ANTALYA
BÜYÜKŞEHİR
BELEDİYESİ

SUSTAINABLE ENERGY ACTION PLAN

Executive Summary

2021

Executive Summary

With the Industrial Revolution, climate change is increasing day by day due to the use and release of fossil fuels that accumulate under the ground over millions of years. According to the Physical Science Basis of Climate Change (IPCC, 2013) Report of the Intergovernmental Panel on Climate Change (IPCC), warming of the global climate is unequivocal, and most of the observed changes in climate since the 1950s are unprecedented until the last millennium. Each decade of the past 30 years has been warmer on Earth than all ten-year periods of global surface temperatures recorded since 1850. Beginning with the industrial revolution, it has been proven that carbon dioxide emissions from human activities, particularly due to fossil fuel consumption, have increased much faster than the oceans and forest areas can absorb. It is predicted that continuing the existing habits of societies will have serious climate change consequences, which will lead to great environmental destruction and possible mass deaths, as well as related humanitarian disasters.

The SEAP process has been prepared in accordance with the CoM methodology used by all cities preparing a Sustainable Energy Action Plan. The following basic steps were followed in the process carried out in accordance with CoM's SEAP reporting template and accompanying method report:

a) Preparing the greenhouse gas emission inventory and evaluating the current situation

b) Reduction of greenhouse gas emissions by at least 40% in 2030 compared to the base year of 2019

c) Establishing sustainable energy actions to reduce greenhouse gas emissions

Antalya Sustainable Energy Action Plan creates a roadmap for reducing emissions from energy consumption in different sectors determined with the participation of urban stakeholders. This roadmap was first started with the calculation of the current status greenhouse gas emissions inventory of the province of Antalya for 2019. The inventory was created by the International Council of Local Initiatives (ICLEI) based on the IPCC guidelines and has been prepared within the framework of the general principles and philosophy of the International Protocol for the Analysis of Local Government Greenhouse Gas Emissions (IEAP), which is valid for every local government.

a) Key Findings

When the 2019 emissions of Antalya city, including industry, are analyzed, the total energy consumption in the province is 28.623.531 MWh and greenhouse gas emissions are 10.683.551 tCO2e. Within the total inventory, emissions from fuel and electricity consumption of buildings (including industry) 47.1% (40.9% buildings and 6.1% industry), emissions from transportation 30.2%, emissions from agriculture and livestock about 6%, energy production emissions from solid waste and wastewater processes have a share of 8.5%, and emissions from solid waste and wastewater processes have a share of 8.2% (Figure 1).

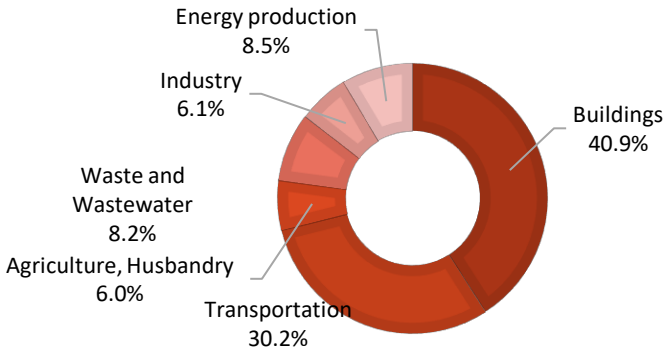


Figure 1: Sectoral greenhouse gas inventory of Antalya city

It is concluded that with the reduction measures put forward in the sectors, a 40% reduction can be achieved in Antalya's per capita emissions by 2030 compared to 2019. With the BAU (Business As Usual) scenario of Antalya, the predictions made by different institutions regarding the population and sectoral growth have been evaluated and 2030 emissions have been calculated as 7.886.537 tCO2e according to this scenario. By 2030, it is aimed to reduce 4,576,943 tCO2e in the buildings sector, 2.009.046 tCO2e in the transportation sector, 923,349 tCO2e in other sectors including waste and wastewater actions, and 377,208 tCO2e with renewable energy.

Since it is not possible to talk about absolute emission reductions in Turkey's growth rates, expressing greenhouse gas emission reduction targets in terms of emissions per capita is necessary. According to the BAU scenario, emissions per capita are expected to increase from 3.28 tons CO2e to 4.36 tons CO2e from 2019 to 2030 with current strategies. With the reduction actions specified in the prepared Antalya Sustainable Energy Action Plan, it is predicted that a reduction of approximately 40.12% can be achieved in the per capita emissions of Antalya province by 2030 compared to the base year of 2019. According to this result, emissions per capita are targeted to decrease to 1.96 tons CO2e/person in 2030.

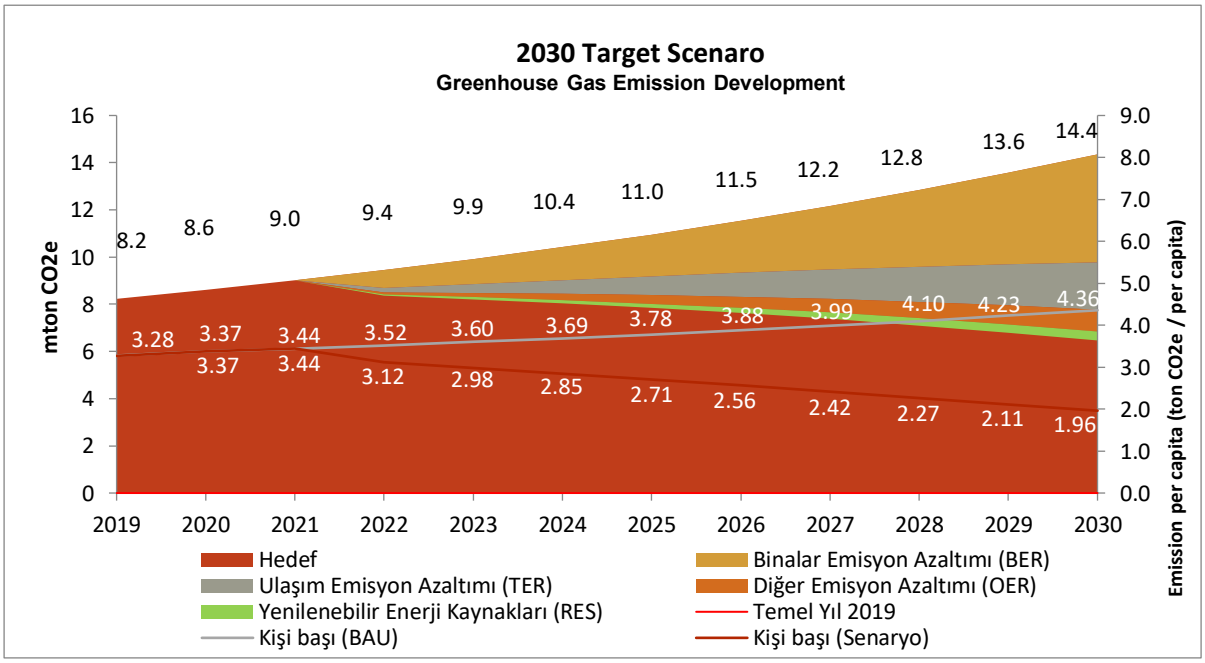


Figure 2: Antalya province greenhouse gas reduction scenario for 2030

a) Actions

Reduction actions have been created separately for buildings, energy, transportation and other sectors to reduce energy consumption and greenhouse gas emissions. All actions are examined under the current situation/purpose, relationship with existing plans, priority level, steps of action, type of action, amount of savings, responsible, stakeholders, and contribution of the municipality, timing and risks. As a result of these actions, it is aimed to reduce energy consumption and greenhouse gas emissions in the amounts shown in the table below on a sectoral basis.

Table 1: Sectoral reduction targets for 2030

Ton CO_2e Reduction 2030	Ton CO_2e Reduction 2030	Ton CO_2e Reduction 2030
4.576.934	4.576.934	4.576.934
377.208	377.208	377.208
2.009.046	2.009.046	2.009.046
923.349	923.349	923.349
7.886.537	**7.886.537**	**7.886.537**

1.1.1. Local Policy and Actions

In terms of reducing the negative effects of climate change, local policies are as important as national policies. In this context, Western Mediterranean Development Agency (BAKA) TR61 Level 2 Regional Plan (2014-2023), which covers Antalya Isparta Burdur provinces, Antalya Metropolitan Municipality (2020-2024) Strategic Plan, are examined as local policies that can contribute to the action plan for Antalya province.

According to the BAKA TR61 Level 2 Regional Plan (2014-2023), the western transportation corridor connecting the Antalya metropolitan area with the inner part of the region is shown as the development area of the Region's industry in the Regional Spatial Development Scheme, in which the activities targeted to be carried out during the plan period are shown. The number of foreign tourists coming to Antalya, also known as a tourism city, increased by more than 100% between 2003 and 2012 and rose to the third place in the list of the most visited cities in the world. Although it is known that climate change affects many sectors, Antalya province is also affected. In this context, it comes to the fore to avoid practices and actions that cause the effects of climate change to increase. In the Regional Plan, it is also aimed to integrate the transportation routes for the province of Antalya and to realize multi-modal transportation; It is also aimed to develop maritime transportation.

In the 2020-2024 Strategic Plan of the Antalya Metropolitan Municipality, the ninth strategic objective was defined as “to provide a planned, modern aesthetic and livable city formation by directing the social and economic development of the city in accordance with the natural, historical and cultural texture of the city” and Objective 9.5 states “to plan and carry out activities against disasters and earthquakes that may occur”.

In the Strategic Plan, the tenth strategic objective is “creating a green and healthy city that respects nature”, Target 10.1 “To maintain and increase the amount of green areas”, Target 10.2 “To protect the environment and human health, to create a city with a high quality of life, and to Activating and disseminating social awareness in this area”, Target 10.3 “Increasing social awareness for a clean and healthy city, activating waste management” and Target 10.4 “Making necessary analyzes and inspections related to public health and developing them in line with accreditation processes” are included. Target 11.6 “Developing and diversifying renewable energy sources” is included under the

commitment of “planning infrastructure works to increase the quality of urban life”, which is stated as another strategic objective. Strategic Objective 12 Supporting the definition of "planning and developing agricultural infrastructure services, increasing agricultural production, making rural living areas livable and aesthetic with its infrastructure and superstructure", Target 12.2 "protecting, planning, improving agricultural resources and increasing producer awareness" is stated. In strategic objective 13, eighteen targets have been determined for transportation under "to provide planned, rational, high quality, safe and integrated public transportation service with the rail system, taking into account the population density that the city will have in the future".

Table 2: Local policies and actions associated with the Sustainable Energy Action Plan

Sector	Plan Title	Strategic Objective	Strategic Target
Buildings	Antalya Metropolitan Municipality 2020-2024 Strategic Plan	A4. Increasing the quality of urban living spaces	H4.3 Using renewable energy sources and technological lighting elements in buildings and facilities under the responsibility of the Metropolitan Municipality
Energy	Antalya Metropolitan Municipality 2020-2024 Strategic Plan	A11. Planning infrastructure works to increase the quality of urban life	H11.6 Developing and diversifying renewable energy sources
Transportation	BAKA TR61 Düzey 2 Bölge Planı (2014-2023)	Priority 2. Ensuring effective use of airlines	Measure 2.1. Attempts will be made to increase the number of scheduled flights at Antalya airport.
		Priority 3. Development of maritime transport	Measure 3.1. Studies will be carried out for the effective use of Antalya port.
	Antalya Metropolitan Municipality 2020-2024 Strategic Plan	A13. Considering the population density of the city in the future, to provide planned, rational, high quality, safe and integrated public transportation service with the rail system.	H13.1 Increasing public transportation and increasing citizen satisfaction by increasing service quality H13.2 To ensure the integration of the rail system network with other types of public transportation H13.3 Developing environmentally friendly transportation services and projects H13.4 Developing and improving pedestrian and bicycle transport H13.6 Strengthening transport infrastructure and smart transport systems H13.7 Extending the rail system network
Waste	Antalya Metropolitan Municipality 2020-	A3. Making Antalya an environmentally and nature-friendly city	H3.1 Realizing an environmentally friendly waste management

	2024 Strategic Plan		
Agriculture	Antalya Metropolitan Municipality 2020-2024 Strategic Plan	A8. Realizing the local development model	H8.3 To implement projects that will increase agricultural production, to raise awareness and support the producers
		A12. Planning and developing agricultural infrastructure services, increasing agricultural production, making rural living areas livable and aesthetic with its infrastructure and superstructure	H12.2 Protecting, planning, improving agricultural resources and increasing producer awareness
Green Areas	Antalya Metropolitan Municipality 2020-2024 Strategic Plan	A3. Making Antalya an environmentally and nature-friendly city	H3.3 Protecting and increasing green spaces
		A10. To create a green and healthy city that respects nature	H10.1 Maintaining and increasing the amount of green areas
Disaster Management	Antalya Metropolitan Municipality 2020-2024 Strategic Plan	A9. To provide a planned, modern aesthetic and livable city formation by directing the social and economic development of the city in accordance with the natural, historical and cultural texture of the city.	H9.5 Planning and carrying out activities against disasters and earthquakes that may occur throughout the city
Public Health	Antalya Metropolitan Municipality 2020-2024 Strategic Plan	A10. To create a green and healthy city that respects nature	H10.2 Protecting the environment and human health, creating a city with a high quality of life and activating and spreading social awareness in this area H10.3 Increasing social awareness for a clean and healthy city, activating waste management H10.4 To make necessary analyses and inspections related to public health, to develop them in line with accreditation processes

1.2. Antalya City General Features

1.2.1. Geographical features

The province of Antalya was established in the south of Turkey, in the west of the Mediterranean Region, between the Gulf of Antalya and the Western Taurus Mountains. The province is surrounded by the Mediterranean in the south, Muğla in the west, Burdur and Isparta in the north, Konya in the northeast, Karaman and Mersin in the east. It is known that it is the fifth largest province of Turkey with an area of 20,177 km2.

On average, 77.8% of the provincial land is mountainous, 10.2% is plain, and 12% is rough. Many peaks of the Taurus Mountains, which cover three quarters of the province area, exceed 2500-3000 meters. There are wide plateaus and basins in the Teke region in the west. The variability of the province in terms of topography creates different characteristics in terms of climate, agriculture, demography and settlement. A large part of the territory of the province, excluding the settlements, consists of plateaus covered with grain fields.

The province of Antalya is generally under the influence of the Mediterranean climate. The summers are hot and dry; The climate of Antalya, which has warm and rainy winters, is in the "Moderate Sea and Warm Sea Climate Class". The average temperature in summer is between 28 and 36 degrees. It is seen that the temperature exceeds 40 degrees in the afternoon. Snow is rarely seen in coastal areas.

Table 3: Meteorological statistics for Antalya province between 1930 and 2020[1]

Months	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	Yıl
Average temperature (°C)	10,0	10,7	12,9	16,4	20,6	25,3	28,5	28,4	25,2	20,5	15,5	11,6	18,8
Average highest temperature (°C)	14,9	15,6	18,0	21,4	25,6	30,7	34,1	34,1	31,2	26,6	21,3	16,7	24,2
Average lowest temperature (°C)	6,0	6,4	8,1	11,2	15,2	19,6	22,7	22,7	19,4	15,3	10,8	7,6	13,8
Average sunshine duration (hours)	5,1	5,8	6,7	8,0	9,8	11,4	11,8	11,3	9,8	7,9	6,3	4,9	8,2
Average number of rainy days	13,2	11,4	10,0	8,1	7,1	3,5	1,0	0,9	2,5	6,5	8,4	12,8	85,4
Average monthly precipitation amount (mm)	232,6	153,5	94,5	49,9	32,1	10,8	4,5	4,6	16,8	68,7	131,6	262,1	1061,7
Highest temperature (°C)	23,9	26,7	28,6	36,4	41,7	44,8	45,0	44,6	42,5	38,7	33,0	25,4	45,0
lowest temperature	-4,3	-4,6	-1,6	1,4	6,7	11,1	14,8	13,6	10,3	4,9	0,0	-1,9	-4,6

[1]https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?m=ANTALYA

1.2.2. Demographic features

Antalya province can be said to be the 5th most populous province of Turkey. Between 2016 and 2020, the population of Antalya has increased by 9.4%. In Table 4, the population of Antalya for the last five years is shared. According to the table, the districts with the highest increase in Antalya in 2020 compared to 2016 stand out as Döşemealtı with 18.6%, Konyaaltı with 15.1%, Alanya with 13.1%, Kepez with 13% and İbradi with 10%, respectively.

According to the "Socio-Economic Development Ranking of Provinces and Regions (SEGE) 2011 Survey" published by the Ministry of Development, TR61 Region appears to be in the fifth place among 26 level 2 regions. In the ranking made according to the provinces, Antalya is in the 5th place. In the 2012 literacy rate ranking, the TR61 Region is in the first place among the level 2 regions. When the literacy rate is evaluated according to the provinces, it is learned that Antalya is in the first place.

Considering the number of accommodation facilities, bed capacity and the number of foreign tourists in Turkey in the TR61 Level 2 Regional Plan, the TR61 Region is not only in our country; Antalya is the first city that makes it known all over the world. It can be said that Antalya ranks 3rd after Paris and London in the list of the most visited cities in the world, with an annual number of foreign tourists of more than 10 million. Antalya is home to approximately one third of the foreign visitors entering Turkey.

It is possible to talk about ecotourism as a viable alternative tourism type in the inner parts of Antalya and in the natural areas close to the settlements of Isparta and Burdur. In the 2023 Action Plan of the Turkish Tourism Strategy, the province of Antalya has been declared as an ecotourism and cultural tourism development region, and it is aimed to develop alternative tourism types in a qualified manner in these areas. Ecotourism stands out as one of the most important tools that can be used to spread the tourism activities concentrated on the coasts of the Western Mediterranean Region towards the interior of the region.

According to the TR61 Level 2 Regional Plan, within the scope of “Axis of Development 2. Diversification and Expansion of Tourism”, “Priority 1. The Geographical Spreading of Tourism Activities across the Region”, “Measure 6. Antalya's brand identity will be expanded with the emphasis of the Western Mediterranean, tourism activities will be expanded with rich products. It will be encouraged to spread to the entire Region with its range”.

1.3. Greenhouse Gas Reduction

1.3.1. Calculating Greenhouse Gas Inventory

The Covenant of Mayors initiative allows municipalities new to this process to develop a mitigation action plan that fits their local conditions. It allows municipalities that have already taken energy and climate actions to develop a mitigation action plan without making major changes in their approaches. With this principle in mind, the Covenant has developed a multi-option methodology based on or adapted from existing standards and methods. The different options, some of which are interdependent, are the choice of base year, the emissions inventory approach, the greenhouse gases included, the emission factors and the definition of abatement targets.

Base Year

The base year is the reference year against which the emission reduction target will be compared to monitor the results of the proposed activities. When determining this year, it is requested to choose

a year with the most reliable data as possible and without extraordinary events (pandemics, etc.). In this context, the base year for Antalya was chosen as 2019.

Scope

The selected sectors within the borders of Antalya Metropolitan Municipality are buildings, energy, transportation, waste and wastewater, and greenhouse gas calculations related to the industry sector were also made. Antalya Metropolitan Municipality does not have any sanction authority on the industrial sector, which can be defined as the private sector to a large extent. For this reason, while determining the reduction targets, industrial greenhouse gases are excluded from the scope.

Method

The direct and indirect greenhouse gas emissions of each energy carrier were calculated by multiplying the final energy consumption by the corresponding emission factor. In addition, CH4 and N2O emissions from waste, wastewater treatment, agriculture and livestock were calculated and converted to CO2e.

The activity-based approach, which is the most widely used by cities, was used in the preparation of the Baseline Emissions Inventory. This approach includes all CO2e (or greenhouse gas) emissions from energy consumption in Antalya, either directly (through fuel combustion) or indirectly (through electricity consumption). While most greenhouse gas emissions are CO2 emissions, CH4 and N2O emissions are secondary to combustion processes in the residential and transportation sectors. All CO2, CH4 and N2O emissions are calculated for all fuel types together with their global warming potential (GWP) using the IPCC emission factors from the Fifth Assessment Report (AR5). One of the reasons for including other emissions other than CO2 is that Antalya calculates emissions from waste (CH4), wastewater (CH4, N2O), enteric fermentation of farm animals (CH4) and chemical fertilizers used in agriculture (N2O).

Within the determined borders of Antalya Metropolitan Municipality, the greenhouse gas calculations are based on IPCC, LEVEL-1 and LEVEL-2 methodology. Accordingly, the following formulas and variables were used in the calculations according to Scope-1, Scope-2 and Scope-3 greenhouse gas sources:

$$\text{Emissions GHG, fuel} = CO_2 \text{ emission, fuel} + CH_4 \text{ emission, fuel} + N_2O \text{ emission, fuel} + \ldots$$

$$CO_2 \text{ emission, fuel} = \text{Fuel consumption} \times \text{Emission Factor } CO_2\text{, fuel}$$

1.3.2. Assumptions

GHG emission assumptions for the targeted year 2030 were made considering the population growth rate, growth rate of the building and service sector, energy consumption trends in the last ten years, and legislative changes in the jurisdiction of Antalya Metropolitan Municipality. In case the current sector-based situation continues, the assumptions by which we calculate the greenhouse gas development of the city are listed below. Assumptions regarding reductions are also specified in the context of each activity.

a) Population projection

A population projection of 2030 was made for the province of Antalya according to the average of the population growth rate between the years 2010-2020. The population has always continued to increase in the examined year range. While making the population projection, considering the

population projection data of TÜİK for the provinces until 2025, an annual average population increase of 3% is foreseen in the province of Antalya. With this determined rate, it is estimated that the population residing in Antalya will reach 3.294.015 people in 2030.

b) Buildings

Greenhouse gas emissions related to buildings have been increased with the assumptions made according to the building typologies below.

i. Houses: Energy consumption is thought to be directly proportional to population growth and the rate of increase is taken as 3% per year. To determine an increase rate in energy consumption, taking into account the change in previous years; As issues such as infrastructure changes, increase in natural gas penetration rate will affect this increase rate radically, they cause a sound evaluation cannot be made. For this reason, a change in direct proportion to the population growth is foreseen. In order to be able to detail the reduction calculations, the electricity consumption in the residences has been broken down with some assumptions based on the general consumption habits in Turkey. It is assumed that 50% of the electricity consumption in residences is cooling, 10% is heating, 20% is other electrical devices and 20% is lighting.

ii. Non-residential buildings: Energy consumption increases have been determined by taking into account the trends in the last 5 years and the development status of the service sector. The assumptions are as follows:
    1. Natural gas: The natural gas consumption increase is projected to be 5%.
    2. LPG: According to the annual average increase rate of the last 5 years, 3% is foreseen.
    3. Fuel: 3% is projected according to the annual average increase rate in the last 5 years.
    4. Electricity: 3% is projected according to the annual average increase rate in the last 5 years.

iii. Municipal buildings: Considering the increase in service points and their sizes and the stable course to be achieved after the transition to new service points, the following assumptions have been made regarding the energy consumption of municipal buildings:
    1. Natural Gas: An annual increase rate of % is foreseen.
    2. Electricity: An annual increase of 3% is envisaged.

c) Transportation

In the transportation sector, the current situation in the municipality and the number of vehicles and the private vehicle situation in the city are taken into account separately. While it is predicted that the number of vehicles in the city will increase similar to the population growth, the decrease in fuel consumption of renewed vehicles with the developing technology has also been evaluated. The increase rates of fuel consumption and greenhouse gas emissions in the transportation sector are as follows:

i. Municipality fleet:
    1. Diesel: An annual increase rate of 1% is foreseen.
    2. Gasoline: No annual increase percentage is foreseen.

ii. Private Vehicles
    1. Diesel Private vehicles: An annual increase rate of 5% is foreseen.

2. Gasoline Private Vehicles: An annual increase of 2% is foreseen.
3. LPG: No annual increase percentage is foreseen.

d) Waste and wastewater

Waste and wastewater related emissions are increased according to the annual population growth rate of 3%, as they are directly linked to citizen activities.

e) Agriculture and Livestock

It is predicted that the emissions related to agriculture and livestock will increase by 1% per year, taking into account the change in animal existence in the province.

1.4. Identifying SEAP Actions

Actions including greenhouse gas reduction measures aimed to be implemented within the scope of SEAP have been determined by a series of studies. The general content of these studies is mentioned in the methodology section, and the findings of these studies are included in this section. In order to determine SEAP mitigation activities and to select these activities as a priority, a number of criteria, including environmental, social, economic and institutional, have been determined. A criteria pool was created and the criteria matching AMM's strategies at the highest level were selected.

13 criteria were selected from the pool with a total of 23 criteria. In the prioritization of mitigation activities, 13 criteria in Figure 9 were taken into account within the scope of Multi-Criteria Evaluation. In the Multi-Criteria Evaluation, evaluation was made for each criterion using a 4-point Likert scale.

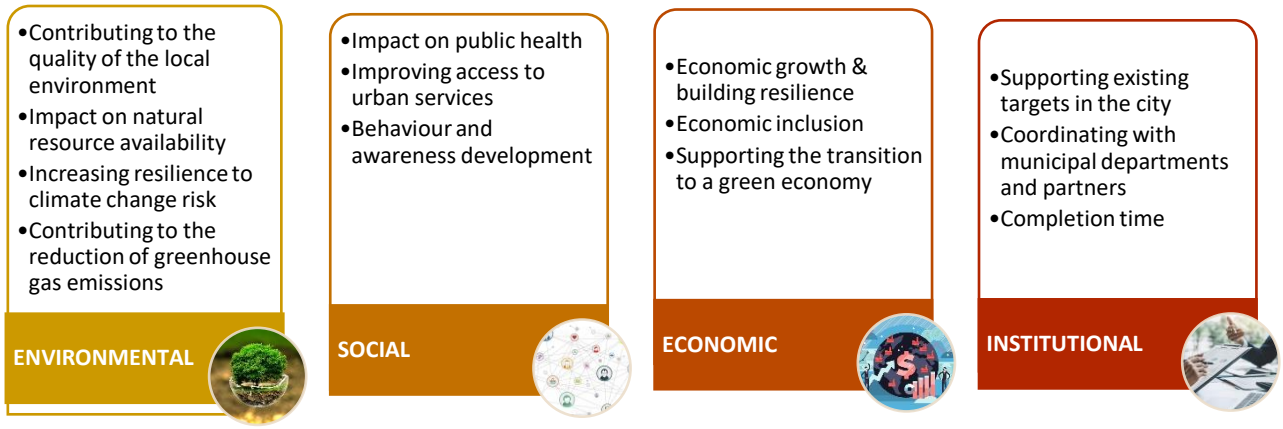


Figure 9: Criteria used in the Multi-Criteria Evaluation analysis

In order to determine the activities with a participatory process, in the multi-stakeholder workshop, the participants made suggestions for activities under the working groups, and a prioritization study was carried out for all these suggested activities, taking into account the mentioned criteria. Table 6 shows how each activity is handled within the criteria.

Table 6: Scope of evaluation of criteria used in action prioritization

Category	Criteria	Evaluation Content of the Criterion
Environmental	Contributing to the quality of the local environment	Impact on air quality, water quality (sea and drinking) and/or land/soil quality

	Impact on natural resource availability	Increasing the availability of water resources, green space, biodiversity and ecosystems
	Increasing resilience to climate change risk	Contributing to increasing the resilience of the city against the risk of climate change
	Contributing to the reduction of greenhouse gas emissions	Developing projects to reduce the city's greenhouse gas emissions
Social	Impact on public health	Reducing public health problems by improving water quality, air quality, resilience to climate hazards
	Improving access to urban services	Improving service availability, access to services and wastewater services
	Behaviour and awareness development	It will affect behaviour change and raise citizen awareness.
Economic	Economic growth & building resilience	Contributing to GDP, providing employment and/or increasing economic resilience to the impact of climate change
	Economic inclusion	Promoting economic inclusion across the entire population through access to skills, jobs, finance and services to increase entrepreneurship and/or economic opportunities
	Supporting the transition to a green economy	Causing situations such as reductions in carbon emissions and pollution, increased energy and resource efficiency, and/or prevention of loss of biodiversity and ecosystem services
Institutional	Supporting existing targets in the city	Supporting and assisting the municipality to achieve its current targets,
	Coordinating with municipal departments and partners	Promoting inclusion through stakeholder engagement
	Completion time	Implementation and execution within time frames (short-medium-long)

2. Greenhouse Gas Reduction

2.1. Greenhouse Gas Emissions Inventory

The current emission inventory was prepared using the data of Antalya Metropolitan Municipality for 2019. The inventory prepared for 2019 covers the building, transportation, waste and wastewater treatment, agriculture, forestry and livestock sectors. During the preparation of the Sustainable Energy Action Plan, the short and long-term strategic plans of the Antalya Metropolitan Municipality, the views of academics, chambers of industry and commerce, public institutions, provincial directorates and professional organizations were taken into account. The current greenhouse gas emissions inventory for 2019 calculated for SEAP is shown in Table 7 below.

Table 7: Antalya greenhouse gas emissions, 2019 (including industry)

Sector	MWh	tCO_2e	%
Total (Antalya Greenhouse Gas Inventory)	**28.623.531**	**10.683.551**	**100,0**
Buildings, Equipment/Field	**11.746.115**	**5.028.308**	**47,1**
Municipal Buildings & Affiliates	440.575	226.396	2,1
Tertiary Buildings Outside the Municipality / Fields	6.078.367	2.511.844	23,5
Dwellings	3.512.897	1.538.127	14,4
Street Lighting	186.214	95.714	0,9
Industry	1.528.062	656.228	6,1
Transport	**12.222.104**	**3.230.777**	**30,2**
Municipal Vehicle Fleet	2,144	563	0,0
Public Transportation (Municipal Buses)	148.177	40.156	0,4
Public Transport (Electric Systems)	13.184	6.777	0,1
Urban Vehicles	10.714.886	2.829.551	26,5
Transit-Bus Station	396.785	107.529	1,0
Civil Airport	946.927	246.201	2,3
Other Emissions	**180.281**	**1.516.034**	**14,2**
Solid Waste Disposal		565.361	5,3
Wastewater Treatment Plant		310.902	2,9
Wastewater Treatment Process CH4		*254.740*	*2,4*
Wastewater Treatment Process CO_2		*43.291*	*0,4*
Wastewater Treatment Process Nit./Denit. N2O		*3.753*	*0,0*
Waste Water Treatment Process Nit./Non-Denit.		*311*	*0,0*
Wastewater Treatment Process N2O		*8.808*	*0,1*
Fugitive Emissions		24	0,0
Agriculture, Livestock and Fertilizer Management		547.082	5,1
Agricultural Watering	180.281	92.665	0,9
Energy Production	**4.475.032**	**908.431**	**8,5**
Fuel Consumption for Electricity Generation	4.475.032	908.431	8,5

As seen in Table 8, the energy consumption of Antalya, including industry, for 2019 was calculated as 28.623.531 MWh and greenhouse gas emissions as 10.683.551 tCO2e. According to the table, the share of emissions from fuel and electricity consumption of buildings in total emissions is 47.1%.Greenhouse gas emissions from transportation are 30.2%. Greenhouse gas emissions from solid waste and wastewater treatment are 8.2%, emissions from electricity generation are 8.5%, and emissions from agriculture and livestock are around 6%.

Table 8: Antalya greenhouse gas emissions, 2019 (excluding industry)

Sector	MWh	tCO_2e	%
Total (Antalya Greenhouse Gas Inventory)	**21.493.229**	**8.232.919**	**100,0**
Buildings, Equipment/Field	**10.218.053**	**4.372.081**	**53,1**

Municipal Buildings / Its Fields	440.575	**226.396**	2,7
Tertiary Buildings Outside the Municipality / Fields	6.078.367	2.511.844	30,5
Dwellings	3.512.897	1.538.127	18,7
Street Lighting	186.214	95.714	1,2
Transport	**11.275.176**	**2.984.575**	**36,3**
Municipal Vehicle Fleet	2.144	563	0,0
Public Transportation (Municipal Buses)	148.177	40.156	0,5
Public Transport (Electric Systems)	13.184	6.777	0,1
Urban Vehicles	10.714.886	2.829.551	34,4
Transit-Bus Station	396.785	107.529	1,3
Other Emissions		**876.263**	**10,6**
Solid Waste Disposal		565.361	6,9
Wastewater Treatment Plant		310.902	3,8
Wastewater Treatment Process CH4		254.740	*3,1*
Wastewater Treatment Process CO_2		*43.291*	*0,5*
Wastewater Treatment Process Nit./Denit. N2O		*3.753*	*0,0*
Waste Water Treatment Process Nit./Non-Denit.		*311*	*0,0*
Wastewater Treatment Process N2O		*8.808*	*0,1*

In Table 8, the energy consumption of Antalya province excluding industry has been calculated as 21,493,229 MWh and the greenhouse gas emission amount has been calculated as 8,232,919 tCO2e in total. According to the calculations, 53.1% is buildings, 36.3% is transportation, and 10.6% is other emissions originating from solid waste and wastewater emissions.

2.2. Objective

Considering the sectoral greenhouse gas reduction and energy saving actions detailed in the following chapters in Antalya SEAP, the effects of the above-mentioned objectives can be observed with the chart below, which includes the current situation BAU (business as usual) scenario and reduction scenarios. Table 9 shows Antalya's sectoral greenhouse gas and energy reduction targets for 2030 in 2030.

According to the table, 10,372,980 MWh energy savings are achieved in buildings from sectors, while the following are also targeted: 4,576,934 tCO2e greenhouse gas reduction, 744,000 MWh energy savings with renewable energy, 377,208 tCO2e greenhouse gas reduction, 8,849,734 MWh energy savings in transportation, 224.157 MWh energy savings for waste-wastewater and other sectors including agriculture and livestock sectors, and 923,349 tCO2e greenhouse gas reduction

Table 9: Antalya 2030 sectoral reduction targets

	MWh Reduction 2030	Ton CO_2e Reduction 2030
Buildings Emission Reduction	10.372.980	4.576.934
Renewable Energy Emission Reduction	744.000	377.208
Transportation Emission Reduction	8.849.734	2.009.046
Waste-Wastewater and other Emission Reduction	224.157	923.349
Total Reduction	**20.190.870**	**7.886.537**

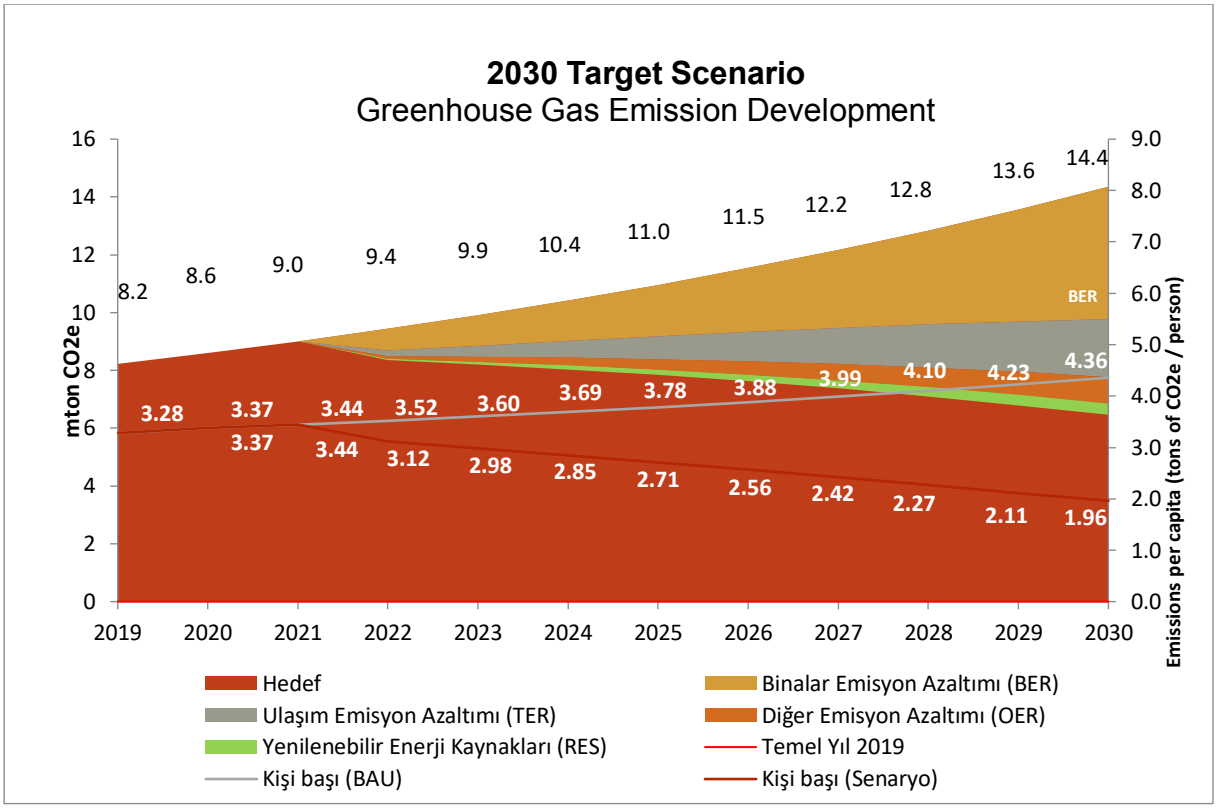


Figure 10: Antalya 2030 greenhouse gas reduction scenario

As indicated in Figure 10, greenhouse gas emissions per capita in Antalya in 2030 are predicted to decrease to 1.96 tCO2e/person in 2030, with the use of waste-waste water, other sectors including agriculture and renewable energy, as well as buildings and transportation sectors.

2.3. Mitigation Actions

In this section, mitigation actions are detailed by sector. Each action has also been aligned with the Antalya Metropolitan Municipality Strategic Plan, which includes the municipality's defined targets for the years 2020-2024.

2.3.1. Action Types

Activities under SEAP fall into the following categories:

- **Investment projects:** Infrastructure investments that Antalya Metropolitan Municipality will undertake either by using its own resources or with the support of donor organizations.
- **Policy measures:** New legislation or policies enacted to conduct more environmentally friendly activities.
- **Plans and strategies:** It provides a more detailed roadmap for improving performance in a particular sector or region (e.g. Climate Action Plan).
- **Behavioural:** Measures that seek to shift a community's behaviour in a particularly targeted direction (for example, towards greater use of public transport). While there is a behavioural component to policy measures, activities in this category focus specifically on behaviour change, such as organizing awareness campaigns.
- **Education:** Activities aimed at capacity building through knowledge exchange.
- **Enforcement and sanction:** Measures that seek to improve compliance with policies and regulations through monitoring and potential penalties.

2.3.2. Action Contents

a) Buildings and Energy

Buildings Current Status

In the buildings sector, there are many national strategic plans and regulations prepared by the Ministry of Environment and Urbanization for the building sector: Energy Efficiency Strategy Document (2012-2023) and National Energy Efficiency Action Plan (2017-2023), Turkish Energy Efficiency Law and EU Regulation on Energy Performance in Buildings. Various activities are being put forward in the province of Antalya to help reduce the effects of this sector on global climate change, especially through measures aimed at reducing greenhouse gas emissions and resource consumption. These activities include municipal buildings, non-residential buildings and residential buildings.

In Target 4.3 for the strategic purpose of "A4. Increasing the quality of urban living spaces" in the Antalya Metropolitan Municipality Strategic Plan 2020-2024, there is the expression "Using renewable energy resources and technological lighting elements in buildings and facilities under the responsibility of the Metropolitan Municipality".

The buildings sector is the most important factor for greenhouse gas emission reductions, and it is important to take effective actions in this regard. However, due to limited data on buildings, it is difficult to predict the scale of improvement that can be achieved. The last detailed survey for all existing buildings was made in 2000. Considering the changes that occurred as a result of the urban transformation initiatives implemented by the Ministry in response to the earthquake disaster that occurred in Gölcük in 1999, it is now significantly out of date. (see “Law No. 6306 on Transformation of Areas Under Disaster Risk”). In the last 20 years, there has been a significant amount of construction (and demolition) work in cities in Turkey, and the process is still ongoing. This may create some opportunities for large-scale energy efficiency gains, particularly where demolished and reconstructed properties exist. It will also be important to reduce the impacts of the construction process by considering issues such as the circular economy and embedded carbon.

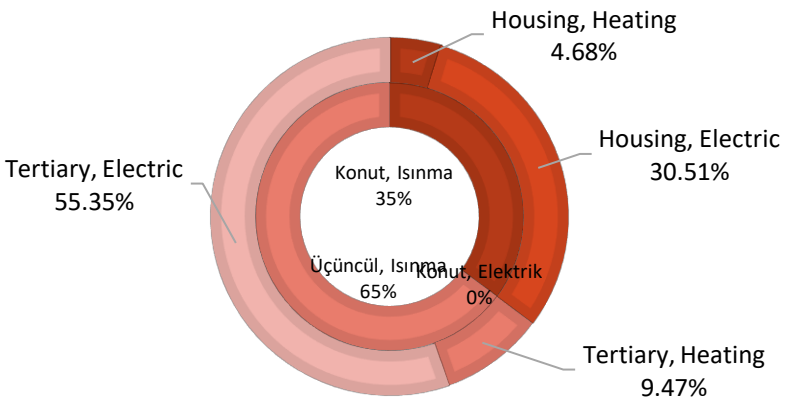


Figure 11: Breakdown of greenhouse gas emissions from heating and electricity consumption of residential and commercial buildings

The figure on the next page shows the breakdown of the emissions by the type of energy consumption source of the residences.

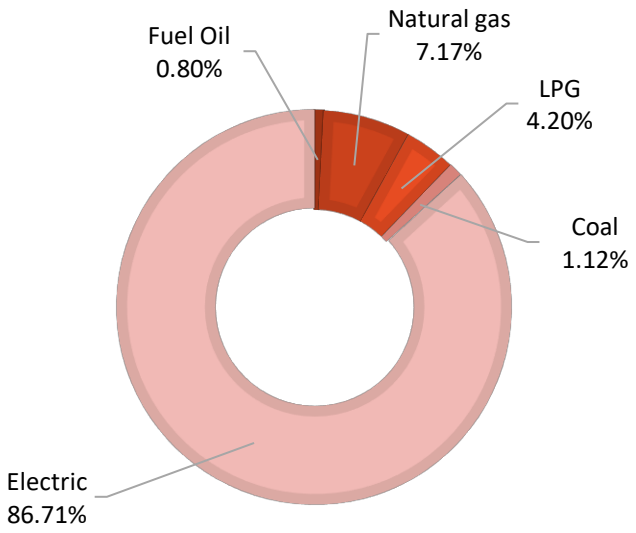


Figure 12: Breakdown of greenhouse gas emissions by fuel type in residences

It is seen that natural gas is used the most after electricity in the breakdown of greenhouse gas emissions by fuels in residences. Their emissions are in the form of LPG, coal and fuel-oil, from highest to lowest (Figure 12).

Energy Current Status

According to the 11 Development Plan (2019-2023) target, it is aimed to increase the share of renewable resources in electricity production to 38.8% by 2023 and to increase the amount of CO2 emissions avoided by newly established renewable energy plants to 18 million tons (cumulatively) from 2018 to 2023[2].According to the 2019-2023 Strategic Plan of the Ministry of Energy and Natural Resources, raising the ratio of electricity installed power based on domestic and renewable energy sources to the total installed power from 59% to 65% is considered as the first of the targets. In this context, a total of 56,804 MW power based on renewable energy sources is targeted in 2023 at the national level, 10,000 MW in solar energy, 11,883 MW in wind energy, 32,037 MW in hydroelectricity, 2,884 MW in geothermal and biomass[3]. According to Turkey's Climate Change Strategy 2010-2023, the share of renewable energy in total electricity generation is expected to increase to 30% by 2023. In this framework, all of our technical and economic hydraulic potential will be utilized, and an electricity generation capacity of 20,000 MW in wind and 600 MW in geothermal will be achieved. Obtaining electrical energy from solar energy will be encouraged[4].

Considering the total solar radiation data of Antalya province, it is higher than Turkey's average of 1527 kWh/m2-year with an average of 1600-1650kWh/m2-year[5]. The implementation and development of unlicensed and building-scale distributed solar energy systems, especially for self-consumption, and the reduction of emissions from building energy consumption are of key

[2] https://www.sbb.gov.tr/wp-content/uploads/2019/11/ON_BIRINCI_KALKINMA-PLANI_2019-2023.pdf
[3] https://sp.enerji.gov.tr/ETKB_2019_2023_Stratejik_Plani.pdf
[4] https://www.gmka.gov.tr/dokumanlar/yayinlar/Turkiye-Iklim-Degisikligi-Stratejisi.pdf
[5] solargis.com

importance in Antalya. In this regard, it is important to carry out coordinated studies with all sector stakeholders, especially universities and academic institutions.

When considered as a renewable energy potential in Antalya, solar energy comes to the fore. When the solar energy potential atlas below is examined, Antalya province is in an advantageous position compared to Turkey's average in terms of sunshine duration and solar radiation level[6].

In the Energy-related Antalya Metropolitan Municipality Strategic Plan 2020-2024, Target 11.6 "Developing and diversifying renewable energy sources" is defined under the strategic objective of "A11. Planning infrastructure works to increase the quality of urban life".

Target of the Sector

Improving the energy efficiency of existing and future buildings, supporting the widespread adoption of sustainable building techniques and the use of environmentally friendly materials can be shown as the target of the sector. In addition, some of the electricity consumption can be provided from renewable sources with solar energy systems to be installed in residential and tertiary buildings, especially integrated into roofs. Regarding buildings and energy, a total of 4,954,142 tons of CO2e greenhouse gas reduction and 11116,980 MWh energy efficiency are targeted for the target year 2030.

Activity Details

Action 1.1.	Renewable energy applications in municipal buildings and the municipality's commitment to low energy consumption in all new public buildings
Current Status/Purpose	According to the greenhouse gas inventory, 2.3% of the buildings belong to the municipal buildings. With this action, it is aimed that the municipality commits to low energy consumption in all new public buildings to be built, as well as renewable energy applications in municipal buildings.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 4.3
Priority Level	High
Action Steps	• Efficiency analysis and feasibility studies of fuels used in municipal buildings • Ensuring the replacement of fuels and lighting in municipal buildings with more energy efficient systems • Ensuring the charging of electric transportation vehicles with photovoltaic systems to be built on the roofs of municipal buildings
Action Type	Investment (public)
Savings Amount	In 2030, it is aimed to reduce greenhouse gas emissions of 142,119 tCO2e in total in public buildings and to save 277,400 MWh of energy.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Ministry of Energy and Natural Resources, Antalya Provincial Directorate of Environment and Urbanization, financial institutions
Contribution of the Municipality	Implementer
Cost	-
Timing	2022-2030
Risks	High investment cost, lack of human resources

[6] http://baka.gov.tr/uploads/1303486512GUNES-TURKCE-KATALOG.pdf

Action 1.2.	Using efficient and smart HVAC systems in buildings
Current Status/Purpose	Improvement studies for buildings highlight the use of more efficient systems. With this action, it is aimed to work on the use of efficient and smart HVAC (Heating, Ventilation and Air Conditioning) systems.
Relationship to Existing Plans	11. Development Plan Article 377.1
Priority Level	High
Action Steps	• Determining the priority districts in Antalya where the HVAC system will be implemented • Carrying out improvement studies on heating, ventilation and air conditioning in the buildings located in the pilot regions to be selected in the priority districts.
Action Type	Investment (public & private)
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality, property owners
Stakeholders	Ministry of Environment and Urbanization, Antalya Provincial Directorate of Environment and Urbanization, financial institutions
Contribution of the Municipality	Implementer and guiding
Cost	-
Timing	2025-2030
Risks	Lack of cooperation between institutions, lack of national support, high investment cost

Action 1.3.	Energy efficient urban transformation and renewable energy integration in houses
Current Status/Purpose	In the greenhouse gas inventory, houses constitute 35.2% of the buildings, excluding industry. With this action, it is aimed to make energy efficient urban transformation in houses and integration of thermal insulation and renewable energy in existing houses.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 11.6
Priority Level	High
Action Steps	• Determination of performance criteria in urban transformation • Increasing urban transformation studies in Antalya, especially in districts with intense fuel and electricity consumption • Making energy efficient applications in buildings to be built within the scope of urban transformation • Ensuring the integration of renewable energy applications in existing and new buildings
Action Type	Investment (public & private)
Savings Amount	In 2030, it is aimed to reduce greenhouse gas emissions by 508,516 tCO2e in total and to save 1,242,674 MWh of energy.
Responsible	Property Owners
Stakeholders	Ministry of Environment and Urbanization, Ministry of Energy and Natural Resources, Antalya Provincial Directorate of Environment and Urbanization, financial institutions
Contribution of the Municipality	Guiding
Cost	-
Timing	2022-2030
Risks	High investment cost, lack of human resources

Action 1.4.	Making interventions with the priority principle of energy efficiency in commercial buildings
Current Status/Purpose	When the greenhouse gas inventory is analysed, commercial buildings have the largest share in buildings, excluding industry, with 57.5%. With this action, it is aimed to ensure energy efficiency in commercial buildings.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 4.3
Priority Level	High
Action Steps	• Efficiency analysis of fuels used in commercial buildings • Ensuring the replacement of fuels and lighting in commercial buildings with more energy efficient systems
Action Type	Investment (public & private)
Savings Amount	By ensuring energy efficiency in commercial buildings, it is aimed to reduce greenhouse gas emissions by 1,561,465 tCO2e in total and to save 4,163,433 MWh of energy in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Ministry of Energy and Natural Resources, Antalya Provincial Directorate of Environment and Urbanization, financial institutions
Contribution of the Municipality	Implementer
Cost	-
Timing	2022-2030
Risks	High investment cost, lack of human resources

Action 1.5.	Energy efficient renovations in existing tertiary buildings
Current Status/Purpose	The largest share in the greenhouse gas inventory, excluding industry, belongs to commercial buildings with 57.5%. With this action, it is aimed to carry out energy efficient renovations in existing tertiary buildings.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 11.6
Priority Level	High
Action Steps	• Conducting feasibility studies for energy efficient renovations in tertiary buildings • Realization of energy efficient renovations with nature-based solutions • Promoting nature-based solutions such as green roofs in existing tertiary buildings
Action Type	Investment (public & private)
Savings Amount	In 2030, it is aimed to reduce the greenhouse gas emissions of 2,394,194 tCO2e in total and to save 4,657,965 MWh of energy.
Responsible	Antalya Metropolitan Municipality, property owners
Stakeholders	Ministry of Environment and Urbanization, Ministry of Energy and Natural Resources, Antalya Provincial Directorate of Environment and Urbanization, financial institutions
Contribution of the Municipality	Implementer and guiding
Cost	900 € / kWp
Timing	2022-2030
Risks	Lack of cooperation between institutions, lack of national support, lack of awareness, high investment cost

Action 1.6.	Increasing high efficiency heat pump applications in buildings

Current Status/Purpose	Buildings constitute 43.6% of the total greenhouse gas inventory. With this ratio, it can be said that it has the largest share in terms of greenhouse gas emissions among other sectors. With this action, it is aimed to increase high efficiency heat pump applications.
Relationship to Existing Plans	UEVEP 2017-2023 Action B5
Priority Level	Medium
Action Steps	• Technical and economic feasibility studies for the usability of heat pump applications in buildings for Antalya • Determination of priority districts in Antalya, where the heat pump system can be applied, especially with high fuel and electricity consumption • Identification of buildings where high efficiency heat pump system will be installed • Implementation of high efficiency heat pump applications in buildings in pilot regions to be selected in priority districts
Action Type	Investment (public & private)
Savings Amount	In 2030, it is aimed to reduce greenhouse gas emissions by 126,061 tCO2e in total and to save 245,254 MWh of energy.
Responsible	Antalya Metropolitan Municipality, property owners
Stakeholders	Ministry of Environment and Urbanization, Ministry of Energy and Natural Resources, Antalya Provincial Directorate of Environment and Urbanization.
Contribution of the Municipality	Implementer and guiding
Cost	-
Timing	2022-2030
Risks	Lack of cooperation between institutions, high investment cost

Action 1.7.	**Use of low-carbon materials throughout the supply chain of embedded carbon assessments in all new public buildings Ensuring the charging of electric transportation vehicles with photovoltaic systems to be built on the roofs of municipal buildings**
Current Status/Purpose	This action is aimed at using low-carbon materials throughout the supply chain of embedded carbon assessments in all new public buildings.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 4.3
Priority Level	Medium
Action Steps	• Investigation of low carbon emission materials in buildings • Creating a road map by carrying out feasibility studies in order to use low carbon emission materials in all new public buildings built or to be built in Antalya.
Action Type	Plan/Strategy
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Antalya Provincial Directorate of Environment and Urbanization.
Contribution of the Municipality	Implementer and guiding
Cost	No predictions have been made.
Timing	2025-2030
Risks	High investment cost

Action 1.8.	Use of efficient and healthy water installations in new buildings
Current Status/Purpose	With this action, it is aimed to popularize the use of efficient and healthy water installations in new buildings.
Relationship to Existing Plans	UEVEP 2017-2023 Action B5
Priority Level	Medium
Action Steps	• Conducting research to create an action plan on drilling and unlicensed drilling • Determination of priority districts for buildings where sustainable and efficient plumbing systems will be applied • Establishment of efficient and healthy water installations in new buildings
Action Type	Investment (private)
Savings Amount	No predictions have been made.
Responsible	Property owners
Stakeholders	Antalya Metropolitan Municipality, Ministry of Environment and Urbanization, Antalya Provincial Directorate of Environment and Urbanization, ASAT
Contribution of the Municipality	Implementer and supporting
Cost	-
Timing	2025-2030
Risks	High investment cost

Action 1.9.	Raising awareness with certification studies for energy efficiency
Current Status/Purpose	With this action, it is aimed to raise awareness through certification studies for energy efficiency.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 11.6
Priority Level	Medium
Action Steps	• Development of incentive mechanisms for the certification studies of Metropolitan Municipality jurisdictions • Carrying out certification studies on energy efficiency • Examining the awareness levels of property owners • Establishing a communication strategy to raise awareness and inform about incentives • Organizing seminars etc. to raise awareness on energy efficiency
Action Type	Behavioural
Savings Amount	In 2030, it is aimed to reduce greenhouse gas emissions by 221.787 tCO2e in total and to save 530,254 MWh of energy.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Antalya Provincial Directorate of Environment and Urbanization
Contribution of the Municipality	Establishing the necessary incentive mechanism with awareness raising activities
Cost	-
Timing	2022-2030
Risks	Unwillingness to change negative behaviours about energy efficiency

a) Transportation

In the National Energy Efficiency Action Plan (NEEAP), measures to be taken regarding the transportation sector are listed. These can be a guide in certain measures which are planned to be implemented in the National Energy Efficiency Action Plan and that Antalya Metropolitan Municipality

will be able to implement in the field of transportation. The general actions of the plan regarding to transportation sector are shared in below.

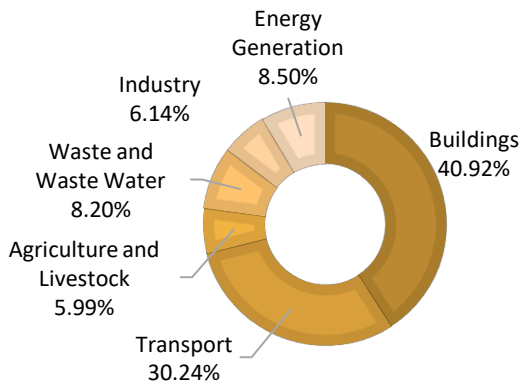
- Promoting energy efficient vehicles
- Development of comparative study on alternative fuels and new technologies
- Developing and Improving Cycling and Pedestrian Transportation
- Reducing automobile use in order to alleviate traffic congestion in cities
- Expanding public transport

In addition, Turkey Transportation and Communication Strategy, Goal 2023 and National Intelligent Transportation Systems Strategy Document (2014-2023 Action Plan) which were also published, contain items supportively qualified in the National Energy Efficiency Action Plan (NEEAP). In the BAKA TR61 Level 2 Regional Plan (2014-2023), there is the expression "Priority 2. Ensuring effective use of airlines". As a Measure 2.1, “Initiatives will be made to increase the number of scheduled flights at Antalya airport.” is called. In Priority 3, it is aimed "to develop maritime transportation" and as Measure 3.1, "Works will be carried out for the effective use of Antalya port." is included the expression.

Regarding the transportation issue in Antalya Metropolitan Municipality 2020-2024 Strategic Plan, following targets are shared:

Under the strategic target A13. " Taking into account the population density that the city will have in the future, to provide planned, rational, high quality, safe public transportation service integrated with the rail system"; H13.1 “To expand public transportation and finally raise citizen satisfaction by increasing service quality”, H13.2 “To ensure the integration of the rail system network with other types of public transportation”, H13.3. "To develop environmentally-friendly transport services and projects, H13.4 "To develop and improve pedestrian and bicycle transportation", H13.6 "To strengthen transportation infrastructure and Intelligent transport systems, and H13.7 “To expand the rail system network".

Antalya province, the distribution of greenhouse gas depend on transportation in greenhouse gas inventory is shown in figure 15 and figure 16. The share of the greenhouse emissions related to transportation in the total inventory corresponds to 30,24% as seen in the graph. When the industry, industrial process emissions and the fuel consumption for electricity generation that the local government cannot intervene are remove from the inventory, the share of transport in the total inventory rises to 36.3%. It is predicted that the measures to be taken regarding transportation will have a high impact on reducing the inventory of Antalya province. When public transportation is included to the diesel consumption in the district, its share is around 70.8%. No data could be found regarding the presence of electric vehicles in the city.



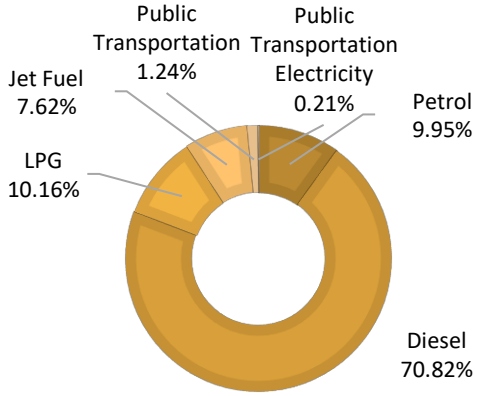


Figure 15: Antalya greenhouse gas scatter plot of inventory, *2019, Figure 16: Greenhouse Gas* Scatter plot of inventory *in Transport, 2019*

Sector Goal:

It can be said that the target for the transportation sector is to provide a behavioral change in reducing fuel consumption with integrated and efficient solutions within the framework of the following items: to carry out of pedestrianization works and to increase the rates of public transportation and cycling; to be replacement the municipal and service vehicles with low-carbon alternatives, to carry out studies on the smart signalization and optimization and for the use of electric and shared vehicles with applications such as smart parking etc., to replace public transportation with energy efficient vehicles, to reduce fuel consumption by providing training to drivers who as initially actively using vehicle on economical driving techniques. For transportation, it is aimed to be reduce total 2,009,046 tons CO2 greenhouse gas emission and 8,849,734 MWh ensure energy saving in the target year 2030.

Action Details

Action 2.1.	Pedestrianization streets in the city centre and to increase the share of pedestrians in transportation
Current situation/ Purpose	With this action, it is aimed to be pedestrianized the streets in the city center and to increase the share of pedestrians in transportation.
Relationship with Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.2
Priority Level	High
Action Steps	• Identifying of the streets to be pedestrianized in the city center • Establishment of incentive mechanisms to increase the share of pedestrians in transportation
Action Type	Investment (public) and Plan/Strategy
Savings Amount	it is aimed to be reduce total 384.831t CO2 greenhouse gas emission and 1.479.242 MWh economize energy consumption in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Transport and Infrastructure, 6st Regional Directorate, Iller Bank, financial institutions, citizens
Contribution of the Municipality	Converting into a pedestrian-friendly the roads, be closed to traffic certain of routes, be ensure them more preferred by pedestrian and cyclists,
Cost	Cost of bike path per km, varies according to the material to be used and the topographic structure.
Timing	2022-2030
Risks	Not to prefer of citizens the roads, need for financial resources, difficulty in changing passenger habits

Action 2.2.	Increasing the rate of use of public transportation by usage the public transportation with (park and ride) to reduce the traffic in the city center.
Current situation/ Purpose	In the Integrated Urban Development Strategy and Action Plan prepared by Ministry of Development, under the Action Plan 5.5.3 "to be made public transport systems environmentally friendly" is included the expression. In the 2020-2024 Strategic Plan of Bursa Metropolitan Municipality, under its the Purpose 2. "to make public transportation faster, safer and more comfortable with smart solutions", there is the goal of "developing public transportation systems". With this action, it is aimed to increase the rate of use of public transportation by usage the public transportation with (park and ride) to reduce the traffic in the city centre.
Relationship with Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.1
Priority Level	High
Action Steps	• Identification of districts with low use of public transportation and high traffic density. • Ensuring the implementation of park and ride applications on public transportation in pilot regions to be selected in priority districts. • Developing incentive mechanism to prefer public transport vehicles by reducing the use of private car
Action Type	Investment (public & private) and Plan/Strategy
Savings Amount	It is aimed to be reduce total 401.813 tCO2 greenhouse gas emission and 1.512.698 MWh ensure energy saving in 2030
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Transport and Infrastructure, 6st Regional Directorate, İller Bank, Antalya Transportation Inc, financial institutions, citizens
Contribution of the Municipality	Guiding and supporting
Cost	-
Timing	2022-2030
Risks	Having faults in implementation due to funding constraints, expect delays to be take place in transportation when the necessary arrangements have been made and traffic congestion, inability to change passenger behaviour patterns

Action 2.3.	Creating feeder public transportation lines between the existing transportation network to new development/urban transformation areas and increasing accessibility to tramway and expanding transportation transfer systems.
Current situation/ Purpose	With this action, it is aimed to create public transport feeder networks between the existing transportation network with new development/transformation areas, to increase accessibility to trams and to expand transportation transfer systems.
Relationship with Existing Plans	BKGSEP Action 5.5.3 Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.1
Priority Level	High

Action Steps	• Identification of new development/urban regeneration areas in the medium term • Establishment public transport feeder networks between the existing transportation network • Conducting feasibility studies to increase accessibility to the tramway • Gradual expansion of transport transfer systems
Action Type	Investment (public)
Savings Amount	It is aimed to be reduce total 230.898 tCO2 greenhouse gas emission and 887.545 MWh ensure energy saving in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholder	Ministry of Transport and Infrastructure, 6st Regional Directorate, İller Bank, Antalya Transportation Inc, financial institutions, citizens
Contribution of the Municipality	Implementer
Cost	The features to be preferred and the diversity of vehicle manufacturer to be make agreements make cost estimation difficult.
Timing	2022-2030
Risks	High initial investment costs, to be very limited sample applications in the current situation

Action 2.4.	**Application of smart traffic methods and optimization of traffic flow and signalization system**
Current situation/ Purpose	The importance of the use of traffic lights with sensors has been took attention by stating that frequently positioned traffic lights cause an increase in vehicle-induced greenhouse gas emissions. In addition, this situation poses a problem in terms of both safety and fuel consumption at intersections with a lack of signalization. In the Intelligent Transportation Systems Strategy Document, under the title of "Intelligent Transportation Systems Mobil Communication Equipment Sensing Technologies Traffic Management Systems, due to be in the search of the comfort, speed, low cost and security of citizens in the transportation; the Intelligent Transportation Systems Information and Communication Technologies to be adopted to transportation, comes to the fore. With this action, it is aimed to optimize of the traffic flow and signalization system with the application of smart traffic methods.
Relationship with Existing Plans	IDEP 2011-2023 Target U2.2, U4.1 UEVEP 2017-2023 Action U4 Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.2
Priority Level	High
Action Steps	• Conversion of existing signalization system to smart signalization • Junction planning and creating smart intersections • Contributing to horizontal and vertical traffic marking works

Action Type	Investment (public) and Plan/Strategy
Savings Amount	It is aimed to be reduce 321.451 tCO2 greenhouse gas emission and 1.210.158 MWh ensure energy saving in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Transport and Infrastructure, 6st Regional Directorate, İller Bank, Antalya Transportation Inc, financial institutions, citizens
Contribution of the Municipality	Implementer and Guiding
Cost	Establishing a Smart Traffic management system: 2.000.000 ₺
Timing	2022-2030
Risks	Communication infrastructure problems, lack of qualified personnel, high investment cost

Action 2.5.	**Conducting feasibility studies and pilot applications on behalf of support of the sustainable transportation**
Current Situation/Purpose	With this action, it is aimed to carry out feasibility studies and pilot applications in order to support sustainable transportation.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.2
Priority Level	High
Action Steps	• Revising transport infrastructure design guide, by taking into account sustainable transport methods • Preparation of the Sustainable Urban Transport Master Plan, which adopts the sustainable urban transport strategy • Establishment of an all-electric (or hybrid) car-sharing club for businesses and citizens • Providing cooperation with universities for pilot studies on sustainable transportation
Action Type	Plan/Strategy
Savings Amount	No predictions have been made
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Transport and Infrastructure, 6st Regional Directorate, Ministry of Environment, Urbanization and Climate Change, Antalya Provincial Directorate of Environment and Urbanization, universities.
Contribution of the Municipality	Implementer and Guiding
Cost	-

Timing	2022-2030
Risks	Having difficulty in implementation due to the need for financial resources and to be very limited of the sample applications in the current situation

Action 2.6.	**Providing economic driving trainings and developing cooperation with Antalya Transportation inc on driving trainings**
Current Situation/Purpose	With providing economic driving techniques training to taxi drivers and all commercial and private vehicle owners, especially public transport vehicle drivers can enable vehicles drivers to reduce their fuel consumption. Various studies have concluded that economic driving training can provide up to 10% fuel savings in vehicle fuel consumption. With this action, it is aimed to providing trainings for economic driving to vehicle personnel who fulfil municipal services and cooperation with Antalya Transportation Inc. on driving trainings.
Relationship to Existing Plans	IDEP 2011-2023 Target U4.1
Priority Level	High
Action Steps	• Providing preliminary briefing for vehicle personnel who fulfil municipal services and to public transport, minibus, taxi and logistics vehicle drivers • Organizing as mentioned trainings in the conference/meeting halls to be allocated or via online platforms
Action Type	Behavioral
Savings Amount	It is aimed to be reduce total 209.762 tCO2 greenhouse gas emission and 1.507.868 MWh ensure energy saving in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of National Education, Vehicle Drivers
Contribution of the Municipality	Implementer and Guiding
Cost	The cost of training in economic driving techniques throughout Turkey is approximately 250 TL/person. (Source: interviews with private education institutions). It is planned that approximately 10,000 drivers will receive training by the public bodies, considering that it will start with the municipality, minibus, taxi and shuttle drivers who using public transportation. Private sector can provide training for drivers who especially those using logistics vehicles.
Timing	2022-2030
Risks	Inability to allocate time for trainings, inability to change citizen behaviour patterns

Action 2.7.	**Increasing its share in transportation with the development of bicycle infrastructures** **Displaying bike routes on web-based systems,** **Developing applications such as scooters and bike sharing**
Current situation/ Purpose	Article 703 of the 11th Development Plan includes the expression "construction of new bicycle paths". With this action, it is aimed to improve bicycle infrastructures and increase their share in transportation, to display bicycle routes in online-based systems (application, map, etc.) and to develop applications such as scooters and bicycle sharing.

Relationship with Existing Plans	11th Development Plan Articles 703.3 and 703.4 IDEP 2011-2023 Target U1.3, U3.1, U3.2 and U4.1 UEVEP 2017-2023 Action U3 and U4 Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.2
Priority Level	High
Action Steps	• Carrying out studies to increase the possibilities of using public transportation vehicles by bicycle. • Making arrangements to display it with web-based systems for configuring the bicycle transportation network. • Positioning of road signs and traffic sign boards in relevant places • Providing necessary incentives for scooters and bike sharing.
Action Type	Investment (public)
Savings Amount	It is aimed to be reduce total 383.831 tCO2 greenhouse gas emission and 1.479.242 MWh ensure energy saving in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholder	Ministry of Transport and Infrastructure, Iller Bank, financial institutions, citizens
Contribution of the Municipality	Implementer and Guiding
Cost	The cost of bicycle path per km varies according to the material to be used and the topographic structure.
Timing	2022-2030
Risks	Financial resource need, difficulty in changing passenger habits

Action 2.8.	Preferring low-emission ones in municipal vehicles
Current situation/ Purpose	The use of low-carbon vehicles in municipal vehicle fleets is important in encouraging local people in this regard. With this action, it is aimed to prefer low-emission ones in municipal vehicles.
Relationship with Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.1
Priority Level	High
Action Steps	• Carrying out studies to replace the official vehicles used by the municipality with low-carbon vehicles. • Encouraging the public by choosing low-emission municipal vehicles.
Action Type	Investment (public & private) and Plan/Strategy
Savings Amount	It is aimed to be reduce total 137 tCO2 greenhouse gas emission and 525 MWh ensure energy saving in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholder	Iller Bank, vehicle manufacturers, vehicle maintenance companies

Contribution of the Municipality	Implementer and Guiding
Cost	The cost varies due to the foreseen cooperation with the private sector.
Timing	2022-2030
Risks	High investment costs, inability to change citizen behavior patterns

Action 2.9.	**Providing of the determination and implementation of public transportation rules in extraordinary situations such as pandemics**
Current situation/ Purpose	With this action, it is aimed to determine and implement the public transportation rules in extraordinary situations such as pandemics.
Relationship with Existing Plans	• Carrying out preliminary study for identify of public transport rules in extraordinary situations
Priority Level	High
Action Steps	• Preparation of an action plan regarding public transportation to be implemented in extraordinary situations such as pandemics. • Creating necessary announcements and incentive mechanisms for citizens to adapt to the prepared action plan.
Action Type	Plan/Strategy
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholder	Antalya Provincial Health Directorate, citizens
Contribution of the Municipality	Implementer and Guiding
Cost	It varies according to the extraordinary situation experienced.
Timing	2022-2030
Risks	Inability to change the behavior patterns of citizens, and lack of vehicles due to the limitation of the number of passengers per vehicle.

Action 2.10.	**Replacing public transport vehicles with energy efficient and vehicles using renewable energy**
Current situation/ Purpose	In the "Integrated Urban Development Strategy and Action Plan" prepared by the Ministry of Development, under Action 5.5.3 "making public transport systems environmentally friendly" is included the expression. With this action, it is aimed to replace public transport vehicles with energy efficient and vehicles using renewable energy.
Relationship with Existing Plans	BKGSEP Action 5.5.3 Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.1
Priority Level	High

Action Steps	• Identifying of public transportation vehicles old ones • Carrying out studies to be ensure by gradually transition of vehicles to electric and biofuel-consuming vehicles. • Ensuring necessary cooperation to replace public transportation with energy efficient vehicles
Action Type	Investment (public)
Savings Amount	It is aimed to be reduce total 8.894 tCO2 greenhouse gas emission and 32.835 MWh ensure energy saving in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholder	Ministry of Transport and Infrastructure, Antalya Transportation Inc., General Directorate of State Railways of the Republic of Turkey (TCDD)
Contribution of the Municipality	Implementer and Guiding
Cost	The cost of electric buses decreases with their become widespeared and the price difference decreases in diesel equivalent vehicles. It is seen from different local government experiences that deals are made at very advantageous prices in bulk purchases. The cost of 1 electric charging station is approximately 40.000 ₺.
Timing	2022-2030
Risks	High initial investment costs, to be very limited of sample applications in the current situation

Action 2.11.	**Determining of the land and capacity increase for electric vehicle charging infrastructure throughout the city, establishing the necessary infrastructure of electric vehicle charging points and ensuring a standardization for electric charging stations**
Current situation/ Purpose	The fact that many European cities have aimed not allow to the entry to their centers the other fossil fuel vehicles in the short and medium term, the successive statements of vehicle manufacturers in regards to be restrict their diesel vehicle productions; even if although not immediately, will soon enter the agenda of Turkey and makes come to the forefront. The fact that the domestic automobile, which will be produced in a few years, is also an electric vehicle gives important clues in this regard. 5 electric charging stations are planned within the scope of the MAtchUP project, which is supported by the European Union Horizon 2020 Smart Cities and Communities program H2020-SCC-2017 call and in which Antalya is also involved. With this action, it is aimed to determine of the land and capacity increase for electric vehicle charging infrastructure throughout the city, to establish electric charging points and to bring a standardization for electric charging stations.
Relationship with Existing Plans	IDEP 2011-2023 Target U4.1 and U4.2 UEVEP 2017-2023 Action U1
Priority Level	Medium

Action Steps	• Conducting feasibility studies in order to determine suitable areas for electric vehicle charging in the city. • Ensuring the establishment of the necessary infrastructure of the determined electric vehicle charging points • Initiation of necessary studies to bring a standardization for electric charging stations in the city
Action Type	Investment (public & private) and Plan/Strategy
Savings Amount	It is aimed to be reduce total 66.429 tCO2 greenhouse gas emission and 739.621 MWh ensure energy saving in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholder	Ministry of Transport and Infrastructure 6th Regional Directorate, Ministry of Energy and Natural Resources, Iller Bank, vehicle manufacturers, vehicle maintenance companies, e-charging station operators
Contribution of the Municipality	Implementer and Guiding
Cost	Cooperation with the private sector is envisaged. Operating e-charging station companies have different membership conditions and ways of working.
Timing	2022-2030
Risks	Having limited of sample applications, high of costs, insecurity in vehicle ranges

Action 2.12.	**Developing a strategy and related incentives to reduce the emissions of licensed taxi vehicles**
Current situation/ Purpose	With this action, it is aimed to develop strategy and related incentives to reduce emissions from licensed vehicles.
Relationship with Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 9.1
Priority Level	Medium
Action Steps	• Identifying the districts where taxi usage is intense in the city. • Providing cooperation with universities to reduce emissions caused from licensed taxi vehicles • Developing exemplary projects in cooperation with universities, where created a strategy and incentive mechanism is established in priority districts to reduce emissions of taxi vehicles.
Action Type	Plan/Strategy
Savings Amount	No predictions have been made.
Responsible	Taxi vehicle owners
Stakeholder	Antalya Metropolitan Municipality, vehicle maintenance companies, universities
Contribution of the Municipality	Guiding
Cost	-
Timing	2025-2030

Risks	Failure to cooperate with licensed taxi vehicle owners

Action. 2.13.	**Developing maritime transport to reduce road traffic**
Current situation/ Purpose	With this action, it is aimed to develop maritime transport in order to reduce road traffic.
Relationship with Existing Plans	BAKA TR61 Level2 Regional Plan Measure 3.1
Priority Level	Low
Action Steps	• Preparing an online survey by the municipality to determine people that will use maritime transport instead of highway. • According to the results of the survey, to planning maritime voyages especially in the districts where the people who will use maritime transport live intensely. • Developing incentive mechanisms for logistics companies using highways to prefer sea transportation.
Action Type	Plan/Strategy
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholder	Ministry of Transport and Infrastructure, General Directorate of Maritime Affairs, Antalya Transportation Inc.
Contribution of the Municipality	Implementer
Cost	-
Timing	2025-2030
Risks	Passengers do not prefer maritime transport

b) Waste and Wastewater

In Antalya Metropolitan Municipality's 2020-2024 Strategic Plan, the goal of A3. "To realize an environmentally friendly waste management" is stated in line with the strategic aim of H3.1 "Making Antalya an environmentally and nature-friendly city". There are 5 sanitary landfills (Alanya, Manavgat, Kızıllı, Patara, Kumluca) within the boundaries of Antalya Metropolitan Municipality. Domestic solid waste reception to the Kumluca Sanitary Landfill Facility was stopped in 2019 due to the capacity of the facility, and the construction of Kumluca Transfer Station was completed. Domestic solid wastes generated in Kumluca and Finike districts are transferred from the Kumluca Transfer Station to the Kızıllı Integrated Waste Evaluation, Recycling and Disposal Facility with vehicles belonging to the Antalya Metropolitan Municipality (Antalya Environmental Status Report, 2019, p.64). The distribution of wastes collected in Antalya province is shown in Table 10.[7]

[7]Antalya Environmental Status Report, 2019, pp.64-65.

Table 10: Composition of waste collected in Antalya province, 2019

Waste Composition	Distribution of collected wastes (%)
Kitchen waste	55,02
Paper	8,78
Cardboard	1,38
Bulk Box	1,22
Plastic	13,90
Glass	6,04
Metal	0,66
Bulky Metal	0,12
Waste Electrical and Electronic Equipment	0,14
Hazardous Waste	0,84
Park and Garden Wastes	1,40
Other Non-Combustibles	0,32
Other Combustibles	9,54
Other Combustible Bulky Wastes	0,28
Other non-combustible Bulky Wastes	0,10
Others	0,30

In 2019, an average of 300-400 tons of sludge is generated daily in all facilities from the domestic wastewater treatment plant operated by the Antalya Metropolitan Municipality ASAT General Directorate. The amount and ratio of the waste and wastewater sector in the city inventory is shown in Figure 17.

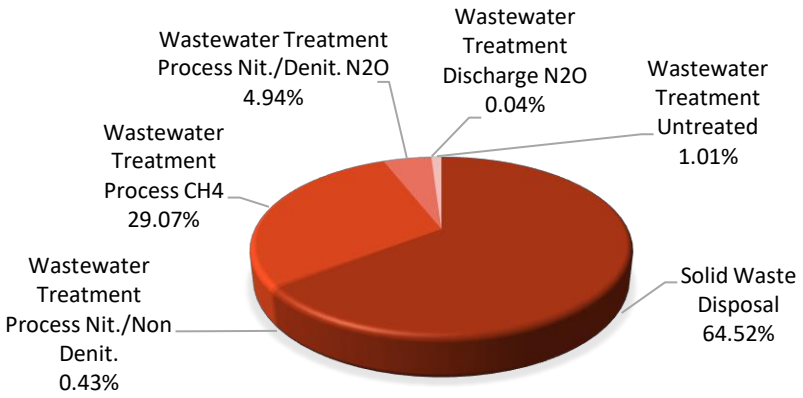


Figure 17: Greenhouse gas emissions from solid waste disposal and wastewater treatment in Antalya province, 2019

Sector Goal: The targets related to the waste sector are generally the determination of waste collection potential in local enterprises and measures to improve waste management, improvement of wastewater treatment facilities and awareness raising studies. Waste and wastewater activities aim to reduce 792,155 tons of CO2e greenhouse gas for the target year 2030.

Action Details

Action 3.1.	Encourage local businesses to reduce single-use plastics and ban their use in the municipality. Mandatory separate collection of materials with a high recycling rate.
Current Status/Purpose	With this action, it is aimed to encourage local businesses to reduce single-use plastics and to ban their use in the municipality and to make separate collection of materials with a high recycling rate mandatory.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 3.1
Priority Level	High
Action Steps	• Identifying businesses that use single-use plastics intensively in Antalya • Establishing an incentive mechanism to reduce single-use plastics in local businesses • Reducing the use of single-use plastic in municipal buildings • Mandatory separate collection of materials with a high recycling rate
Action Type	Plan/Strategy
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Provincial Directorate of Environment and Urbanization, district municipalities
Contribution of the Municipality	guide, practitioner
Cost	-
Timing	2022-2030
Risks	Difficulty changing behavior

Action 3.2.	Carrying out studies for the separation of wastes through recycling and their disposal through composting. Promotion of joint or domestic compost production Investigation of waste collection potential for the food industry (restaurant, hotel, etc.)
Current Status/Purpose	With this action, it is aimed to carry out studies for the separation of wastes by recycling and disposal by composting, to encourage and promote compost production and to investigate the waste collection service potential for the food sector.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 3.1
Priority Level	Medium
Action Steps	• Separation of waste through recycling • Making incentives for citizens regarding wastes that can be composted, and organizing activities by the municipality for composting. • • Researching the waste collection potential for the food industry
Action Type	Behavioral
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Provincial Directorate of Environment and Urbanization, food business operators, citizens
Contribution of the Municipality	Guiding
Cost	-
Timing	2022-2030
Risks	Difficulty changing behavior

Action 3.3.	Conducting pilot projects for sustainable and innovative waste management. Smart route planning for waste collection and transfer vehicles.
Current Status/Purpose	With this action, it is aimed to carry out pilot projects for sustainable and innovative waste management and to make smart route planning studies for waste collection and transfer vehicles.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 3.1
Priority Level	Medium
Action Steps	• Developing pilot projects with universities for sustainable and innovative waste management • • Preliminary work for waste collection and smart route planning for transfer vehicles
Action Type	Plan/Strategy
Savings Amount	In 2030, it is aimed to reduce greenhouse gas emissions of 9,564 tons of CO2e by making improvements in wastewater treatment.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Provincial Directorate of Environment and Urbanization, Provincial Directorate of Development and Urbanization, financial institutions, universities
Contribution of the Municipality	Practitioner
Cost	-
Timing	2025-2030
Risks	Difficulty in implementation due to high costs.

Action 3.4.	Developing a penalty and reward system for solid waste disposal for businesses and industrial facilities. Introducing a “waste disposal tax” to increase recycling and recovery and create new business opportunities.
Current Status/Purpose	With this action, it is aimed to develop a penalty and reward system for solid waste disposal for businesses and industrial facilities,also to introduce a "waste disposal tax" to create new business opportunities due to increased recycling and recovery.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 3.1
Priority Level	Medium
Action Steps	• Conducting feasibility studies to develop a penalty and reward system for solid waste disposal for businesses and industrial facilities. • Establishing incentive mechanisms and organizing activities in this regard to increase recycling and recovery. • Taking the Waste Disposal Tax into the agenda and conducting research for dissemination throughout the province, especially at the facilities and businesses with high waste production.
Action Type	Plan/Strategy
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Provincial Directorate of Environment and Urbanization
Contribution of the Municipality	Practitioner
Cost	-
Action 3.4.	Developing a penalty and reward system for solid waste disposal for businesses and industrial facilities.

	Introducing a “waste disposal tax” to increase recycling and recovery and create new business opportunities.
Current Status/Purpose	With this action, it is aimed to develop a penalty and reward system for solid waste disposal for businesses and industrial facilities,also to introduce a "waste disposal tax" to create new business opportunities due to increased recycling and recovery.

Action 3.5.	**Collaboration with relevant institutions to identify and invest in needed recycling infrastructures. Investment planning in waste sorting and recycling facilities.**
Current Status/Purpose	With this action, it is aimed to determine the required recycling infrastructures and to cooperate with the relevant institutions in order to make investments, as well as to plan investment projects for waste separation and recycling facilities.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 3.1
Priority Level	Medium
Action Steps	• Determining the recycling infrastructure needed in Antalya province • Collaborating with relevant institutions to invest in recycling • • Developing projects with universities for investment planning in waste separation and recycling facilities
Action Type	Plan/Strategy
Savings Amount	With the improvements to be made in the solid waste facilities in 2030, it is aimed to reduce the greenhouse gas emissions of 782,592 tons of CO2e in total.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Environment and Urbanization, Provincial Directorate of Environment and Urbanization, financial institutions, universities
Contribution of the Municipality	Practitioner and mentor
Cost	-
Timing	2025-2030
Risks	Difficulty in implementation due to high costs.

c) Agriculture

The mission in the 2019-2023 Strategic Plan of the Ministry of Agriculture and Forestry is defined as follows: "Activating the ecological resources in Turkey in an effective, efficient and sustainable way with the perspective of the development model and ensuring its economic security, food supply security and human health through ecological, plant and animal added value". The vision of “a model ecological resource management on a global scale” was determined in the plan. The objectives stated in the plan are listed as follows[8].

- Raising welfare in rural areas, increasing yield and quality in agricultural production, ensuring stable food supply
- Ensuring food and feed safety from production to consumption, to take necessary measures for plant and animal health and welfare,
- Protecting fisheries and aquaculture resources, ensuring their sustainable operation,
- Ensuring the sustainable management of soil and water resources,
- Effectively combating climate change, desertification and erosion,
- Conserving biodiversity and ensuring its sustainable management,
- Developing institutional capacity

The following target has been adopted for the strategic purpose of "realizing the local development model", which is included in A8 in the 2020-2024 Strategic Plan of Antalya Metropolitan Municipality.

[8]Ministry of Agriculture and Forestry, 2019-2023 Strategic Plan, p.4-5.

H8.3 “To implement projects that will increase agricultural production, to raise awareness and support the producers”. Another strategic purpose in A12 is: “To plan and develop agricultural infrastructure services, to increase agricultural production, to make rural living spaces liveable and aesthetic with its infrastructure and superstructure”. This purpose also presents the following target in H12.2: "To protect, plan, improve agricultural resources and increase producer awareness"

Table 11: Animal husbandry statistics for Antalya province, TUIK

Animal Type		2018	2019	2020
Cattle	Purebred + Culture Race	104,051	113.687	114.031
	Inter breed cross-breeding	69,301	65.855	64.329
	Native	12,227	12.418	12.251
Horse		1,185	1.073	928
Mule		1168	1.084	871
Donkey		1,400	1.288	1.104
Sheep (native)		493,910	520.826	542.162
Goat (hair and others)		751,741	752.809	770.652
Chicken		489,499	534.248	532.839
Free range chicken		-	-	-
Turkey		27,364	23.388	11.569
Duck + Goose		13,719	9.498	14.238
Camel		160	171	112
Pig		861	820	394
Buffalo		254	77	76
Total		**1.966.840**	**2.037.242**	**2.065.556**

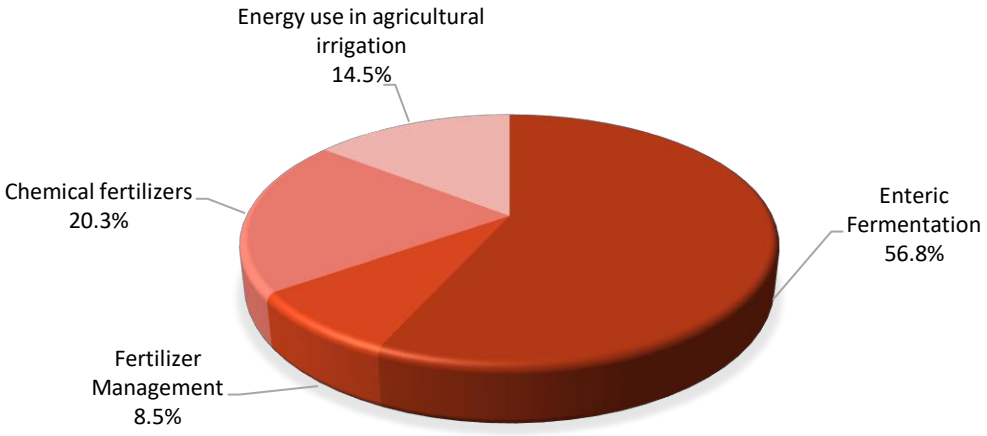


Figure 18: Agriculture and livestock greenhouse gas emissions in Antalya province, 2019

It is known that the biggest share in agriculture and animal husbandry for Antalya province is 56.8%, originating from enteric fermentation. While the emissions due to the use of chemical fertilizers are 20.3%, the share of emissions due to energy use in agricultural irrigation is 14.5% and the share of fertilizer management is 8.5%. In the target year 2030 for agriculture, a total of 131,193 tons of CO2e greenhouse gas reduction and 224,157 MWh energy efficiency are targeted.

Action Details

Action 4.1.	Increasing the use of organic fertilizers instead of chemical fertilizers in agriculture
Current Status/Purpose	With this action, it is aimed to spread the use of organic fertilizers instead of chemical fertilizers in agriculture.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 8.3 and Target 12.2
Priority Level	High
Action Steps	• Informing farmers about the problems caused by the use of chemical fertilizers in agriculture, • Gradually switching to the use of organic fertilizers in all chemical fertilizer use in 2022 and after, or using less nitrogen
Action Type	Investment Project (private)
Savings Amount	A total of 43,403 tCO2e greenhouse gas emission reductions are targeted in 2030.
Responsible	Farmers
Stakeholders	Antalya Metropolitan Municipality, Antalya Provincial Directorate of Agriculture and Forestry, various international funding institutions, institutions providing green financing opportunities
Contribution of the Municipality	In addition to being a guide to the citizens on the subject, the municipality also guides the network connection and communication with the producers.
Cost	-
Timing	2022-2030
Risks	Insufficient encouragement of farmers using chemical fertilizers, lack of information

Action 4.2.	Increasing the use of renewable energy in agricultural irrigation
Current Status/Purpose	With this action, it is aimed to increase the use of renewable energy in agricultural irrigation.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 12.2
Priority Level	High
Action Steps	• Determination of priority districts for energy efficient transformation in agricultural irrigation in Antalya • Carrying out feasibility studies for the design of agricultural irrigation projects using solar energy, one of the renewable energy sources, in the priority districts. • Expanding the use of photovoltaic systems in order to reduce energy consumption in agricultural irrigation in Antalya province
Action Type	Investment project (private)
Savings Amount	In 2030, a total of 57,608 tCO2e greenhouse gas emission reduction and 224,157 MWh energy savings are targeted.
Responsible	Farmland owners
Stakeholders	Antalya Metropolitan Municipality, Antalya Provincial Directorate of Agriculture and Forestry
Contribution of the Municipality	Guiding on issues such as PV applications in agricultural irrigation, grid connection, communicating with producers
Cost	It is estimated that it will fall below 1 €. Although there is great uncertainty in the photovoltaic system installation market, these values are likely to be well below the calculated value due to recent price drops. Currently, the payback period is just over 8 years.
Timing	2022-2030
Risks	Difficulty in behaviour change, lack of knowledge

Action 4.3.	Carrying out innovation / R&D studies in existing agricultural practices Developing good agricultural practices with smart systems Dissemination of waterless landscaping practices throughout the city
Current Status/Purpose	It is aimed to develop good agricultural practices with smart systems, to make innovations or R&D studies in existing agricultural practices and to spread waterless landscape practices throughout the city.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 8.3 and Target 12.2
Priority Level	High
Action Steps	• Developing R&D projects with innovative approaches in existing agricultural practices • Preparing the groundwork for the development of projects in cooperation with the municipality and university in order to improve the existing agricultural practices. • Conducting feasibility studies for the development of agricultural practices integrated with smart systems • Determining the areas where waterless landscape applications can be made throughout the province of Antalya and making dissemination studies
Action Type	Plan/Strategy
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Ministry of Agriculture and Forestry, Provincial Directorate of Agriculture and Forestry, universities
Contribution of the Municipality	Guiding, implementer and supporting
Cost	-
Timing	2025-2030
Risks	Difficulty in implementation due to high costs

Action4.4.	Providing training on low-carbon farming techniques and raising awareness on sustainable management
Current Status/Purpose	With this action, it is aimed to raise awareness about sustainable management by providing training on low-carbon farming techniques.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 8.3 and Target 12.2
Priority Level	High
Action Steps	• Giving informational trainings to farmers at schools or at a location to be allocated by the municipality, with the support of academics who provide education on sustainability in agriculture in agricultural high schools or departments of universities. • Making incentive joint campaigns that can be organized with the support of agricultural cooperatives
Action Type	Behavioural
Savings Amount	No predictions have been made.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Farmers, Ministry of Agriculture and Forestry, Provincial Directorate of Agriculture and Forestry, universities
Contribution of the Municipality	Implementer (various organisations, costs related to information points, awareness promotion activities), guiding, supporting
Cost	-
Timing	2022-2030
Risks	Failure to change citizen behaviour patterns

Action 4.5.	Promoting low-carbon agricultural practices Promoting bioenergy crops for biomass combustion plants
Current Status/Purpose	This action is aimed at promoting low-carbon agricultural practices and the use of bioenergy crops for biomass combustion plants.
Relationship to Existing Plans	Antalya Metropolitan Municipality 2020-2024 Strategic Plan Target 8.3
Priority Level	Medium
Action Steps	• Organizing an information meeting for farmers on the promotion of low carbon agricultural practices and bioenergy crops by the municipality • Organizing an event to raise awareness of farmers on low-carbon agricultural practices on May 14, World Farmers Day. • Making incentive joint campaigns that can be organized with the support of agricultural cooperatives
Action Type	Behavioural
Savings Amount	A total of 30,182 tCO2e greenhouse gas emission reductions are targeted in 2030.
Responsible	Antalya Metropolitan Municipality
Stakeholders	Farmers, Ministry of Agriculture and Forestry, Provincial Directorate of Agriculture and Forestry, universities, agricultural cooperatives
Contribution of the Municipality	Implementer (various organisations, costs related to information points, awareness promotion activities), guiding, supporting
Cost	-
Timing	2022-2030
Risks	Failure to change citizen behaviour patterns

3. Overview

This report sets out the targets determined with the participation of the stakeholders of Antalya province and aimed at reducing emissions from energy consumption and greenhouse gases in different sectors. The most important bases of this report, the starting point of which is the Antalya province-scale greenhouse gas inventory, are the reports prepared or commissioned by Antalya Metropolitan Municipality and different institutions regarding the future of Antalya province, and the visions of the city stakeholders for the future of the city.

Urban greenhouse gas emissions calculated for Antalya's base year 2019, including industry, are 10,683,551 tCO2e in total. When the emissions of Antalya province, including industry, are analyzed in 2019, the total energy consumption in the province is 28.623.531 MWh and greenhouse gas emissions are 10.683.551 tCO2e. Emissions in the total inventory showed a distribution as follows: emissions from fuel and electricity consumption of buildings (including industry) 47.7% (40.9% buildings and 6.1% industry), emissions from transportation 30.24%, emissions from agriculture and livestock are approximately 6%, emissions from energy production 8.5%, emissions from solid waste and wastewater processes 8.2%'.

For 2019, Antalya's greenhouse gas emission, excluding industry [9], has been calculated as 8,232,919tCO2e. Since the next emission reduction targets of the district do not cover the industrial sector, they are excluded. With the reduction measures put forward in the sectors, it is planned that

[9]Emissions specified as excluding industry are greenhouse gas emission values excluding industry, civil airports, fugitive emissions, agriculture and energy production.

Antalya's per capita emissions will decrease from 3.28 tCO2e/person in 2019 to approximately 1.96 tCO2e/person in 2030.

It is concluded that with the reduction measures put forward in the sectors, a 40% reduction can be achieved in Antalya's per capita emissions by 2030 compared to 2019. With the BAU (Bussiness As Usual) scenario of Antalya, the predictions made by different institutions regarding the population and sectoral growth were evaluated and the 2030 emissions were calculated as 7.886.537 tCO2e according to this scenario. By 2030, it is aimed to reduce 4,576,943 tCO2e in the buildings sector, 2.009.046 tCO2e in the transportation sector, 923,349 tCO2e in other sectors including waste and wastewater actions, and 377,208 tCO2e with renewable energy. Antalya Sustainable Energy Action Plan creates a roadmap to reduce emissions from energy consumption in different sectors determined with the participation of urban stakeholders.