate of Public Works (14-18%) and the Directorate of Parks and Gardens (12-13%).

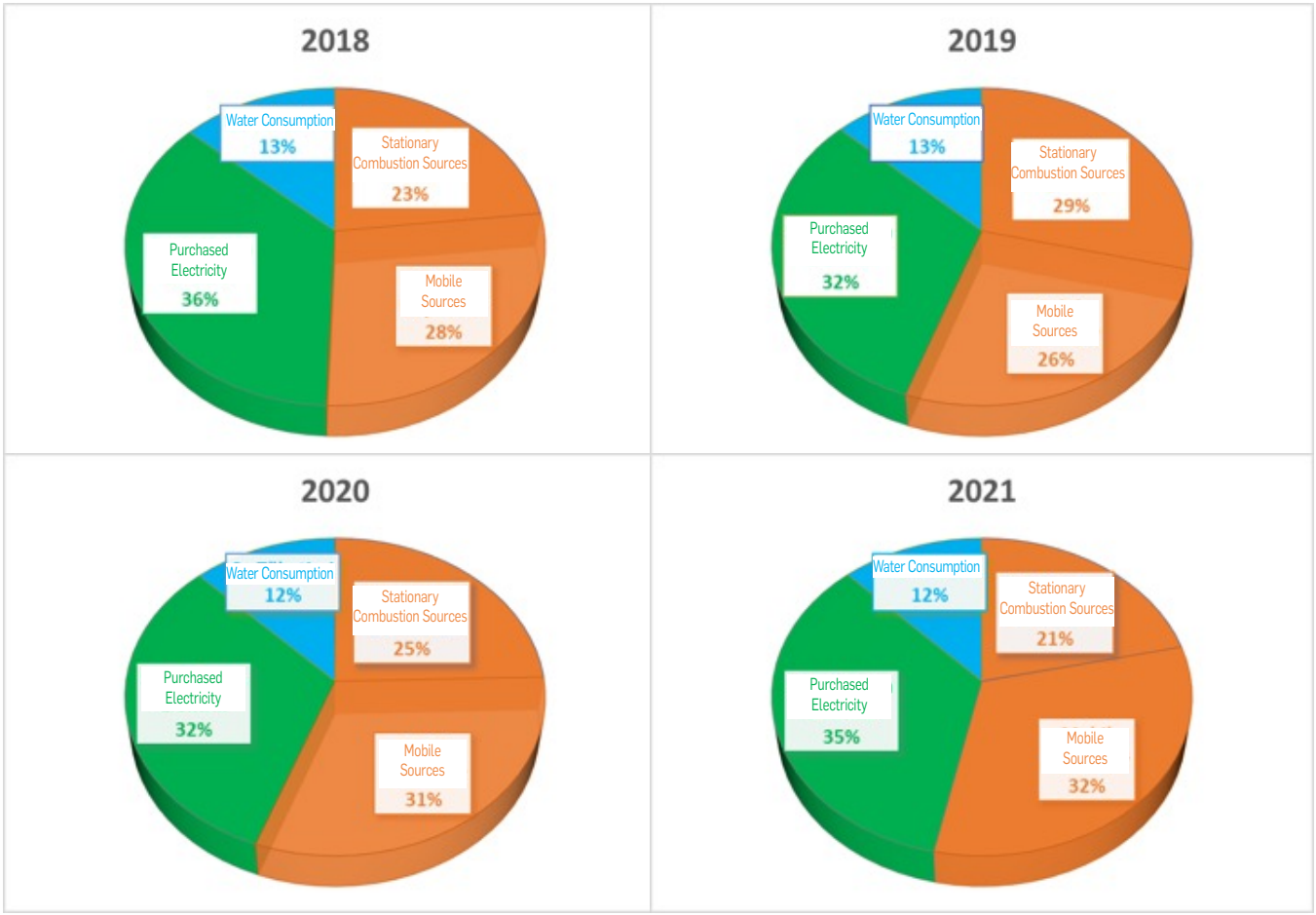

Figure 4.1. Percentage distribution of greenhouse gas emissions by Scopes between 2018-2021

Scope 2 refers to greenhouse gas emissions associated with the purchase of electricity from the grid. The Directorate of Parks and Gardens is the organisation that consumes the most grid electricity and causes greenhouse gas emissions (46-56%). The Directorate of Enterprises and Subsidiaries causes between 16% and 21% of the emissions in this scope. The swimming pool (annual consumption up to 1 million kWh) and cafes (each with an annual consumption of approximately 200,000 kWh) operated by the Directorate of Enterprises

and Subsidiaries have been identified as facilities that consume significant amounts of electricity. It was determined that 12-13 per cent of greenhouse gas emissions under Scope 2 was caused by the Main Service building activities. During the COVID-19 Pandemic, Scope 2 emissions decreased by 16%. In this context, the emissions caused by the Directorate of Parks and Gardens, Directorate of Enterprises and Subsidiaries, Main Service Building and Directorate of Public Works in 2020 decreased by approximately 369,000 $kgCO_2e$, 200,000 kgCO2e, 78,000 kgCO2e and 50,000 kgCO2e, respectively.

Scope 3 includes greenhouse gas emissions generated during drinking and wastewater supply. The Directorate of Nursery (23-36%) and the Directorate of Enterprises and Subsidiaries (26-41%) take the first two places in this scope. The swimming pool within the Directorate of Enterprises and Subsidiaries attracts attention with an annual water consumption of up to 30 thousand m^3. The Main Service Building contributes 9-11% annually to the emissions caused by water consumption, while the Municipal Police Department contributes thereto on an annual basis by 5-6%. Emissions from water consumption also decreased by 20% during the COVID-19 pandemic. The Directorate of Nursery played a leading role in this decrease by consuming approximately 300,000 $kgCO_2e$ less water. During this period, keeping the day-care centres closed for some periods was an important factor.

Each sub-division and total annual carbon dioxide equivalent greenhouse gas emissions and corporate emission contributions of the data received from the Directorates are summarised in the tables below.

Table 4.1. Scope 1 Stationary Combustion Emissions of Directorates

Scope 1 - Stationary Combustion (kg CO2e)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	0	0	0	0
Directorate of Press and Publication	0	0	0	0
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	66.399	71.093	75.654	85.338
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	2.060.692	1.717.907	1.343.023	1.290.219
Directorate of Public Relations	0	0	0	0
Directorate of Legal Affairs	0	0	0	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	1.149.290	2.426.957	1.551.660	1.091.232
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	0	0	0	0
Directorate of Culture and Social Affairs	0	301	4.192	4.704
Libraries	0	0	0	0
Directorate of Financial Services	0	0	0	0
Private Secretariat	0	0	0	0
Directorate of Parks and Gardens	0	0	0	0
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	0	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	0	0	0	0
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	0	0	0	0
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	0	0	0	0
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	0	0	0	0

Table 4.2. Contribution of Directorates to Scope 1 Stationary Combustion Emissions

Scope 1 - Stationary Combustion (‰)	2018	2019	2020	2021
Scope 1 - Stationary Combustion (‰)Directorate of	0	0	0	0
Press and Publication	0	0	0	0
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	20	17	25	35
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	629	407	452	522
Directorate of Public Relations	0	0	0	0
Directorate of Legal Affairs	0	0	0	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	351	576	522	442
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	0	0	0	0
Directorate of Culture and Social Affairs	0	0	1	2
Libraries	0	0	0	0
Directorate of Financial Services	0	0	0	0
Private Secretariat	0	0	0	0
Directorate of Parks and Gardens	0	0	0	0
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	0	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	0	0	0	0
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	0	0	0	0
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	0	0	0	0
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	0	0	0	0

Table 4.3. Scope 1 Mobile Combustion Emissions of Directorates

Scope 1-Mobile Combustion (kg CO2e)	2018	2019	2020	2021
Scope 1 - Stationary Combustion (‰)Directorate of	8.500	7.969	9.517	11.521
Press and Publication	5.375	4.868	4.861	7.119
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	52.101	30.968	20.460	15.391
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	531.775	685.641	618.280	566.678
Directorate of Public Relations	0	18.341	18.484	25.390
Directorate of Legal Affairs	0	0	3.978	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	6.630	10.077	17.308	13.297
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	44.152	46.788	42.955	57.032
Directorate of Culture and Social Affairs	0	0	0	0
Libraries	0	0	0	0
Directorate of Financial Services	0	0	578	3.196
Private Secretariat	0	15.005	10.703	15.813
Directorate of Parks and Gardens	515.110	446.644	469.685	421.395
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	2.498	1.175	1.429
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	80.708	85.000	40.924	42.395
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	12.870	19.863	25.124	21.094
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	2.525.606	2.435.841	2.401.474	2.397.487
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	88.225	62.803	71.164	79.206

Table 4.4. Contribution of Directorates to Scope 1 Mobile Combustion Emissions

Scope 1-Mobile Combustion (‰)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	2	2	3	3
Directorate of Press and Publication	1	1	1	2
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	13	8	5	4
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	137	177	165	154
Directorate of Public Relations	0	5	5	7
Directorate of Legal Affairs	0	0	1	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	2	3	5	4
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	11	12	11	16
Directorate of Culture and Social Affairs	0	0	0	0
Libraries	0	0	0	0
Directorate of Financial Services	0	0	0	1
Private Secretariat	0	4	3	4
Directorate of Parks and Gardens	133	115	125	115
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	1	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	21	22	11	12
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	3	5	7	6
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	652	629	639	652
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	23	16	19	22

Table 4.5. Scope 2 Emissions of Directorates associated with the Purchase of Electricity

Scope 2-Electricity (kg CO2e)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	12.173	12.450	10.054	10.313
Directorate of Press and Publication	0	0	0	0
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	657.818	636.134	558.194	512.723
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	341.023	290.884	241.377	230.585
Directorate of Public Relations	0	0	13.482	20.023
Directorate of Legal Affairs	0	0	0	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	807.387	963.429	766.694	767.897
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	45.956	87.932	112.199	37.004
Directorate of Culture and Social Affairs	107.047	196.140	146.619	139.055
Libraries	5.139	5.286	3.707	3.256
Directorate of Financial Services	0	0	0	0
Private Secretariat	0	0	0	0
Directorate of Parks and Gardens	2.846.064	2.166.727	1.797.756	1.912.763
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	0	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	15.858	13.748	5.882	16.139
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	0	0	385	108.012
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	156.994	135.533	135.523	136.363
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	100.747	131.446	100.915	93.530

Table 4.6. Contribution of Directorates to Scope 2 Emissions associated with the Purchase of Electricity

Scope 2-Electricity (‰)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	2	3	3	3
Directorate of Press and Publication	0	0	0	0
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	129	137	143	129
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	67	63	62	58
Directorate of Public Relations	0	0	3	5
Directorate of Legal Affairs	0	0	0	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	158	208	197	193
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	9	19	29	9
Directorate of Culture and Social Affairs	21	42	38	35
Libraries	1	1	1	1
Directorate of Financial Services	0	0	0	0
Private Secretariat	0	0	0	0
Directorate of Parks and Gardens	558	467	462	480
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	0	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	3	3	2	4
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	0	0	0	27
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	31	29	35	34
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	20	28	26	23

Table 4.7. Scope 2 Water Consumption Emissions of Directorates

Scope 3-Water (kg CO2e)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	7.697	8.411	7.472	17.207
Directorate of Press and Publication	0	0	0	0
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	169.147	181.884	167.504	140.829
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	24.909	51.626	42.752	53.848
Directorate of Public Relations	0	0	10.543	11.509
Directorate of Legal Affairs	0	0	0	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	679.195	605.282	606.124	361.615
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	663.511	673.868	343.561	413.940
Directorate of Culture and Social Affairs	112.787	96.973	60.316	107.213
Libraries	0	0	0	0
Directorate of Financial Services	0	0	0	0
Private Secretariat	0	0	0	0
Directorate of Parks and Gardens	53.378	77.025	106.350	121.488
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	0	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	14.035	12.475	8.639	8.846
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	35.344	33.132	24.978	45.795
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	6.017	26.482	24.178	36.763
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	119.301	114.968	83.393	75.307

Table 4.8. Contribution of Directorates to Scope 3 Water Consumption Emissions

Scope 3-Water (‰)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	4	4	5	12
Directorate of Press and Publication	0	0	0	0
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	90	97	113	101
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	13	27	29	39
Directorate of Public Relations	0	0	7	8
Directorate of Legal Affairs	0	0	0	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	360	322	408	259
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	352	358	231	297
Directorate of Culture and Social Affairs	60	52	41	77
Libraries	0	0	0	0
Directorate of Financial Services	0	0	0	0
Private Secretariat	0	0	0	0
Directorate of Parks and Gardens	28	41	72	87
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	0	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	7	7	6	6
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	19	18	17	33
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	3	14	16	26
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	63	61	56	54

Table 4.9. Total Emissions of Directorates

Total emission (kg CO2e)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	20.674	20.419	19.571	21.834
Directorate of Press and Publication	5.375	4.868	4.861	7.119
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	776.318	738.194	654.308	613.452
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	2.933.491	2.694.432	2.202.680	2.087.482
Directorate of Public Relations	0	18.341	31.966	45.413
Directorate of Legal Affairs	0	0	3.978	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	1.963.308	3.400.464	2.335.662	1.872.426
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	90.107	134.720	155.154	94.036
Directorate of Culture and Social Affairs	107.047	196.440	150.811	143.759
Libraries	5.139	5.286	3.707	3.256
Directorate of Financial Services	0	0	578	3.196
Private Secretariat	0	15.005	10.703	15.813
Directorate of Parks and Gardens	3.361.174	2.613.371	2.267.440	2.334.158
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	2.498	1.175	1.429
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	96.566	98.748	46.806	58.535
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	12.870	19.863	25.509	129.107
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	2.682.600	2.571.374	2.536.997	2.533.849
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	188.973	194.249	172.079	172.736

Table 4.10. Contribution of Directorates to Total Emissions

Total emission (‰)	2018	2019	2020	2021
Directorate of Environmental Protection and Control	1	1	2	2
Directorate of Press and Publication	0	0	0	1
Directorate of Information Processing	0	0	0	0
Directorate of Social Support Services	55	51	54	53
Directorate of Foreign Affairs	0	0	0	0
Directorate of Real Estate and Expropriation	0	0	0	0
Directorate of Survey and Project	0	0	0	0
Directorate of Public Works	208	184	182	181
Directorate of Public Relations	0	1	3	4
Directorate of Legal Affairs	0	0	0	0
Directorate of Zoning and Urban Planning	0	0	0	0
Directorate of Enterprises and Subsidiaries	139	233	193	162
Directorate of Urban Design	0	0	0	0
Directorate of Nursery	6	9	13	8
Directorate of Culture and Social Affairs	8	13	12	12
Libraries	0	0	0	0
Directorate of Financial Services	0	0	0	0
Private Secretariat	0	1	1	1
Directorate of Parks and Gardens	238	179	187	202
Directorate of Plan and Project	0	0	0	0
Directorate of Licenses and Inspections	0	0	0	0
Directorate of Health Affairs	0	0	0	0
Directorate of Social Support Services	7	7	4	5
Directorate of Social Welfare Affairs	0	0	0	0
Directorate of Sports Affairs	1	1	2	11
Directorate of Strategy Development	0	0	0	0
Directorate of Cleaning Services	190	176	209	220
Directorate of Building Control	0	0	0	0
Directorate of Municipal Police	13	13	14	15

4.3. Mitigation Targets

In the study, greenhouse gas emission values between 2018 and 2021 were analysed, and it was determined that the emissions of some directorates decreased in 2020 and 2021 due to COVID-19 pandemic measures. Therefore, 2019, the last year before the COVID-19 pandemic, was selected as the baseline year. In 2019, the total emission amount is 14,610 tCO2e and the emission amount per person served is 28.6 kgCO2e. According to the CoM, the amount of emissions per person in 2030 should be reduced by 40% compared to the baseline year. For 2030, the maximum emission amount per person is determined as 17.2 kgCO2e. According to the population projection made by Bank of Provinces methodology, the population of Antalya Muratpasa Municipality is expected to be 570,000 people in 2030. Therefore, the total amount of greenhouse gas emissions in 2030 is targeted to be below 9,790 tCO2e. With the implementation of the Mitigation and Adaptation Action Plans mentioned in the next section, the total emission targeted for 2030 is 8,555 tCO2e and emission per capita is 15 kgCO2e (Figure 4.2). In other words, CO2e mitigation of 47.6% is targeted in annual greenhouse gas emissions by 2030 compared to 2019.

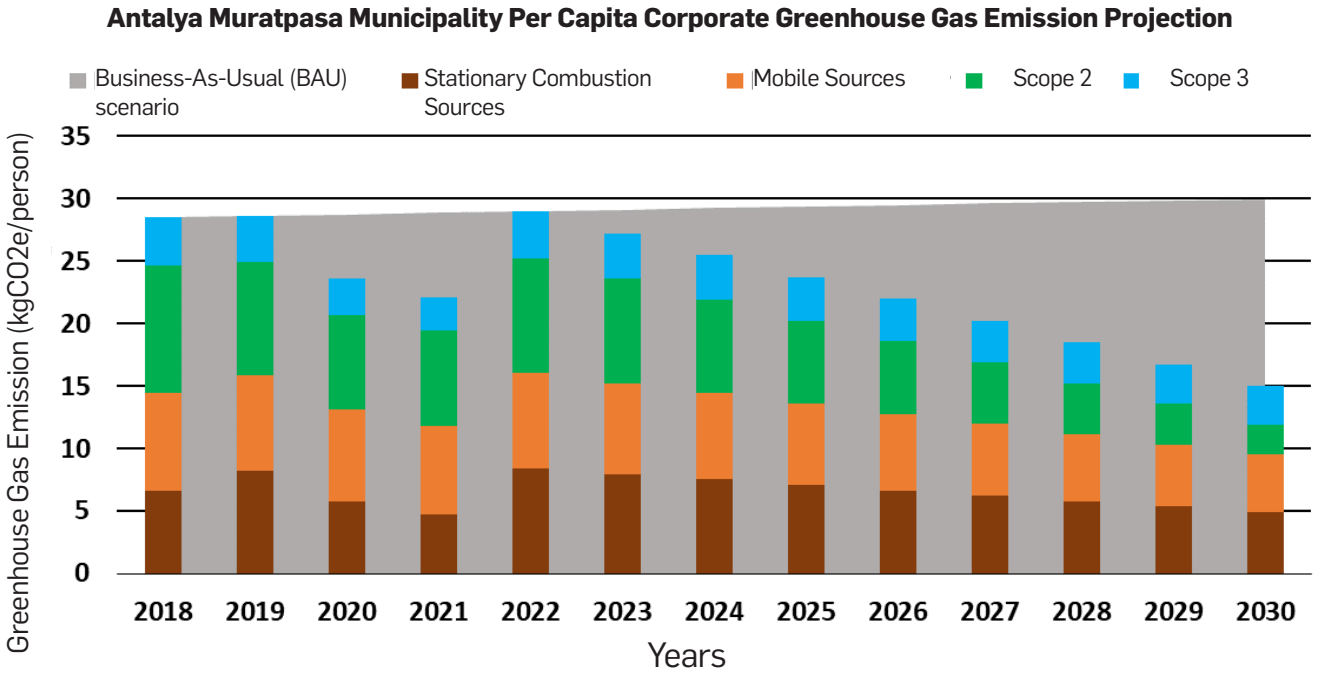

Figure 4.2. Greenhouse Gas Emission Projection of Antalya Muratpasa Municipality by Sub-Divisions

4.4. Sensitivity (Risk) Analysis against Hazards Resulting from Climate Change

Directorates of Antalya Muratpasa Municipality were analysed in two separate groups: those located in the Main Service Building and directorates in individual buildings (with their own organisations). The most important detail at this point is the differences in the way of communicating with the citizens served and the way of doing business. While the directorates located in individual buildings are generally more mobile and need to go to the point where service is provided, the directorates located in the Main Service Building are responsible for visiting the citizens who want to receive service when necessary or establishing communication

between the Municipality and other public organisations. A directorate located in the Main Service Building does not have a significant vehicle fleet separate from the Directorate of Support Services to which it is affiliated, and there is a possibility that they may utilise independent heating and cooling alternatives in their daily routines. The only directorate that contradicts this assessment is the Directorate of Municipal Police. Although the Directorate of Municipal Police seems to be located in the Main Service Building, it actually has police stations, service points, its own offices and its own vehicle fleet throughout the municipality. The Directorate of Municipal Police selects the heating and cooling requirements of the places where it is responsible for providing service in accordance with the point of service.

The risks of Antalya Muratpasa Municipality directorates in providing services on excessive rainfall and flooding, extreme weather events, wave of cold air, sea level rise, wave of hot air and drought, forest fires, water pollution and infectious diseases were revealed as a result of the workshop held with the External and Internal Stakeholder Meeting. Workshop participants were reminded of the information contained in Chapters 2 and 3 of this report and the activities of the directorates were explained to them. Afterwards, the participants were asked to score which directorate would be affected by the dangers arising from climate change and to what extent. In the scoring, a temperature map was created by characterising it as 1-Low, 2-Medium, 3-High.

The evaluation results of the directorates located in individual buildings and the Main Service Building are shown in Table 4.11 and Table 4.12, respectively. When a general evaluation is made, it is concluded that the directorates located in individual buildings are more sensitive to climatic risks. It is thought that the most important reason for this is that the mobility of the directorates located in the individual buildings is higher than the directorates in the Main Service Building (except for the Directorate of Municipal Police). In addition, since the internal and external stakeholder workshop was held after the COVID-19 Pandemic, there is a possibility of bias in the assessment of infectious diseases. Regarding the risk of forest fires, participants were told that park and garden fires should also be considered in this context. It is assessed among the directorates located in individual buildings that the most important climatic threats that the directorates will have difficulty in fulfilling their activities within the directorates located in individual buildings will occur in the issues of infectious diseases, excessive precipitation and flooding and pollution of water. It was stated by the participants that infectious diseases are a high risk for the activities of Directorates of Environmental Protection and Control, Nursery, Social Support Services, Health Affairs and Cleaning Services. It is assessed by the workshop participants that the risk of excessive precipitation and flooding constitutes a high risk for the activities of the Directorates of Public Works, Parks and Gardens, Enterprises and Subsidiaries and Cleaning Services, while the risk of water pollution is assessed as medium-high (2.1-2.5) by almost all directorates operating in individual buildings. It has been determined that the Directorates of Parks and Gardens, Environmental Protection and Control, Public Works, Enterprises and Subsidiaries and Cleaning Services will be adversely affected by the risk of extreme weather events. In addition, it has been concluded that the Directorate of Parks and Gardens will be adversely affected by the risks of wave of cold air, hot air and forest fires.

Table 4.11. Sensitivity of Directorates in Individual Buildings to Climatic Threats

	Extreme Precipitation and Flooding	Extreme Weather Events	Wave of Cold Air	Rise in Sea Level	Wave of Hot Air and Drought	Forest Fires	Pollution of Water	Infectious Diseases	Average
(ASSIM) (Enterprises and Subsidiaries)	2,1	2,0	1,7	1,1	1,9	1,3	2,1	2,4	**1,8**
Environmental Protection and Control	2,5	2,5	2,0	1,7	2,2	1,9	2,5	2,7	**2,2**
Public Works	2,7	2,5	2,1	1,8	2,3	1,9	2,3	2,3	**2,2**
Enterprises and Subsidiaries	2,6	2,4	2,1	2,1	2,1	1,7	2,5	2,5	**2,2**
Nursery	2,3	2,2	1,9	1,4	2,0	1,3	2,5	2,7	**2,0**
Parks and Gardens	2,7	2,6	2,5	2,1	2,5	2,5	2,4	2,1	**2,4**
Health Affairs	2,2	2,2	2,2	1,5	2,3	1,9	2,5	2,6	**2,2**
Social Support Services	2,4	2,2	2,2	1,5	2,3	1,7	2,2	2,7	**2,1**
Sport Affairs	2,4	2,2	2,1	1,7	2,1	1,5	2,3	2,4	**2,1**
Cleaning Services	2,6	2,4	2,1	1,8	2,3	2,0	2,5	2,6	**2,3**
Average	**2,4**	**2,3**	**2,1**	**1,7**	**2,2**	**1,8**	**2,4**	**2,5**	**2,2**

Table 4.12. Sensitivity of the Directorates in the Main Service Building to Climatic Threats

	Extreme Precipitation and Flooding	Extreme Weather Events	Wave of Cold Air	Rise in Sea Level	Wave of Hot Air and Drought	Forest Fires	Pollution of Water	Infectious Diseases	Average
Press and Publication	2,2	2,1	2,0	1,5	2,0	1,5	2,1	2,4	**2,0**
Information Processing	2,0	2,0	1,8	1,4	1,8	1,4	2,0	2,2	**1,8**
Support Services	2,2	2,1	2,0	1,6	2,2	1,5	2,2	2,4	**2,0**
Foreign Affairs	1,8	1,8	1,7	1,5	1,8	1,4	2,0	2,2	**1,8**
Real Estate and Expropriation	1,9	2,0	1,8	1,5	1,8	1,4	2,1	2,3	**1,8**
Survey and Project	1,9	1,9	1,7	1,5	1,9	1,4	2,0	2,2	**1,8**
Public Relations	2,2	2,0	1,9	1,5	2,0	1,4	2,1	2,7	**2,0**
Zoning and Urban Planning	2,1	1,9	2,0	1,5	1,9	1,4	2,0	2,3	**1,9**
Human Resources and Training	1,7	1,7	1,7	1,4	1,7	1,2	2,0	2,4	**1,7**
Women and Family Services	2,0	1,9	1,8	1,4	1,8	1,2	2,2	2,5	**1,9**
Urban Design	2,0	2,0	2,0	1,6	2,0	1,4	2,2	2,2	**1,9**
Culture and Social Affairs	2,0	2,1	1,9	1,5	2,0	1,4	2,2	2,6	**2,0**
Financial Services	1,9	1,9	1,8	1,5	1,8	1,2	1,9	2,4	**1,8**
Private Secretariat	2,0	1,8	1,8	1,4	1,8	1,3	1,9	2,4	**1,8**
Plan and Project	2,0	2,0	1,9	1,5	1,9	1,3	2,0	2,2	**1,8**

Table 4.12. Sensitivity of the Directorates in the Main Service Building to Climatic Threats (continued)

	Extreme Precipitation and Flooding	Extreme Weather Events	Wave of Cold Air	Rise in Sea Level	Wave of Hot Air and Drought	Forest Fires	Pollution of Water	Infectious Diseases	Average
Licenses and Inspections	1,9	2,0	2,0	1,5	1,9	1,4	2,1	2,4	**1,9**
Social Welfare Affairs	2,3	2,3	2,2	1,6	2,2	1,5	2,3	2,7	**2,2**
Strategy Development	1,8	1,8	1,8	1,4	1,7	1,2	2,0	2,2	**1,7**
Inspection Board	1,8	1,8	1,8	1,5	1,8	1,3	2,0	2,2	**1,8**
Building Control	2,0	2,2	2,0	1,5	2,0	1,4	2,0	2,4	**1,9**
Registry Affairs	1,8	1,7	1,7	1,4	1,7	1,2	1,8	2,1	**1,7**
Municipal Police	2,3	2,3	2,1	1,6	2,2	1,7	2,3	2,5	**2,1**
Average	**2,0**	**1,9**	**1,9**	**1,5**	**1,9**	**1,4**	**2,1**	**2,3**	**1,9**

Within the directorates located in the Main Service Building, it has been determined that the most important climatic threats that the directorates will have difficulty in fulfilling their activities are the same as the directorates located in the individual buildings and these are infectious diseases, excessive rainfall and flooding and water pollution. It was evaluated by the workshop participants that infectious diseases would restrict the activities of the Directorates of Social Welfare Affairs, Public Relations, Culture and Social Affairs, Women and Family Services and the Municipal Police. Except for the risks of forest fires and rise in sea level, the average assessments of climatic threats in other directorates were found to be between medium (1.7-2.3). The likelihood of forest fires and rise in sea level to hinder the activities of the directorates located in the Main Service Building was found to be low in general.

5. SUSTAINABLE ENERGY AND CLIMATE ACTIONS

It is recommended that the following activities be carried out in order to reduce greenhouse gas emissions in line with the CoM targets of Antalya Muratpasa Municipality in the 2030s and to prevent municipal activities from being affected by climate change. In addition, minimising fossil fuel consumption in every decision to be taken and every step to be taken until 2050 will be beneficial for the healthier progress of this process. Action plans are basically categorised under two headings: greenhouse gas emission mitigation (Mitigation-A) and adaptation to climate change (Adaptation-U). Table 5.1 provides an explanation on coding.

Table 5.1. Categorisation of Action Plans

First Letter	Next Letters
A: Mitigation	AK: Land Use
U: Adaptation	AY: Disaster Management
	B: Buildings
	E: Energy
	GG: Food Safety
	K: Corporate
	S: Health
	SAK: Water and Waste Management
	U: Transport

As a result of mitigation activities, **6,055,300 kgCO2e** emission mitigation is foreseen. This is **1,235,300 kgCO2e** above the CoM target of **4,820,000 kgCO2e.** It is planned to realise 48.6% reduction compared to the baseline year. Table 5.2 shows the emission values that will occur according to sub-divisions with the realisation of 46 action plans, 10 of which are mitigation and 36 of which are adaptation action plans.

Table 5.2. Emission Values for 2030 by Sub-Divisions and Amounts of Mitigation by Reference Year

Scope (kg CO2e)		2019	2030	Mitigation (%)
Scope 1	Stationary Combustion Sources	4.216.257	2.371.657	49,6
	Mobile Sources	3.872.306	3.069.206	29,0
Scope 2	Purchased Electricity	4.639.708	1.355.608	73,8
Scope 3	Water Consumption	1.882.125	1.758.625	16,3
	Total	14.610.397	8.555.097	41,4
	Total Emission	510.368	570.011	
	Emission per Person (kg CO2e / person)	**28,6**	**15**	**48,6**

Azaltım Planları:

1. AE. Installation of Solar Power Plants (SPPs) on a total area of 21,000 m2: SPPs can be installed on the roofs of buildings located close to the transport axes of Antalya. The availability of the facility with a park-and-ride logic in appropriate spaces will reduce urban traffic, thus reducing urban greenhouse gas emissions, and Since energy will be obtained from the sun, emissions from electricity supplied from the grid (Scope 2) will be reduced. 5,660,000 kWh of energy will be generated and approximately 2,739,000 kgCO2e emissions will be reduced annually.

2. AE. Preparation and implementation of a project to reduce energy losses and leakages at Suleyman Erol Swimming Pool: In order to reduce the emissions of Suleyman Erol Swimming Pool, it is recommended to define and realise the necessary revisions for water recovery, lighting, heating units and insulation materials that save electrical energy, and the use of heat pumps (air-to-air and air-to-water) instead of using natural gas. If the project is realised, 980,000 kgCO2e emission will be reduced.

3. AE. Reduction of emissions from passenger cars to reduce motor vehicle emissions: Currently, 72 passenger cars are used in various departments of the municipality. Passenger cars are responsible for approximately 6% of mobile emissions. Vehicles travel an average of 45 kilometres per day. This distance is sufficient for the use of electric vehicles. However, the infrastructure (charging station, vehicle maintenance, and battery renewal definitions) is still insufficient. It is proposed to gradually replace existing vehicles with electric passenger cars by 2030. If electric vehicles are charged with electricity generated instead of grid electricity, 195,000 kgCO2e emission will be reduced.

4. AE. Motor vehicle fuel consumption monitoring project: Approximately 80% of motor vehicle emissions come from panel vans, minibuses, vans and trucks. Fuel consumption of these vehicles varies according to the load, route and meteorological conditions. It is thought that these changes may cause malfunctions in vehicles not to be monitored. For example, while a truck consumed less than 40 litres of fuel per 100 km in 2018-2020, it was determined that the same truck consumed 51 litres of fuel per 100 km in 2021. Although the 25% difference in question may seem insignificant in total, it is thought that it would be useful to collect data and monitor the vehicles with a systematic study in order to monitor similar situations in other vehicles. Another example is that a passenger car used by one directorate consumes 6.8 litres of fuel per 100 km, while another vehicle of the same type consumes 9.6 litres of fuel per 100 km in another directorate. Such differences should be analysed and losses should be prevented. It is foreseen that this project will be implemented free of charge or with a very low budget. It is estimated that the project will prevent 169,000 kgCO2e emissions, which corresponds to 5% of the emissions from panel vans, minibuses, vans and trucks.

5. AE. Training on economical driving: Although the drivers of our Municipality consist of competent personnel in their fields, it is anticipated that the innovations in vehicle technology will be introduced with the developing technology and this will reduce vehicle emissions and maintenance costs. It is foreseen that a 5% decrease in vehicle emissions (193,500 kgCO2e) will be achieved by providing these trainings to the relevant personnel every two years.

6. AE. Evaluation of alternative mixtures that can be used instead of Hot Asphalt in the Asphalt Plant unit: Plant facility under the Directorate of Public Works is currently responsible for 14% of the total corporate greenhouse gas emissions of Antalya Muratpasa Municipality (2,054,000 kgCO2e). In the current situation, production is planned for hot asphalt pouring. However, technologies that can be suitable for the existing system with innovative approaches should be investigated, and the principle of compatible operation of these systems with existing equipment should be evaluated. It is foreseen that CO2e emission will be reduced if the suitability of the existing plant for warm mix asphalt etc. systems is investigated.

7. AE. Greenhouse gas emission reduction in Main Service Building: The Main Service Building is responsible for 6% of total emissions. Various projects are needed to minimise heat losses in the Main Service Building caused by some essential situations, to use economical lighting devices and to save water. In order to prevent heat losses, it is recommended that the personnel meet their needs in smoking rooms as in airports instead of using fire escapes. Thus, heat losses caused by fire escapes will be prevented. However, it will be useful to consider the use of heat pumps instead of natural gas for the period after 2030. A reduction in energy use is expected due to the energy-efficient lighting equipment that has already been replaced. It was observed that some directorates have too many printers, photocopiers and scanners. It is recommended to reduce electricity consumption by optimising their number. It is recommended to save electricity by automatically switching off the electricity of computers, air conditioners, printers, lighting and similar equipment at a certain time interval. It is suggested that the receipts given to citizens should be issued as e-receipts/e-documents and recycled paper should be used upon request. It is also recommended that air conditioning system maintenance and cooling gases be replaced with gases with lower greenhouse gas potential (HFO, CO2, HC and Ammonia). It is recommended that end-of-life devices and computers be replaced with energy-efficient models throughout the municipality. However, savings in water consumption is expected with the use of water saving apparatus in the taps. It is recommended to use water meters on some floors to monitor the results. It is recommended that all computers, including the Main Service Building, be switched to sleep mode after more than 5 minutes of waiting time. If these procedures are implemented, a saving of 10% in natural gas consumption, 5% in electricity consumption and 10% in water consumption will be achieved, resulting in an emission reduction of 85,400 kgCO2e. In addition, rainwater harvesting is proposed for the irrigation of the green areas in the Main Service Building and the adjacent city square. It has been determined that the works in this item have been carried out to a large extent, but have not yet been reflected in the measurements. Only smoking rooms need to be prepared and independent ventilation needs to be established.

8. AE. Use of alternative energy sources in parks and lighting with energy-saving devices: Lighting of parks at night is indispensable as it is generally a security issue. Currently, greenhouse gas emissions from parks and gardens constitute 14% (2,039,000 kgCO2e) of corporate emissions. Therefore, energy saving in parks and gardens has an important place. Using energy-saving lighting options in only 5% of the parks by

2030 and charging this lighting requirement with solar energy will lead to 113,800 kgCO2e energy savings. In which of the existing or new parks this action can be implemented should be determined by the joint decision of the Directorate of Parks and Gardens and the Energy Management Unit.

9. AE. Route optimisation for waste collection by artificial neural network method: Solid waste collection trucks are responsible for 57% of total mobile emissions (2,200,000 kgCO2e). In order to optimise the routes to reduce these emissions, vehicles will be monitored by installing weight sensors for two years and route optimisation will be carried out according to parameters such as seasonal and weekday/weekend, and 10% greenhouse gas emission reduction will be achieved in 2030 (245,600 kgCO2e). Data for this action can be collected in three ways. Firstly, garbage containers can be updated and sensors and batteries can be installed in them. Thus, the quantities inside the container can be monitored during each container unloading. As a second method, weight sensors will be installed in the container loading sections of the garbage trucks and the full and empty weights of each garbage container will be calculated. The third method is to install a camera on the garbage truck that can clearly see the inside of the container while it is being loaded and monitor the fullness of the container. Thus, the container occupancy rate will be monitored directly. Occupancy monitoring with camera is the most economical method in terms of implementation and ease of use. All trucks will be equipped with a GPS and a camera and container tracking will be carried out, container occupancy rates will be monitored with the software to be developed and then route optimisation will be performed.

10. AE. Maintenance of air conditioning equipment in all other buildings and renewal and replacement within a programme: Klima gazlarının Florlu Sera It is recommended that air conditioning gases should be maintained/labelled within the scope of the Regulation on Fluorinated Greenhouse Gases (Official Gazette, 29 June 2022, Issue: 31881) and replaced with the appropriate refrigerant gases such as HFO, HC, Carbon Dioxide, Ammonia. Although the number of air conditioners is currently known, it is not known how much fluorinated greenhouse gases are in the air conditioners that have been used in different years, which should be monitored according to the Regulation on Fluorinated Greenhouse Gases.

Adaptation Actions:

11. UAK. Adaptation against excessive precipitation and flooding with permeable asphalt, permeable pavements and permeable car parks: It is aimed to prevent excessive precipitation from causing flooding by using permeable ground in the projects in the planning stage. In addition, it is recommended to use cobblestones and similar materials with high permeability in pedestrian crossings in order to slow down the vehicles and prevent water accumulation. Thus, works will be carried out in order to prevent flooding, one of the urban vulnerabilities, and victimisation is caused by precipitation.

12. UAK. Assessment of the threats arising from climate change in the areas to be newly zoned and in the areas where urban transformation will take place, and preparation of zoning plans and plan notes: It is recommended that factors such as excessive precipitation, floods, extreme weather events, waves of cold air, sea level rise, waves of

hot air and drought, forest fires, water pollution and infectious diseases should be evaluated together when preparing zoning plans and plan notes. In addition, it is recommended that partial green roof and partial rooftop solar power plant applications be made in the buildings in these areas, In order to reduce the urban heat island effect, in parcels where rainwater harvesting is less than the area specified by the regulation, it is recommended that bicycle paths and walking paths, e-charging stations and bicycle parking areas be added to the zoning plans and plan notes on an island basis.

13. UAK. Meeting the irrigation needs of at least one facility by 2030 with rainwater harvesting: The main objective here is to meet the irrigation needs as well as to prevent flooding due to excessive precipitation.

14. UAK. Establishing a Miyawaki Forest to increase the resilience of biodiversity to climatic threats: It is proposed to be planned in an area that will not pose a problem in terms of security in order to increase the resilience of biodiversity against climatic threats. There is no example of this practice in our country. However, there are examples in the Mediterranean Basin (Italy) (Schirone et al. 2011; Urban-Forests, 2021).

15. UAY. Consideration of meteorological warnings in work planning: Due to climate change, meteorological events that reach the size of disasters are experienced more frequently. It is recommended to take into account the warnings of the Regional Directorate of Meteorology in work planning. Citizens should be informed when necessary in order to avoid victimisation.

16. UAY. Strengthening the roofs of new bazaars and roof supports of old bazaars and using bazaar roofs for the cultivation of medicinal aromatic plants by women's associations: Using the roofs of the bazaars as green areas adds additional value to them and reduces the urban heat island effect. Within the framework of the United Nations Sustainable Development Goal of reducing inequalities, it is proposed that these green areas be used by women's associations to grow medicinal aromatic plants with high financial value. By 2030, it is proposed to implement the application in a bazaar that will be built or strengthened.

17. UAY. Reducing the heat island effect by painting old bazaars and building roofs white: In order to reduce heat waves and urban heat island effect, it is recommended that existing bazaars and building roofs be painted white. In this context, an inventory study should first be carried out to list which buildings and bazaars can be utilised in this context.

18. UAY. Construction of a park thematising climate change: It is proposed to construct a park with endemic plants and natural landscaping, sculptures drawing attention to climate change and environmental protection, and a water storage feature against floods in extreme precipitation. In addition, switching to natural landscaping in the parks for which the municipality is responsible will save water.

19. UAY. Building resistance to extreme weather events: In order to prevent damage to buildings, parks and gardens, damage to the community and the disruption of transport due to extreme weather events, it is recommended that controls and measures be taken by the

relevant directorates in buildings, parks and gardens at regular intervals.

20. UAY. Realisation of personnel and vehicle planning against climatic threats: It is recommended to raise awareness of the personnel against all climatic threats and to ensure their readiness for the realisation of coordination in case of disaster and to prepare a Disaster Action Plan.

21. UAY. Citizen education: It is recommended to create and broadcast public service announcements to educate citizens on disasters that may occur in the city, especially climatic threats.

22. UAY. Co-operation against flooding: In order to prevent the possibility of flooding of Duden and Aksu streams, it is recommended to plan works in cooperation with other district municipalities in the basin, Antalya Metropolitan Municipality, Antalya Provincial Directorate of Environment, Urbanisation and Climate Change and DSI.

23. UB. Obtaining Energy Identity Certificate for existing buildings: It is recommended to determine the energy losses in existing buildings within a planning and to obtain an energy (lighting, heating, cooling, water and waste management) identity certificate for buildings. This activity will both save energy and provide resistance to meteorological events.

24. UB. Obtaining Climate Friendly Organisation Certificate for Antalya Muratpasa Municipality: İThe Climate Friendly Organisation certificate is a certificate issued by TSE to ensure that there is no carbon footprint. Obtaining this certificate contributes to the race for awareness.

25. UB. Establishing an infrastructure to award the "Climate Friendly Local Organisation" label to commercial organisations: It is thought that labelling activities will be useful in order to support commercial establishments serving within the municipal boundaries to produce local solutions by considering climatic sensitivities and to reduce the ecological footprint. At this point, it can be planned to organise workshops with stakeholders to determine the parameters.

26. UB. Popularisation of green roof and vertical garden applications: Green roofs are recommended for the utilisation of building roofs to provide a carbon sink area, to support biodiversity, to provide additional building insulation, to reduce the urban heat island effect, and to prevent flooding by slowing down rainwater. However, this is likely to cause static problems in existing buildings. It is recommended that this should be done at low densities in places where it is easy to grow locally and where it will be beneficial to gain space with arid landscaping applications. Vertical gardens are a method used in areas with high air pollution to act as filtration or to reduce the urban heat island effect by eliminating the appearance of concrete walls. It is recommended to be used for different purposes at least at a few points.

27. UB. Informing citizens about the Regulation on Fluorinated Greenhouse Gases:
It is recommended to carry out awareness-raising activities every year to inform citizens about the regulation and the European Commission regulation (EC517/2014), which

entered into force in our country and was revised in 2022, and to create companies to follow the necessary activities.

28. UB. Assessment of damage to building foundations against rising sea waters: Currently, according to the Regulation on the Implementation of the Coastal Law (Official Gazette, 03.08.1990, No: 20594), the coastal band is 150 m. However, sea level is expected to rise by 2 m by 2100 and 5 m by 2150. This situation will bring up the danger of corrosion due to salination in the foundations of the buildings to be constructed especially in Guzeloba and Çaglayan neighbourhoods. In addition, the beaches under the Directorate of Enterprises and Subsidiaries are likely to be adversely affected by the sea level rise. In order to monitor the change in sea level and to raise public awareness on this issue, it is recommended to establish a mareograph station in cooperation with the General Directorate of Mapping to measure the sea level at a beach operated by the Directorate of Enterprises and Subsidiaries. Thus, the sea level rise in the cliff area will be monitored regularly, the response of the cliffs to climatic effects will be monitored according to the sea level and social awareness will be created. Currently, sea level measurement with mareograph is carried out only in Antalya harbour in the vicinity of Antalya. With the data to be obtained from the two stations, it will be possible to evaluate how many metres the coastal band will be in the 2050s, both in the cliff band and in the region including Guzeloba and Çaglayan neighbourhoods. The first mareograph station in the history of the Republic was established in Antalya in 1935 (5.1.). Its location could not be determined from open sources. If it is identified, the establishment of a similar station in the same place should be evaluated separately.

29. UE. Planning with approximately zero emission policy in new and retrofitted buildings: It is recommended to reduce greenhouse gas emissions as much as possible by preparing new or retrofitted buildings, pools, sports fields, parks, bazaars and similar facilities with a zero emission policy as much as possible.

30. UE. Providing training on energy saving: It is recommended that the importance of saving energy should be emphasised by giving compulsory training on energy saving to the municipal staff, similar training should be given to the relevant private sector representatives together with the chambers, and public meetings should be held together with the City Council and non-governmental organisations.

31. UGG. Carrying out quality control in food services provided by the Municipality: It is recommended that quality control is carried out in the food services provided by the Social Welfare Affairs, Social Support Services, Nursery and Enterprises and Subsidiaries Directorates of the Municipality and that this situation is shared at regular intervals by verifying that high-quality food is provided. In terms of food safety, it is suggested that supplier companies should be kept under supervision and documents should be requested that the foodstuffs supplied meet the standards/regulations/legislation.

32. UK. Establishing a data set for the calculation of greenhouse gas emissions of services purchased under Scope 3: It is suggested to raise awareness on this issue and to collect all the services purchased and activities carried out by the municipality

(exhibitions, openings, concerts, publicity, type and reason of travel, kilometres covered, etc.-, buildings constructed, fixtures purchased, consumables, rented vehicles, etc.) in a pool and to monitor them. It is recommended that the services to be purchased from now on and the activities to be carried out should be leased and purchased in such a way that greenhouse gas emissions are as low as possible.

33. UK. Including the actions contained herein in the Municipality Strategic Plan: It is recommended that the actions in this

Figure 5.1. Antalya mareograph station: The first mareograph station in the history of the Republic established in 1935 (TUDES, 2022)

action plan, which are deemed appropriate by the relevant directorates of the municipality and the Municipal Council, and which are not included in the Municipal Strategic Plan, be included in the next action plan.

34. UK. Collaborating and proposing projects to build climate resilience: It is recommended to cooperate with municipalities that have prepared or want to prepare sustainable energy and climate action plans, to exchange information and to apply for joint projects. In addition, it is recommended to prepare joint projects on climate change with Antalya City Council, professional organisations, non-governmental organisations and universities and apply for joint-call projects.

35. UK. Informing the public about endemic flora and fauna: Muratpasa is built on cliffs and is home to many endemic flora and fauna. It is recommended that activities should be carried out to promote this flora and to ensure that it is preferable by the society as a natural landscape. In addition, there are many endangered sea creatures and migratory and resident birds living in the region. It is suggested that introductory information about these species should be provided and the actions to be taken by the community and the municipality should be determined in order to prevent these creatures from being under stress.

36. US. Creation of "Portal of Municipal Services": Developing the digital infrastructure that will allow citizens to carry out their work without coming to the Main Service Building will both reduce greenhouse gas emissions and eliminate the risk of infectious diseases. In order to facilitate access to this infrastructure, information activities should be considered to provide access to the public with the help of a tablet placed at the stand in the mukhtars' offices in the regions where the elderly population is dense.

37. US. Assessing the risk of infectious diseases while carrying out cultural activities: It is recommended to keep the activities short, especially in winter months where it is easy to spread infectious diseases in indoor environments, and to carry out the activities planned to last longer in the outdoor environment.

38. US. Monitoring pollution on the beaches: It is recommended that necessary measures should be taken to identify the elements threatening the beaches and potential pollution before they reach the beaches and to provide early warning, and periodic beach/seabed cleanup should be carried out.

39. US. Avoiding disruption of health services during unusual meteorological conditions: It is recommended to establish alternative routes in order to avoid disruption of health services during unusual meteorological events.

40. USAY. Having a team in the bazaars to increase efficiency in recycling: It is thought that recycling awareness and efficiency can be increased by sending a team to the bazaars in the regions where the Environmental Neighbour Card application has just started on the days when the bazaars are established, as they are more easily accessible to citizens and are open all day long.

41. USAY. Reducing solid waste generation in announcements and posters: It is suggested that paper announcements and posters prepared to notify

citizens of municipality activities should be announced through digital boards, SMS and social media to reduce waste generation.

42. USAY. Establishment of waste collection centres: It is proposed to prepare a project to carry out these operations at points that are constantly open, especially markets, mukhtars' offices and police stations, in order to collect wastes within the framework of the Environmental Neighbour Card project in a more efficient and continuous manner.

43. USAY. Practices and trainings on waste minimisation: It is recommended to implement practices in line with the needs of the personnel, especially to reduce the generation of recyclable wastes, and to provide training to the personnel on the subject. It is recommended not to use disposable plastics in the facilities under the Directorate of Enterprises and Subsidiaries.

44. USAY. Recycling of bazaar and garden waste: Separate collection of bazaar organic wastes and preparation of projects for composting and biofuel production are suggested.

45. USAY. Partial transition to natural landscaping in parks and gardens: In order to protect the endemic plant population of parks and gardens and to maintain the vitality, especially birds, it is recommended to switch to natural landscaping in these areas. This will reduce greenhouse gas emissions based on water and electricity consumption and reduce the stress on endemic plants and especially on the habitats of birds. It is also recommended to make planning for the protection of forested areas with natural vegetation and wetlands.

46. UU. Bicycle path from the airport to the city centre with the "You Got The Power" project: Take a Ride to Old town:

Our airport will increase its capacity very soon. After this increase, the airport will become a transfer point with the increase in arriving and departing passengers. In order for the passengers waiting during this transfer process to be able to visit the city, it is recommended that a bicycle path should be planned on a route extending from the airport to Duden Coastal Waterfall via Kardes Kentler Boulevard and then to Kaleici via Lara Street. It is considered that the construction process of this 22 km long track can be solved by developing a joint project with the competent institutions and organisations.

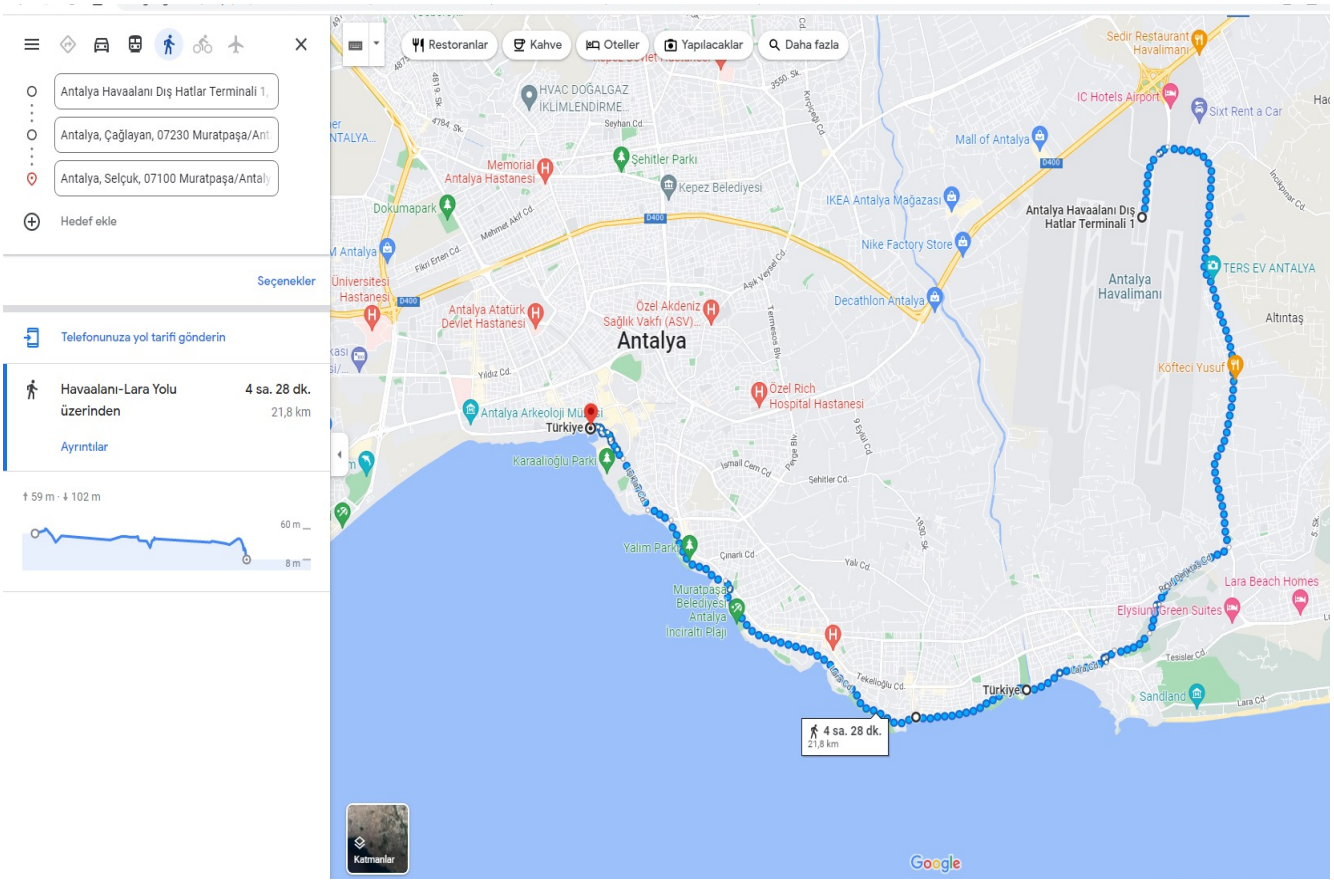

Figure 5.2. Cycling Route implemented within the scope of "You Got The Power" project

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