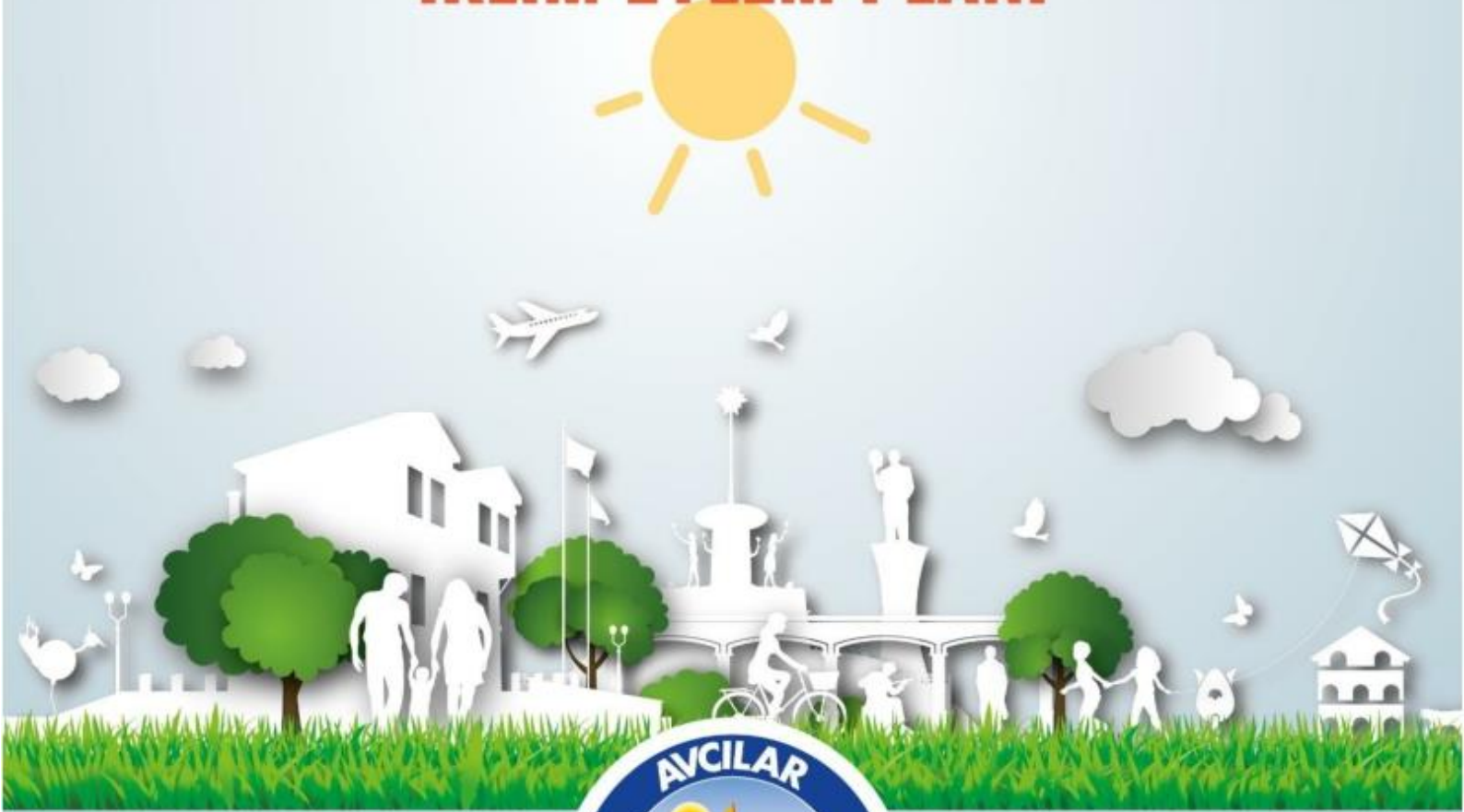


AVCILAR BELEDİYESİ SÜRDÜRÜLEBİLİR ENERJİ ve İKLİM EYLEM PLANI



DemirEnerji

18 Aralık 2020

Preface

As humanity, our story to gather in the cities, starting with the industrial revolution, has been continuing at full speed. Although the area cities cover is geographically very small, the majority of the world's population now live in them. People produce and consume in cities. This production and consumption force us to use more energy and exploit natural resources faster. Cities are the leading cause of the climate crisis with their production and consumption. This is just the one side of the issue. On the other hand, cities and people living in them are facing the greatest effects of the climate crisis they themselves cause. Cities getting bigger and spreading wider cause increased greenhouse gas emissions and the effects of irregular urbanization are gradually advancing.



Another reality of the cities is that they are affected by the climate crisis. Extreme weather conditions with continually increasing frequency and severity along with other risks caused by the climate crisis seriously threaten the existence of the urban systems. Various problems brought about by climate crisis in the cities such as temperature change, precipitation regime change, drought/flooding, rise in the sea level, population movements started to concern cities closely.

With regard to Avcılar, the increasing population, and commercial and industrial activities along with it are making the load on Avcılar's infrastructure, superstructure and ecosystem heavier; necessitating the widening of the smart city vision with sustainability principles. In addition, Avcılar has an immense problem: earthquake. We are aiming at a renewal after which there remains no building in Avcılar that is not earthquake-proof. If used well, this is a great opportunity for fighting against and adapting to climate crisis. The principles of reduction and adaptation are an important part of the Avcılar2029 vision that we developed with the resilient city approach and we examine all the steps we take through the lens of these concepts.

The need for collective action to fight against the global warming means that we, as local governments, have great duties. Local governments around the world are increasingly taking initiative and stepping forth. We, as Avcılar Municipality, are developing adaptation policies and strategies that will help prevent the climate crisis and mitigate its effects on the citizens. As Avcılar Municipality, we are aiming to reduce the greenhouse gas emissions in our district based on our mission to create a climate-friendly city. For this purpose, we prepared a Sustainable Energy and Climate Adaptation Action Plan that supports the participation of the stakeholders and capacity increase operations by assessing climate-related risks and opportunities and considering the climate change reduction and adaptation options. I believe that this study prepared with participation and intensive efforts of our local stakeholders, civil society organizations, trade associations, university representatives and municipality workers will improve our local administration capacity and the people of the district will provide the necessary support for the operations we will conduct.

I sincerely thank all the participants who contributed to this study who took part in the creation of our Sustainable Energy and Climate Adaptation Action Plan by providing ideas, offering their academic and scientific support, and taking part in the workshop. Based on our "Attention is Applied!" principle, now is the time to realize this plan.

Preparation of the List of Participants

Nilgün **CENDEK**/ Head of Avcılar Municipality Environmental Protection and Control Department/Environmental Engineer

Raşit Fırat **DENİZ** / Avcılar Municipality Environmental Protection and Control Department/Environmental Engineer

Consultants and Technical Experts

Dr. Baha **KUBAN** / Demir Enerji

Esra **DEMİR** / Demir Enerji

Caner **DEMİR** /Demir Enerji

Gonca **AKGÜL** / Demir Enerji / Urban Planner

Kaan **EMİR** / Demir Enerji / Environmental Engineer

Melda **KARADEMİR** / Demir Enerji / Environmental Engineer

Oya **TABANOĞLU** / Demir Enerji / Urban Planner

Workshop Participants

Reduction Stakeholder Workshop

Av. Turan **HANÇERLİ** / Mayor of Avcılar

Nilgün **CENDEK** / Head of Avcılar Municipality Environmental Protection and Control Department

Raşit Fırat **DENİZ** / Avcılar Municipality Environmental Protection and Control Department

Gözde **KATIKÇI** / Avcılar Municipal Council Member

Dr. Baha **KUBAN** / Demir Enerji
Egemen **BELET** / CEE İstanbul Branch

Saim **PEKER** / CME İstanbul Branch
Özgür **HIR** / CME İstanbul Branch Enerji Commission

Muzaffer **BAŞARAN** / CME İstanbul Branch

Cuma **ÇELİK** / Tülay **BURSALIOĞLU** / CME İstanbul Branch

Dr. Özgül **KÖSE** /Avcılar Municipality Healthcare Affairs Department

Anıl **KARAHAN** /Avcılar Municipality Financial Affairs Department

Işıl Beste **BAYRAK** / Avcılar Municipality Parks and Gardens Department

Ömür **YAŞAYAN** / CEE İstanbul Branch

Sultan **AKARÇAY DEMİR** / Avcılar Municipality Cleaning Works Department

Uğur **ALSAÇ** / Avcılar Municipality Civil Works Department

Dilek **ALBAYRAK** / Avcılar Municipality Development and Urbanization Department

Sevgi **KELEŞER** / Avcılar Municipality Development and Urbanization Department

M. Hakan **PEKESEN** / Avcılar Municipality Urban Renewal Department

Ayşegül **LAÇIN** / Avcılar Municipality Planning and Projects Department

Adaptation Stakeholder Workshop

Nilgün **CENDEK** / Head of Avcılar Municipality Environmental Protection and Control Department

Raşit Fırat **DENİZ** / Avcılar Municipality Environmental Protection and Control Department

Prof. Dr. Doğanay **TOLUNAY**/ İstanbul University / Faculty of Forest

Ayhan **BAYAT** / İBB Fire Department, Avcılar Group

Hülya **ÇEŞMECİ** / TEMA Association İstanbul Representative
Yeliz **YURDABAK** / Avcılar Municipality Planning and Projects Department

Esra **ERGIN** / İstanbul Planning Agency, Energy Policies
Gökhan **KAYMAK** / Avcılar Municipality Transportation Services Department

Işıl Beste **BAYRAK** / Avcılar Municipality Parks and Gardens Department

Melike **AKKAYA** /

Funda **CİHAN** / CEE İstanbul Branch

Seda **ATABEK** / Freelance Auditor-Consultant

Yeliz **YURDABAK** / Avcılar Municipality Planning and Projects Department

Esra **DEMİR**/ Demir Enerji

Gonca **AKGÜL** / Demir Enerji

Kaan **EMİR** / Demir Enerji

Melda **KARADEMİR** / Demir Enerji

Oya **TABANOĞLU** / Demir Enerji

Deniz **GENÇ** / Avcılar Municipality Environmental Protection and Control Department

Elif **ERCAN** / Avcılar Municipality Environmental Protection and Control Department

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List of Abbreviations

Abbreviation	Description
BAU	Business as usual
CoM	Covenant of Mayors
IEAP	International Local Government GHG Emissions Analysis Protocol
ICLEI	International Council for Local Environmental Initiatives
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
İBB	İstanbul Metropolitan Municipality
İDKK	Climate Change Coordination Commission
SECAP	Sustainable Energy and Climate Action Plan

Executive Summary

Introduction

The climate change is accelerating by the day because of the aerial emissions from the use of fossil fuels accumulating under the ground especially after the industrial revolution. According to the Climate Change Physical Science Basis Report (IPCC, 2013) of Intergovernmental Panel on Climate Change (IPCC), warming of the global climate is definite and the changes seen in the climate since 1950s are on a level that was never seen before until the last thousand years. Each decade of the last 30 years was hotter than all global surface temperatures recorded in the previous decades on earth since 1840. It has been proven that carbon dioxide emissions from fossil fuel use induced by human activities starting with the industrial revolution has increased to a level beyond the oceans and forests on earth can absorb. It is foreseen that societies maintaining their current habits will cause serious climate changes which will result in great environmental destruction and probable mass deaths as well as related human-induced disasters.

SECAP Process

SECAP process has been prepared in accordance with the methodology of the Covenant of Mayors (CoM) used by all municipalities that issue a Sustainable Energy and Climate Action Plan. The basic steps followed in the process managed in accordance with the SECAP reporting scheme and the accompanying method report are as follows:

- a) Assessing the current situation by taking a greenhouse gas emission inventory, creating actions for reducing emissions
- b) Identifying climate adaptation actions for sectors affected by the climate change through a risk and vulnerability assessment

Greenhouse Gas Reduction

Avclar Sustainable Energy and Climate Action Plan sets out a road map for reducing greenhouse gas emissions due to energy consumption in various sectors identified with the participation of urban stakeholders. This road map starts with taking the greenhouse gas emission inventory for the prevailing state in 2019. The inventory was created on the basis of IPCC directives by the International Council for Local Environmental Initiatives (or Local Governments for Sustainability -ICLEI) and prepared within the framework of general principles and the philosophy of International Local Government GHG Emissions Analysis Protocol which applies to all local governments.

a) Basic Findings

Energy consumption (including industrial) for Avclar was estimated at 4.075.278 MWh and greenhouse gas emission was estimated at 1.323.183 tCO_{2e} for 2019. The share of buildings' fuel and electricity consumption in the total emissions was 60%. Greenhouse gas emissions caused by transportation was 31.4% Greenhouse gas emissions caused by solid wastes and wastewater was 8.5% and all other emissions accounted for 0,1%.

Avclar district energy consumption excluding industrial was 3.476.548 MWh and greenhouse gas emission amount was estimated at 1.089.334 tCO_{2e}. According to the estimations, buildings accounted for 51.4%, transportation accounted for 38.1%, solid wastes and wastewater accounted for 10.4% and all other sources along with agricultural irrigation and animal presence accounted for 0.1%.

It has been determined that a reduction of approximately 40% until 2030 with respect to 2019 can be achieved in Avcılar for emissions per person with the reduction measures identified for sectors. BAU (Business as Usual, meaning 'current situation remains as it is') scenario for Avcılar has demonstrated the predictions of different institutions based on population and sectoral growth, and according to this scenario the emissions for 2030 were estimated as 1,234,995 tCO_{2e}. The population was foreseen to increase to 525,902 in 2030 from 448,882 in 2019.

Reduction targets by 2030 are 241,104 tCO_{2e} for buildings sector, 146,662 tCO_{2e} for transportation sector, and 73.798 tCO_{2e} for other sectors including wastes/wastewater, agriculture and husbandry sectors with the actions detailed under the heading *3.3.2 Contents of Activities*.

Because it is not possible to talk about absolute emission reductions for the growth rate in Turkey, it is correct to express emission reduction targets as emissions per person. According to the BAU scenario, emissions per person reduces by 3.3% from 2.43 tons in 2019 to 2.35 tons in 2030. The most prominent reasons for this are the reduction in fuel consumption and increase in energy efficiency due to technological advancements and the fact that energy and fossil fuel consumption does not increase at the same rate as population growth.

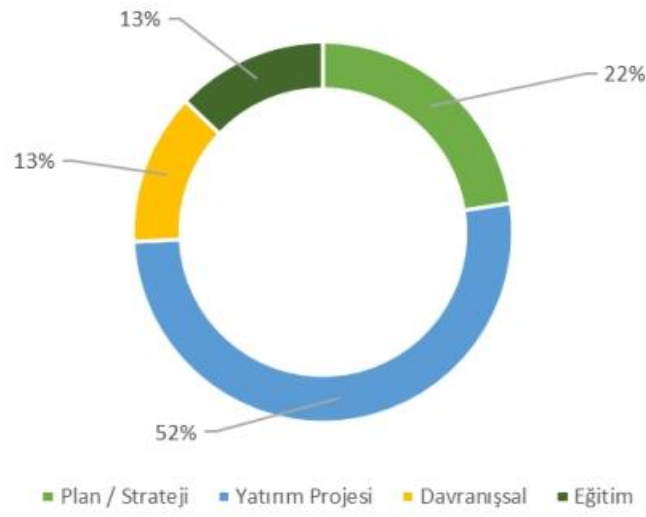
It can be seen that a reduction of 42% for emissions per person and a reduction of 41% according to the BAU scenario from 2019 to 2030 can be achieved in Avcılar through the reduction measures identified for each sector. According to these results, emissions per person will be brought down to the level of 1,40 tCO_{2e}/person in 2030.

b) Actions

Reduction actions for energy consumption and greenhouse gas emissions are created separately for buildings, energy, and transportation sectors and other sectors. All actions have been examined under the headings of current situation/purpose, relation to current plans, activities/steps, type of activity, saving amount, delivery plan and risks.

Table 1: Avcılar SECAP reduction actions

Sector/Area	Number of Actions
Buildings and Energy	8
Transportation	8
Other	5



*Plan/Strategy = Plan/Strateji Yatırım Projesi = Investment Project Davranışsal = Behavioral Eğitim = Education

Figure 1: Types of reduction actions*

The amounts of energy consumption and greenhouse gas emission reduction targeted as a result of these actions are shown in the table below.

Table 2: Sectoral reduction targets for 2030

	MWh Reduction 2030	CO ₂ e Reduction Ton 2030
Buildings Emission Reduction	694.058	241.104
Renewable Energy Emission Reduction	78.000	40.092
Transportation Emission Reduction	609.435	146.662
Wastes-Wastewater and other emission reduction	-	73.798
Total Reduction	1.381.493	501.656

Adaptation to Climate Change

a) Basic Findings

The climate adaptation activities to be conducted by the Avcılar district within the scope of the fight against the climate change have been identified through a participatory process in which risks and affectibilities the city faces and will face due to the climate change have been examined. Aforementioned activities and scientific assessment methods have been conducted with participation of experts from related organizations. Sectors such as critical infrastructure and built environment, transportation system, biodiversity, waste management, water presence, public health, industry, and disaster management in the district are taken into the scope of Risk and Affectibility Assessment.

As the result of the assessments of dangers such as hot and cold air waves, excessive precipitation and storms, drought, landslide, flood, and sea level rise; it has been identified that the presence of biodiversity is seriously threatened by all these dangers. Because the presence of water resources will be significantly affected by rising temperatures and drought, it has been determined that big risks will arise for water provision. It has been stated that almost all sectors are in danger of floods due to sudden precipitation. The areas exposed to landslide danger due to storms and excessive precipitation are critical infrastructure and built environment, and transportation infrastructure. Although sea level rise has been considered low risk in the short term and medium term, it has been included in the adaptation activities.

Although earthquake, which is a natural disaster that poses a great threat to İstanbul Metropolitan Area, is not linked to the climate, it will negatively affect the environmental, social, economic and institutional capacities with the major damage it will inflict on the urban infrastructure and public health. For this reason, it has been determined and underlined that adaptation operations that aim to achieve preparedness against climatic dangers must be regarded together with earthquake in the emergency action plans through an integrated approach.

b) Actions

Adaptation actions have been created for reducing the urban heat island effects, increasing green space presence and biodiversity, ensuring effective and sustainable use of water resources, being prepared against climatic disasters, and reducing and preventing all of the aforementioned disasters. The operations advised to be carried out in all areas also involve improving the public health and quality of life.

Table 3: Avcılar SECAP adaptation activities

Sector/Area	Number of Activities
Urban Heat Islands and Green Spaces	12
Water Management	10
Disaster management	14

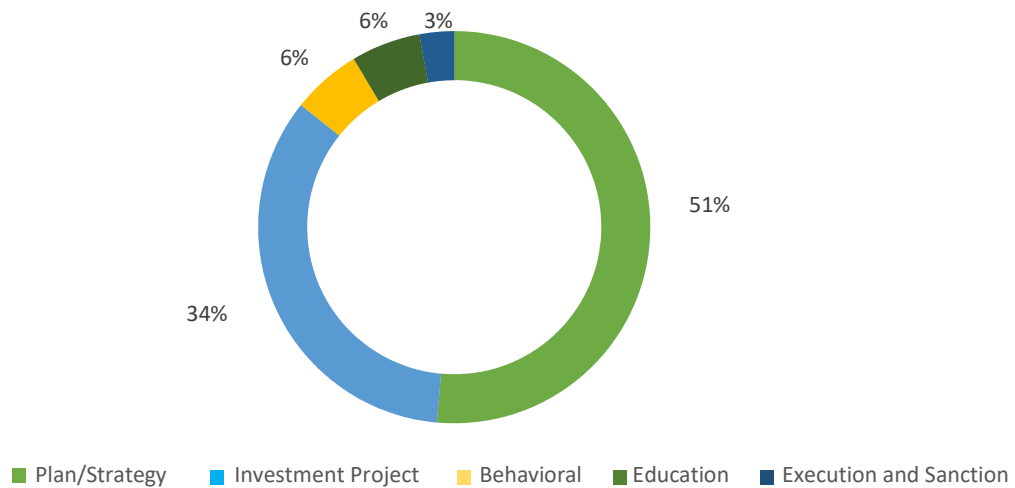


Figure 2: Types of Adaptation Activities

1.Introduction

1.1. Overview

With regard to the rate at which the climate change reached in the beginning of the 21st century, climatologists firmly assert that global warming is occurring due to carbon dioxide and equivalent greenhouse gases induced by the use of fossil fuels. It is being observed that societies continuing their current production and consumption habits will cause significant climate change results, which will in turn give rise to major environmental destruction, possible mass deaths and other related human-induced disasters as demonstrated by the increase in extreme weather conditions in daily life. It has been proven that from the industrial revolution to this day, carbon dioxide emissions induced by human activity involving fossil fuel consumption has risen to an amount higher than that can be absorbed by oceans and forests. This danger clearly shown by climatology has directed the world towards the issue and stirred up the mobilization of cities.

Local governments have started to get involved more deeply with this issue that closely concern people's health and quality of life. Local governments being more capable of resolving local problems than national governments due to their difference in decision-making processes along with their ability to make use of the advantages of being local for the process management have made their place in the fight against the climate change indispensable, and local governments, and unions and coalitions formed by them have started to set further targets than national governments have done since the beginning of 2000s, demonstrating that they are able to take an important part in the fight against the climate change.

Avclar Municipality is a signatory of the Covenant of Mayors (CoM) established by the European Commission with the purpose of encouraging and supporting urban reduction plans to reduce the greenhouse gas emissions created by cities and promoting the use of clean energy sources. Accordingly, it commits to implement the stated measures for adaptation to the climate change to achieve a greenhouse gas emission reduction of at least 40% from the base year 2019 to 2030. Avclar Municipality has taken an important step to reduce the negative effects of the climate change and prepare the district against future climatic changes by creating a Sustainable Energy and Climate Action Plan (SECAP) led by its Environmental Protection and Control Directorate in coordination with the local stakeholders.

1.2. The Relation Between Strategic Plan Targets and Action Plan

Target 3.4 of İstanbul Metropolitan Municipality 2020-2024 Strategic Plan includes the expression "protecting the environment by extending the fight against the climate change". Avclar has taken an important step in accordance with this target of İstanbul Metropolitan Municipality by preparing the Sustainable Energy and Climate Action Plan. The contents of the actions in this plan has been have been specified in compliance with strategic plans of İBB and Avclar Municipality. When examined by sector, purposes and targets guiding the creation of the relevant action plan's content are stated below. The first purpose of the İstanbul Metropolitan Municipality 2020-2024 Strategic Plan is "creating a resilient city by developing quality and functional living spaces." "Conducting urban renewal services through transparent and participatory methods" description related to the buildings is given in the Target 1.2 in accordance with this purpose. The third target under the heading of "increasing service quality and providing citizen-oriented services" in the first purpose in the plan related to the buildings of Avclar Municipality 2020-2024 Strategic Plan is stated as "improving the service quality and efficiency by using the resources effectively and efficiently". Within this scope, improving the quality of service buildings becomes prominent.

İstanbul Metropolitan Municipality current strategic plan Target 3.2 is described as “enhancing and extending the operations regarding renewable energy, energy efficiency and lighting facilities” under the heading “strengthening sustainable environment and energy management”, which is the third purpose in the energy section of the plan. With regard to this target, renewing some of the municipal buildings into green buildings until 2025, using renewable energy for some part of the electricity consumption of İBB, increasing install renewable energy power amount and increasing the number of persons that receive training on energy efficiency have been determined as the performance indicators.¹ The latest strategic plan of Avcılar Municipality includes the “developing environmentalist policies for reducing the negative effects of urbanization and the climate change” target under the heading “ensuring the development of the sustainable environment”, one of the strategic purposes that involves the use of renewable energy. Making use of alternative energy resources in relation to the location and a long duration of insolation is mentioned in the plan within the scope of the energy subject.

Target 2.2 in the aforementioned İBB strategic plan is described as “improving integration, accessibility and quality in public transportation” under the heading “developing urban transportation within the scope of sustainable mobilization” which is the second strategic purpose related to transportation in the plan. Under the same strategic purpose, Target 2.6 is described as “strengthening the road systems infrastructure and making them sustainable.”² In the latest Avcılar district strategic plan, “improving service quality and efficiency by using resources effectively and efficiently” subtarget is described under the heading of “Increasing service quality and providing citizen-oriented services”, which is the first purpose related to transportation. Within the scope of this target, the need to provide transportation services in the district in a timely, comfortable, integrated, innovative and environmentally conscious manner that respects the people is emphasized.

In the İstanbul Metropolitan Municipality 2020-2024 strategic plan, Target 3.1 is described as “increasing the rate of recycling by developing waste management implementations”, supporting “strengthening the sustainable environment and energy management” subject which is the third strategic purpose related to the waste management under the heading of environmental consciousness. In the Avcılar Municipality 2020-2024 Strategic Plan, the first target under the third purpose related to waste and wastewater management which is “sustainable environment and health management” is described as “achieving exemplary waste management implementations by developing environmentalist projects for reducing the negative effects of urbanization and the climate change.” Within this scope, sorting wastes by type through waste management implementations and making endeavors related to recycling are included in the identified activities.³

In the İstanbul Metropolitan Municipality Strategic Plan, “conducting urban renewal operations while prioritizing disaster measures with transparent and participatory methods” target is described under the heading “creating a resilient city by developing quality and functional living spaces” which is the first strategic purpose in the plan. Avcılar district consists of 10 neighborhoods and has a population of 448,882. There are 27,581 buildings, 172,538 households and 24,045 stores in the district. The number of risky buildings in the district is 7948. The district is a settlement area where intensive urban renewal operations are carried out. Target 6.1 in the Avcılar Municipality 2020-2024 strategic plan is described as “building living spaces that extend modern architecture, protecting the cultural urban memory” under the heading “enriching the living spaces by modernizing them against natural disasters” which is the sixth strategic purpose in the plan.

¹ İBB Strategic Plan, 2020-2024, s.112.

² İBB Strategic Plan, 2020-2024, s.91.

³ Avcılar Belediyesi, 2020-2024 Strategic Plan, 2019, s.57.

Target 3.3 in the İstanbul Metropolitan Municipality 2020-2024 Strategic Report is described as “creating sustainable green spaces and increasing the active green space area per person” under the heading “strengthening sustainable environment and energy management” which is the third strategic purpose related to the green spaces. “Creating areas for physical activity and sports purposes in the parks, recreational areas and green spaces in the district” target in the current Avcılar Municipality Strategic Plan attracts attention.

Target 6.2 in the Avcılar Municipality 2020-2024 strategic plan is described as “improving the livable infrastructure and superstructure in the public open areas.” Increasing the length of rainwater drainage canals and the rate at which trees are irrigated are the prominent subjects within the target related to water management. Pruning, fertilizing, and irrigating all plants in the parks and gardens, and near the roads within the district borders and planting seasonal trees are included in the activities.⁴

The first strategic purpose of the latest İBB 2020-2024 strategic plan is described as “creating a resilient city by developing quality and functional living spaces” which includes Target 1.1 “increasing İstanbul’s resilience against disasters” and Target 1.5 “developing the disaster and emergency response capacity and a societal awareness by making use of intelligent systems and technology.”

Table 4 below provides the purposes and targets in the strategic plan related to the Sustainable Energy and Climate Action Plan.

Table 4: Strategic aims and targets related to the Sustainable Energy and Climate Action Plan

Sector	Strategic Plan	Strategic Purpose	Strategic Target
Buildings	İBB Strategic Plan	P1. Creating a resilient city by developing quality and functional living spaces	T1.3 conducting urban renewal operations while prioritizing disaster measures with transparent and participatory methods
	Avcılar Municipality Strategic Plan	P1. Increasing service quality and providing citizen-oriented services	T1.3 Improving the service quality and efficiency by using the resources effectively and efficiently
Energy	İBB Strategic Plan	P3. Strengthening sustainable environment and energy management	T3.2 Enhancing and extending the operations regarding renewable energy, energy efficiency and lighting facilities
	Avcılar Municipality Strategic Plan	P4. Ensuring the development of the sustainable environment	T4.1 Developing environmentalist policies for reducing the negative effects of urbanization and the climate change
Transportation	İBB Strategic Plan	P2. Developing urban transportation within the scope of sustainable mobilization	T2.2 Improving integration, accessibility and quality in public transportation
			T2.6 Strengthening the road systems infrastructure and making them sustainable

⁴ Avcılar Belediyesi Stratejik Plan, 2020-2024, s.87.

	Avçılar Municipality Strategic Plan	P1. Increasing service quality and providing citizen-oriented services	T1.3 Improving the service quality and efficiency by using the resources effectively and efficiently
Waste	İBB Stratejik Plan	P3. Strengthening sustainable environment and energy management	T3.1 Increasing the rate of recycling by developing waste management implementations
	Avçılar Municipality Strategic Plan	P3. Sustainable environment and health management	T3.1 achieving exemplary waste management implementations by developing environmental projects for reducing the negative effects of urbanization and the climate change
Urban Heat Island Effect	İBB Strategic Plan	P3. Strengthening sustainable environment and energy management	T3.4 Protecting the environment by extending the fight against the climate change
Green Spaces	İBB Strategic Plan	P3. Strengthening sustainable environment and energy management	T3.3 Creating sustainable green spaces and increasing the active green space area per person
Water Management	Avçılar Municipality Strategic Plan	P4. Urban Development and Structuring	T6.2 Improving the livable infrastructure and superstructure in the public open areas
Disaster Management	İBB Strategic Plan	P1. Creating a resilient city by developing quality and functional living spaces	T1.1 Increasing İstanbul's resilience against disasters
	İBB Strategic Plan	P1. Creating a resilient city by developing quality and functional living spaces	H1.5 developing the disaster and emergency response capacity and a societal awareness by making use of intelligent systems and technology

1.3. Report Structure

“Sustainable Energy and Climate Action Plan” basically consists of five sections.

Section 1 “Introduction”: This part provides an overview of the SECAP process and sheds light on targets and strategies of national and local plans on sustainable energy and climate adaptation. A relation is formed in this scope with SECAP issued for Avçılar district.

Section 2 “Methodology”: The steps of SECAP preparation process and the methodological approaches employed within the scope of this process are explained in this section that under two parts as reduction and adaptation. The reduction part includes the assumptions made through the use of city data as well as the international standards employed for taking greenhouse gas inventory along with the details concerning the process followed for the identification of reduction activities and stakeholder participation. The adaptation part generally presents the risk and affectability assessment and the methodological approaches employed for identifying the affected sectors.

Section 3 “Reduction”: This section includes information related to the 2030 reduction target and projection as well as inventory findings with their sectoral breakdown. While reduction activities are provided based on the sectors, current situation of the sectors and findings related to national and city strategies are also mentioned.

Section 4 “Adaptation”: Urban heat island effect that also involves Avçılar, endeavors related to floods and drought, and risk and affectability assessment regarding climate adaptation are detailed in this section.

Section 5 “Avcılar SECAP Actions”: Actions to be employed for reducing the current greenhouse gas emissions of Avcılar and improving its resilience against climatic risks are stated in this section. These actions are first split into two categories as Reduction and Adaptation and then assessed by the sectors given below:

- Reduction:
 - Buildings: Municipal buildings, residential buildings, non-residential buildings
 - Energy
 - Transportation
 - Wastes
- Adaptation:
 - Land Use Planning
 - Disaster Management
 - Water Management
 - Agriculture, Husbandry and Biodiversity
 - Public Health

Section 6 “Monitoring Plan”: This section includes the needs identified in the preparation process of SECAP to be met in the future processes. The target is to guide the local administration with advice regarding the needed monitoring process for the implementation of the report.

Section 7 “Conclusion”: This section includes the assessments of the findings within the scope of SECAP by the base year and details 2030 reduction scenarios with breakdown.

1.4. Climate Change Policies

1.4.1. Global Policies and Activities

The foundations of the framework of the cooperation against the climate change was laid with the 1992 United Nations Climate Change Framework Agreement. After this starting point of the intensive endeavors made against the climate change, the Paris Agreement, accepted in 2015 and put into effect in November 2016, has been a breakthrough. Today, the assessment of production and consumption activities in the cities on a scale based on the climate change and their effective inclusion in the processes of rational planning and strategy identification regarding energy conservation have become a necessity. Since 2016, around 200 countries have signed and ratified the Agreement. Although Turkey has signed it too, it is among the 10 countries that haven't ratified it yet.

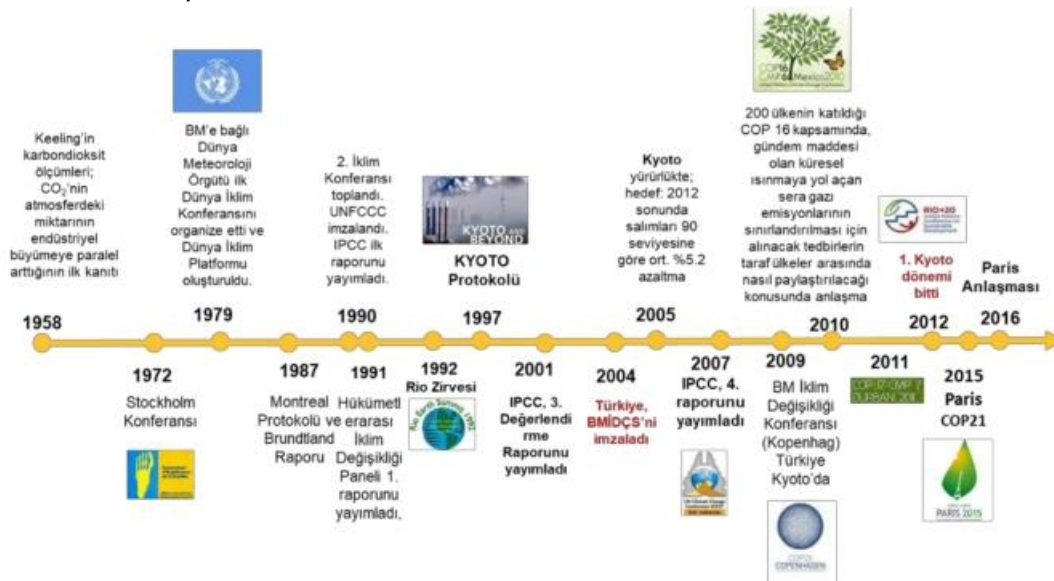


Figure 3: International climate change negotiations summary*

*1958 - Keeling's carbon dioxide measurements, the first evidence showing that the amount of CO₂ in the atmosphere increases in parallel with industrial growth
1972 - Stockholm Conference
1979 - UN's World Meteorology Organization organized the first World Climate Conference and the World Climate Platform was created.
1987 - The Montreal Protocol and the Brundtland Report
1990 - 2nd Climate Conference gathered. UNFCCC was signed. IPCC published its first report.
1991 - Intergovernmental Panel on Climate Change published its first report.
1992 - Rio Summit
1997 - Kyoto Protocol
2001 - IPCC published its third assessment report
2004 - Türkiye signed United Nations Framework Convention on Climate Change
2007 - IPCC published its 4th report
2009 - UN Climate Change Conference (Copenhagen), Türkiye joined Kyoto
2010 - Agreement on how to allocate the measures to parties for limiting greenhouse gas emissions causing global warming which is an agenda item within the scope of COP 16, hosting 200 countries
2012 - 1st Term of Kyoto has ended
2016 - Paris Agreement

Paris Agreement has brought different approaches to the international climate cooperation model. The Agreement, taking priority over the countries' climate policies in the global fight against the climate change, is based on "nationally directed climate action logic." Within this scope, a transition from the Kyoto model, where signatory countries are bound by reduction liabilities through rigid rules and sanctions on an international level, to a cooperation model that depends on voluntary contributions determined by each country with respect to its own national conditions occurred. National declaration of will specified by Turkey is detailed in the next section.

Although the focus was mainly on the reduction of greenhouse gases, after Paris Agreement it has shifted towards the adaptation to the climate change in the agendas of more countries than before. The effects of the climate change vary nationally and regionally according to floods and inundations, drought, heat waves etc. For this reason, measures to be taken in different places also vary. Local governments has an important role in specifying response tools and methods as well as in infrastructure investments. Organizations that bring local governments in the different geographical areas of the world, like ICLEI, C40 and the Covenant of Mayors, present an important opportunity of cooperation and experience sharing for the local governments that want to step forward in this direction. However, specifying methods suitable for local conditions is not enough on its own; local governments also need to have the financial capacity and political power of decision making.

Because the fight of the European cities against the climate change started much earlier than Turkey, their inventory identifications and reduction strategies are significantly more extensive than Turkey. The European Union plans to reduce the greenhouse effect and the carbon emission by 2050 with the issued climate action plan. Targets in the plan include the reduction of greenhouse gas emissions by 40%, providing energy from renewable resources for the 40% of the total energy consumption and reducing the total energy use by 40% in 2030 compared to 1990. The European Union is currently revising these targets with the intention to set them higher in the months we are in.

When the action plans in Turkey are examined, it can be seen that the strategies developed in the plans revolve around the subjects of thermal insulation, renewable energy and the use of energy-efficient lighting in current buildings, extending the public transportation and rail systems, intelligent traffic management, education and awareness-raising activities, increasing green spaces, reducing the use of chemical fertilizers, and obtaining energy from wastes. Bursa Metropolitan, Kadıköy, Denizli, and İstanbul Metropolitan municipalities are among the ones that have issued Sustainable Energy and Climate Action Plans. In addition, the number of local governments that issued a Sustainable Energy and Climate Action Plan is approximately 20.

12 of these are municipalities that signed the Covenant of Mayors.

Considering the aforementioned effects and examples, it is understood that active policies, actions and strategies are needed in various areas from transportation and buildings to infrastructure, waste management, and land use for the fight against climate change in cities.

1.4.2. National Policies and Actions

Turkey has become a party to the United Nations Framework Convention on Climate Change (UNFCCC) in 2004. Before becoming a party to the UNFCCC, Turkey has established the Climate Change Coordination Commission (İDKK) in 2001. After Turkey became a party to the UNFCCC, the İDKK was reconfigured and in 2010 its duties were expanded to include the new members.

Turkey has a different position than the countries listed in the Appendix-I. In 2001 Turkey's special conditions were recognized in the 7th Conference of the Parties held in Marrakesh, and it was decided that the country would be taken out from the list in Appendix-II to be added in the list in Appendix-I. This affected the Turkey's political decision to become a party to the Kyoto Protocol and accelerated the process. In 2009, five years later than joining the convention, Turkey's entry to the Kyoto Protocol was certified and the documentation was sent to the United Nations Secretariat. The confirmation process of the Protocol was completed in August 2009. Turkey was not included in the Appendix-B list of the Protocol (meaning it does not have numerical liabilities for reducing the greenhouse gas emissions).

"Climate Change Office" was established under the Environment Management General Directorate within the Ministry of Environment and Urbanization in 2009 with the purpose of addressing the issues related to the climate change.

Turkey issued a "National Climate Change Strategy" in May 2010 considering its own special conditions and capacity for contributing to the global endeavors that aim to minimize the effects of the climate change. Series of short- (within a year), medium- (within 1 to 3 years) and long (to be started within the next 10 years) long-term targets to be implemented are included in the strategy regarding transportation, industry, buildings, wastes and agriculture. The measures listed below are also included in this strategy:

- Cogeneration and local heating
- Use of renewable energy sources in addition to local coal
- Increasing the efficiency of the buildings

The regulations introduced with the Energy Efficiency Law encompass all sectors of the economy as well as people and organizations on national, regional and local levels regarding legal duties and liabilities. These regulations include new liabilities, supports and actions for industry, buildings and transportation sectors. Energy Performance in Buildings regulations were also put into effect and within this scope it was made obligatory to issue Energy Performance Certificates for new buildings starting from 2011. The Regulation on Increasing the Efficiency in Use of Energy and Energy Resources covers the practical measures some of which are given below:

- Creating corporate structure and certification programs for the Energy Service Company sector
- Providing education and capacity increase for all public and private sector stakeholders
- Creating mechanisms to support energy efficiency projects
- Appointing energy managers to industry and buildings sectors

The Regulation on Increasing the Efficiency in Use of Energy and Energy Resources numbered 28097 also covers various incentives to be provided to those who voluntarily promise to reduce the energy intensity by carrying out projects that increase the energy efficiency. The regulative endeavors related to developing the local renewable energy resources were improved and the number of wind and solar energy facilities in Turkey significantly increased. Some of the planned actions related to energy efficiency and the use of new energy resources are as follows:

- Establishing production technologies with zero emissions such as nuclear energy and those based on renewable energy resources on the local content condition,
- Increasing the general efficiency of current thermal power plants,
- Reducing the energy intensities to 2004 levels,
- Increasing the share of local renewable energy resources in total energy production to 25%,
- Obtaining maximum benefit from the energy efficiency potential of the industry sector,
- Benefiting from the energy efficiency potential of the built environment

In 2011 Ministry of Environment and Urbanization issued the Climate Change Adaptation Strategy and Action Plan of Turkey. Turkey's Climate Change Adaptation Strategy and Action Plan focuses on the five main subjects below supported by technical and scientific studies, and participatory processes:

- Water Resources Management
- Agriculture and Food Security
- Ecosystem Services, Biologic Diversity and Forestry
- Natural Disaster Risk Management
- Human Health

It is suggested that greenhouse gas emissions are reduced by 21% compared to their usual level according to the Intended Nationally Determined Contribution proposed to UNFCCC by Turkey. By this means, Turkey will be able to advance in the way of low-carbon development in line with the long-term target of reducing the global temperature increase below 2°C until 2030.

The figure compares the emission reduction to be achieved when these plans and policies are followed and the BAU (Business as Usual) scenario.

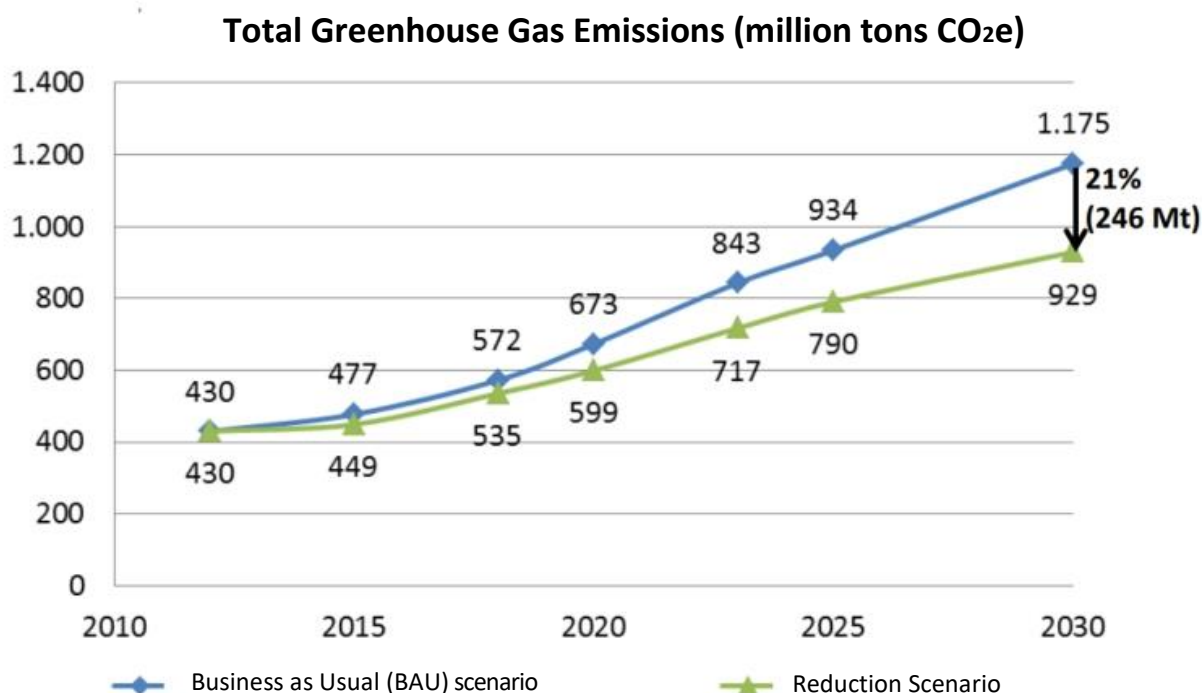


Figure 4: Turkey's Intended Nationally Determined Contribution (INDC) target

Turkey supports the INDC targets with a series of national climate change policies given below:

- 11th Development Plan
- Turkey Climate Change Strategy (2010-2023)
- Turkey's Climate Change Adaptation Strategy and Action Plan (2011-2023)
- Republic of Turkey Climate Change Action Plan (2011-2023)
- 2023 Industry and Technology Strategy
- Energy Efficiency Strategy Document (2012-2023)
- National Recycling Strategy Document and Action Plan (2014-2017)
- Regulation on Monitoring Greenhouse Gas Emissions (2014)
- National Intelligent Transportation Systems Strategy Document (2014-2023) and Attached Action Plan (2014-2016)
- Turkey National Renewable Energy Action Plan (2014)
- National Energy Efficiency Action Plan (2017-2023)
- Ministry of Energy and Natural Resources Strategic Plan (2019-2023)

Plans and policies to be implemented for different sectors and INDC are detailed in the next page.

Buildings

The basic INDC policy adopted for the buildings sector is to reduce the primary energy demand in the new and existing buildings. This target will be reached with the help of designs, technological equipment, construction materials and methods that encourage the use of renewable energy resources (such as loans and tax reductions). To reduce the energy use and its negative effects on climate, the measures listed below will be supported:

- Passive energy and zero-energy house design for minimizing the energy demand and ensuring local energy production

- Constructing new residential and service buildings with energy savings in line with the Energy Performance in Buildings Regulations
- Issuing Energy Performance Certificates for new and existing buildings to reduce the energy consumed per square meter and control energy consumption and greenhouse gas emissions

Industry

Main intervention areas in the industry are energy efficiency wastes. The aim is to provide financial support for energy efficiency projects, increasing energy efficiency in industrial facilities and reduce emission intensity by implementing the Energy Efficiency Strategy Document and National Energy Efficiency Action Plan. Making endeavors to increase the use of wastes as alternative fuels in appropriate sectors is another area where sustainability and circularity can be achieved in industry sector.

Energy

Renewable energy investments will be supported to increase the electricity production capacity with solar and wind energy. The aim is to increase the solar energy capacity to 10 GW and the wind energy capacity to 16 GW by 2030. Targets also include reducing the electric transmission and distribution losses to 15% and improving the public power plants. Initiatives such as utilizing full potential of the hydroelectricity, microproduction, establishing cogeneration systems and producing on-site electricity are among the ones related to the energy sector.

Transportation

The strategic purpose of the transportation sector is to encourage sustainable means of transportation such as walking, riding bicycles, and public transportation. The targets in line with this purpose include:

- High speed rail system projects
- Increasing urban rail systems
- Encouraging the increased use of marine and rail transportation for both freight shipment and passenger transport

The energy use in transportation sector is another area of strategy for the INDC. Promoting alternative fuels and environmentally friendly vehicles, reducing emissions by fuel consumption and road transport via National Intelligent Transportation Systems Strategy Document (2014-2023) and Attached Action Plan (2014-2016) as well as ensuring fuel savings and decommissioning obsolete vehicles are among the targets. Certain policies to ensure energy efficiency that include green port and green airport projects along with special consumption tax exemption for marital transport, buildings, and urban renewal exist.

Wastes

National policies that aim to ensure the circularity of the wastes sector include sending solid wastes to managed regular storing areas to reduce wastes on one hand and recover secondary raw materials on the other for use as energy resources.

Energy can be recovered from wastes with the industrial symbiosis approach. Below processes can be used to achieve this:

- Material recycling
- Biological drying
- Biological methanation
- Compost production

- Recovery of the gas in the advanced thermal process or burning and regular storage areas
- Use of industrial wastes in other industrial sectors as alternative raw materials or fuels

Other policies in the wastes sector include using the wastes coming from livestock and poultry farms, rehabilitating unmanaged waste areas and ensuring that wastes are taken to the managed regular waste storage sites.

Biodiversity

Basic national policies related to sustainability revolve around ensuring fuel reduction through merging lands in the agricultural areas, ameliorating pastures, controlling fertilizer use, promoting the adoption of modern agricultural practices and supporting the reduction of soil tillage methods in land management. When implemented together, these policies will help reduce the direct and indirect emissions caused by agriculture and husbandry, mitigate the negative effects on water and air quality and supporting healthier ecosystems. National policies related to forested land include increasing sink areas and preventing the land degradation, and implementing the Forest Rehabilitation Action Plan and National Forestation Campaign.

A The actions suggested in the Avcılar Sustainable Energy and Climate Action Plan have been prepared in line with the current plans and strategies of 11th Development Plan (2019-2023), National Energy Efficiency Action Plan, Turkey Climate Change Strategy 2010-2023, R.T. Ministry of Energy and Natural Resources 2019-2023 Strategic Plan, Turkey Transportation and Communication Strategy 2023, National Intelligent Transportation Systems Strategy Document (2014-2023).

1.4.3. Local Policies and Actions

The mission of Avcılar Municipality is defined as “ensuring an environmentalist city that achieved service equality and increases the quality of life of its citizens, providing quality local services based on transparency, accountability, participatory services focused on the satisfaction of the citizens with a high social welfare level.”

It is stated in the Avcılar Municipality 2019 Activity Report that the “Cities for Climate” declaration, stipulating that local governments should assume responsibilities for making cities just, egalitarian and livable, and keeping the global warming under the level of 1,5°C until 2030 within the vision set out by the Paris Agreement, has been signed on December 5, 2019. Within this scope, the aforementioned activity report specifies that 8 training courses were run in 2019 in accordance with “course on zero waste together with İBB Climate Change Department, Marmara Municipalities Union (MBB) and Provincial Environment and Urbanization Directorate” performance indicator in the previous strategic plan.⁵ The municipality aims to be a signatory of the Covenant of Mayors in the near future.

Avcılar Municipality 2020-2024 Strategic Plan includes “P3. Making Contributions to the Development of Sustainable Environment”, “P5. Preventing Problems Related to the Public and Human Health, Making Contributions to Healthy Social Development and Welfare”, and “P6. Enriching Living Spaces by Modernizing Them against Natural Disasters” purposes in relation to reducing the negative effects of the climate change. The targets related to the strategic purposes are stated in the strategic plan and performance indicators have been created for yearly measurement until 2025.

⁵Avcılar Belediyesi, Faaliyet Raporu, 2019, s.326.

1.5. Avclar District General Information

1.5.1. Geographical Location, Population

The district, whose total area is 38.5 million m² or 3850 hectares, is surrounded by Küçükçekmece Lake and Küçükçekmece district on the east and Sea of Marmara on the south. It is 27 km away from İstanbul. TEM highway and E-5 (D-100) motorway goes through the borders of the district.

The population went up to 1222 in 1940 from 340 in 1934. It became 1730 in 1945 during the World War II. The reason for this large increase in the population is thought to be the military troops deployed in the area, because after the war the population suddenly fell down to 1130.

On 4 April 1987 it was connected to Küçükçekmece and stayed as a neighborhood of the district for five years. On 27 May 1992, Avclar neighborhood was separated from the Küçükçekmece district with the Cabinet decree numbered 3806 and made a district. With a decision made in 1992 the district consisted of 9 neighborhoods. Soon after, the number of the neighborhoods was increased to 10 and the current administrative units of the district were formed. Since the official opening of the district on 12 October 1992, the institutions and organizations in the district has kept providing services to the people.⁶

Although the population increase has been lower than the general average until 1950, after this point it gained significant momentum. Construction of the fuel refill facilities in 1959 and the founding of TEK Ambarlı Thermal Power Plant are the two initial factors that drove rate of the population increase. In the recent past, for example around 1990 the population of the district became 126,282. 1 From 1990 to 2019 the population increased by approximately three times to 448,882. Avclar consists of 10 neighborhoods. The table below shows the population of Avclar by neighborhood.

Between 2012-2019 the population of the district increased by 13.5%. However, the increase rate in Tahtakale (32%), Denizköşkler (19%), Üniversite (16%) and Cihangir (16%) neighborhoods are above the district average.

Table 5: Avclar district neighborhoods

Neighborhood	Area (Hectare)	2012	2013	2014	2015	2016	2017	2018	2019
Yeşilkent	507,52	66,435	68,105	69,857	71,328	71,800	71,783	70,914	72,463
Cihangir	380,72	56,213	58,269	59,431	60,544	61,320	62,149	62,478	64,632
Tahtakale	1129,44	45,383	45,751	44,196	46,919	50,695	53,209	54,893	60,022
M. Kemal Paşa	95	43,979	44,878	46,050	46,938	46,681	47,027	46,294	47,389
Denizköşkler	169,65	38,852	39,937	45,823	45,503	45,601	45,942	45,944	46,380
Gümüşpala	115,6	38,274	39,316	40,511	40,807	41,279	41,317	41,079	42,079
Ambarlı	182,35	34,722	38,203	38,777	39,068	38,642	38,318	38,139	38,444
Merkez	85,65	31,563	31,644	31,478	31,590	31,515	31,820	31,741	32,264
Firuzköy	1253,06	20,526	21,105	21,348	21,716	22,102	22,496	22,436	22,850
Üniversite	284,06	19,327	20,032	20,381	20,815	21,135	21,621	21,707	22,359
TOTAL	4203,05	395,274	407,240	417,852	425,228	430,770	435,682	435,625	448,882

Seven year average of the population increase rate is getting closer to 2%. However, the relatively low increase rate may rise to 3% in some years.

⁶T.C. İstanbul Valiliği, harika.istanbul.gov.tr
<https://archive.vn/20121221171542/http://harika.istanbul.gov.tr/Default.aspx?pid=215#selection-1211.0-1211.557>

1.5.2. Socioeconomic Features

Fishery, viticulture and agriculture in the district, which was a village when the republic was established, disappeared after industrial facilities had been founded and left their places to industry, commerce, recreation (entertainment/relaxing) facilities. 377 industrial facilities operate in Avcılar (as of ISO December 2020) in various areas, particularly metalware, textile and clothing. 165 companies are active in the occupational fields related to textile.

More than 40% of the population consists of workers while 10% consists of local business people and official workers⁷.

The ranking of the Avcılar district in İstanbul and Turkey according to the results of the “Socioeconomic Development Ranking of the Districts Research – SEGE 2017” conducted by the Ministry of Industry and Technology can be seen in the table below. The respective rankings and levels of the districts were determined by the District SEGE 2017 study that was conducted based on 32 variables on 7 dimensions of demography, employment, education, health, competitiveness, finance and quality of life. Avcılar district was placed on the second development level group along with 176 other districts that have an index value between 1.74 and 0.52. Its ranking are 78th among the 970 districts in total and 30th in the 39 districts of İstanbul.

Table 6: Avcılar 2017 Socioeconomic Development Index Results

Year	TR ranking	İstanbul city ranking	Score	Level
2017	78	30	1.451	2

A Socioeconomic Development Index that covers neighborhoods has been created within the Mahallem İstanbul project supported by the İstanbul Development Agency based on similar data dated 2016. The scores out of 100 can be seen in the graphic below.

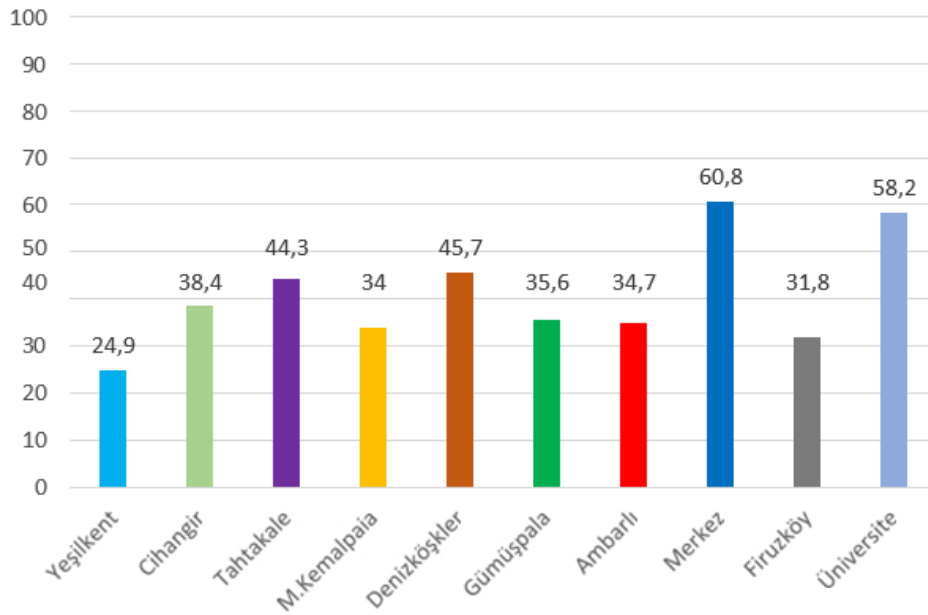


Figure 5: Social Development Index of the Neighborhoods - mahallem İstanbul, 2016, 2016⁸

⁷ <https://www.istanbul.net.tr/istanbul-rehberi/dosyalar/bolumler/avcilar/7/61>

⁸ Mahallelerin Sosyo Gelişmişlik Endeksi, mahallem İstanbul, 2016.

1.5.3 Education

There are many educational institutions in the district. İstanbul University – Cerrahpaşa Avcılar Campus is a highly important one of them. Engineering, Veterinary, and Sports Sciences Faculties as well as Technical Sciences Vocational School.^[4] İstanbul Gelişim University is also in the district. According to the data received from the İstanbul Statistics Office, 59% of the population is at an educational stage below high-school, 24% is on high-school level and 17% is on university or a higher level.

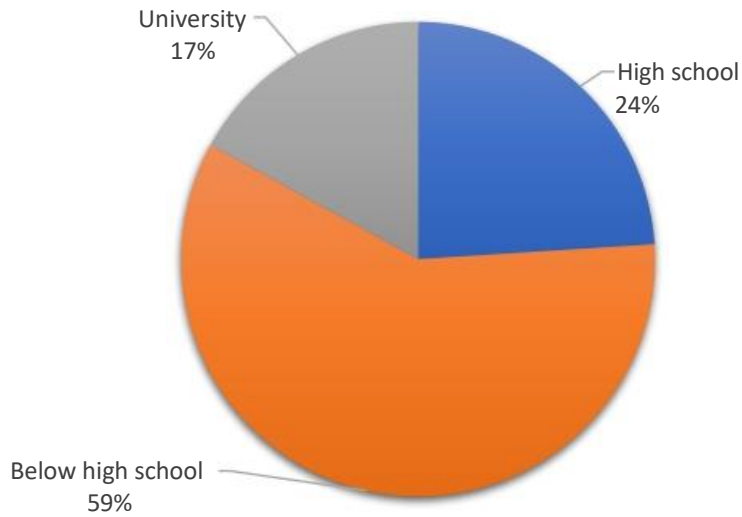


Figure 6: Avclar District Education Status, 2019

2.Methodology

2.1. SECAP Methodology Overview

Avcılar Sustainable Energy and Climate Action Plan employs the methods and standards adopted by the Covenant of Mayors. The figure below shows the steps taken in the preparation process of the Sustainable Energy and Climate Action Plan.



*Sera gazı envanterinin hazırlanması = Taking **greenhouse gas inventory**

Veri toplama = Data collection

Azaltım projeksiyonu kent vizyonu ve hedeflerine göre **azaltım eylemlerinin** oluşturulması = identifying **reduction actions** according to reduction projection, city vision and targets

Katılımcı karar verme = Participatory decision-making

Risk ve etkilenebilirlik değerlendirmesinin yapılması = Making **risk and affectedness assessment**

İklim değişikliğine uyum eylemlerinin oluşturulması = identifying climate change **adaptation actions**

Kısa/orta ve uzun vadeli eylemlerin uygulanması = **Implementation** of short, medium and long-term **actions**

monitoring and reporting

SEİEP süreci adımları= SECAP process steps

Figure 7: Steps of SECAP process*

- Preparation of the Greenhouse Gas Inventory:** Collecting greenhouse gas resources consumption data of Avcılar and identifying the sources with the most greenhouse gas emissions
- Creating the Greenhouse Gas Reduction Actions:** Creating actions on buildings, energy, transportation, wastes and wastewater to be included in the greenhouse gas emission reduction part of the Avcılar Climate Action Plan
- Risk and Affectedness Assessment:** Exposure and probability assessment of extreme weather conditions and flood risk on critical infrastructure and built environment, transportation, biodiversity, waste management, water resources, public health, industry, and disaster management areas of effect according to various parameters as well as risk level identification (low, medium or high) through 5-response Likert scale grading (the table arranged for Avcılar for risk and affectedness assessment can be found in the Attachment C.)
- Creating the Climate Change Adaptation Actions:** Identification of climate adaptation actions specific to Avcılar according to the risk and affectedness results related to the climate change. Some basic issues to be taken into account regarding the actions are listed below:
 - Actions must be compatible with the national climate regulations
 - Actions must be compatible with the relative municipality's Strategic Plan
 - Actions must target the high risk and affectedness issues specific to the locality
- Implementation of the Actions:** Realizing the actions in the Sustainable Energy and Climate Action Plan
- Monitoring and Reporting:** Monitoring and reporting the changes in the greenhouse gas sources and energy consumption starting from the determined base year

2.2. Greenhouse Gas Reduction

2.2.1. Followed Processes

The Covenant of Mayors initiative allows the municipalities that are starting this process to develop a reduction plan that fits their specific local conditions. It also allows the municipalities that have already created their energy and climate actions to develop a reduction action plan without making significant changes.

Taking this principle into consideration, a multi-option methodology based on the current standards and methods or one that is adapted from them has been developed within the covenant. Different options, some of which depend on each other, are related to the issues of base year choice, emission inventory approach, included greenhouse gases, emissions factors and the description of reduction targets.

Base Year

The base year is the reference year for the emissions reduction target comparisons to be made for monitoring the results of the advised activities. When determining this year, it is desired to chose a year when the data are most credible and the extraordinary incidents (pandemic etc.) are the fewest. Accordingly, this year has been chosen as 2019 for Avçılar.

Scope

The sectors chosen in the Avçılar Municipality borders are buildings, energy, transportation, wastes and wastewater; and the related greenhouse gas calculations have been made. Avçılar Municipality has no authority over the industry sector which can be defined as mostly private. For this reason, industrial greenhouse gases has not been taken into the scope of the reduction targets.

Method

The direct and indirect greenhouse gas emissions of each energy carrier has been calculated by multiplying energy consumption with the corresponding emission factor. In addition CH₄ and N₂O emissions caused by wastes, wastewater, and agriculture and husbandry have been calculated and converted to CO₂.

Activity-based approach has been used for taking the Current Situation Emission Inventory which is the one most commonly used by cities. All CO₂e (or greenhouse gases) emissions in Avçılar caused by direct (by burning fuels) and indirect (by using electricity) electricity consumption is included in this approach. While most of the greenhouse gas emissions are CO₂ emissions, CH₄ and N₂O emissions have secondary importance with respect to their burning processes in the buildings and transportation sector. All CO₂, CH₄ and N₂O emissions along with their global warming potentials (GWP) are calculated for all fuel types using IPCC emissions factors in the Fifth Assessment Report (AR5). One other reason why emissions other than CO₂ are included is that Avçılar calculates the emissions caused by wastes (CH₄), wastewater (CH₄, N₂O), enteric fermentation of livestock (CH₄) and chemical fertilizers used in agriculture (N₂O).

IPCC, STAGE-1 and STAGE-2 methodologies have been employed in the calculation of greenhouse gases within the determined borders of Avçılar Municipality. Accordingly, the formulas and variables below have been used in the calculations of the Scope-1, Scope-2 and Scope-3 greenhouse gas sources by their types:

$$\text{Emissions GHG, fuel} = \text{CO}_2 \text{ emission, fuel} + \text{CH}_4 \text{ emission, fuel} + \text{N}_2\text{O emission, fuel} + \dots$$
$$\text{CO}_2 \text{ emission, fuel} = \text{Fuel consumption} \times \text{Emission Factor CO}_2, \text{ fuel}$$

2.2.2. Assumptions Made

Population increase rate, buildings and service sectors growth rate, energy consumption trends in the last 10 years, and regulative changes that affect Avçılar Municipality's area of authority have been taken into account when the assumptions related to greenhouse gas emission for the target year 2030 have been being made. The assumptions made about the greenhouse gas development in the city, on the condition that current sector-based situation continues, can be found below. The assumptions related to reductions are stated in the content of each activity.

a) Population projection

When the population increase from 2007 to today is examined, it is seen that the highest increase happened in 2011 with 5% but the increase rates in the last 5 years were below 2%. In 2018 the population decreased. TÜİK city estimations until 2025 were taken into account while making the population projection. Considering all of these parameters, an average of 1.4% yearly population increase rate have been estimated. At this rate, Avclar is thought to have a population of 525,902 in 2030.

b) Buildings

Assumptions on the greenhouse gas emissions related to the buildings were made based on the building typologies listed below:

- i. Households: Energy consumption is thought to be directly proportional to the population increase rate and the increase rate was taken as 1.4%. To set an increase rate for the energy consumption by taking previous years into account causes an inaccurate evaluation because it is fundamentally affected by the factors like infrastructure changes and natural gas penetration increase rate. For this reason, the energy consumption increase rate is taken as the same as population increase rate. In order to detail the reduction calculations, a breakdown has been determined with certain assumptions based on electricity consumption in households across Turkey. The electricity consumption in households is assumed to consist of 40% lighting, 20% heating, 10% cooling and 30% other electric devices.
- ii. Non-residential buildings: Increases in the energy consumption have been determined by taking the trends of the last 5 years and the development state of the service sector. The assumptions are as follows:
 1. Natural Gas: No increase in the natural gas consumption is estimated for the districts with approximately 97% penetration ratio.
 2. LPG: 1% according to the increase rate in the last 4 years
 3. Liquid fuel: 1% according to the increase rate in the last 4 years
 4. Electricity: 1% according to the increase rate in the last 4 years
- iii. Municipal Buildings: Considering the increase in the number and size of the service points and the stable course to be followed after the transition to new service points, the assumptions made related to the energy consumption of the buildings are as follows:
 1. Natural gas: 2% yearly increase rate
 2. Electricity: 2% yearly increase rate

c) Transportation

For the transportation sector, the current situation and the number of vehicles belonging to the municipality, and the state of the private vehicles in the city have been examined separately. While the number of the vehicles in the city is estimated to increase at the same rate as the population, the reduction in the fuel consumption of the vehicles thanks to the developing technologies is also taken into consideration. Transportation sector fuel consumption and greenhouse gas emission increase rates are as follows:

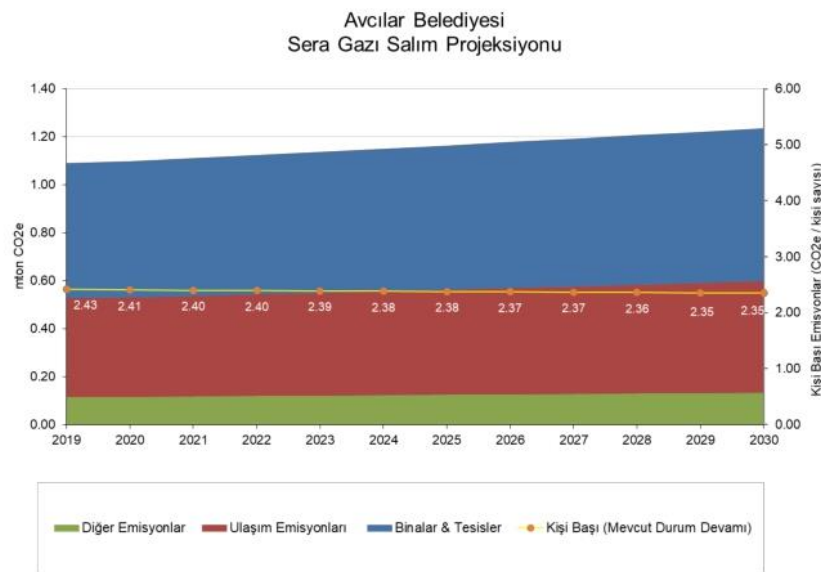
- i. Municipal vehicle fleet:
 1. Diesel: 1% yearly increase rate
 2. Gasoline: 0% yearly increase rate
- ii. Private vehicles
 3. Diesel private vehicles: %1
 4. Gasoline private vehicles: %1
 5. LPG: %1

d) Wastes and wastewater

A Emissions caused by wastes and wastewater are linked with the 1.4% population increase rate because they are directly tied to citizen activities. Emissions related to the agriculture and husbandry are estimated as 1% considering the change in the animal presence in the city.

Greenhouse Gas Reduction Projection

As a result of the assumptions above, Avcılar district 2030 greenhouse gas emissions (without industry) has been calculated as 1.234.995 tCO₂e from the base year 2019 and the total energy consumption is thought to be 3.943.437 MWh. The amount of emission per person, which is 2,43 tCO₂e in 2019 is thought to be 2,35 in 2030 (figure 8). It can be said that the main reasons behind the reduction in the emission level in the case that current practices in the city continue are achieving reduction in some sectors thanks to the developing technology and the population increase rate being higher than the emission increase rate. Greenhouse gas emissions increased in accordance with the increase estimates for 2020 and later, however, because the population increase rate is higher than the emissions increase rate, the emission amount per person becomes lower.



Kişi başı emisyonlar (CO₂e/kişi sayısı) = Emissions per person (CO₂e/number of persons)

Diğer Emisyonlar = Other Emissions

Ulaşım Emisyonları = Transportation Emissions

Binalar & Tesisler = Buildings & Facilities

Kişi Başı (Mevcut Durum Devamı) = Per Person (Business As Usual)

Figure 8: Avcılar greenhouse gas emission projection*

2.3. Adaptation to Climate Change

2.3.1. The CoM Process

The Covenant of Mayors (CoM) is one of the most serious agreements that bring together thousands of volunteering local governments that will implement climate and energy plans to create resilience against the climate change. Signatory cities of the Covenant of Mayors commit to follow the directives and methodologies created for designing and implementing policies and measures necessary for determining the targets for reducing the CO₂ emissions and reaching these targets.

In this context, informing and guiding processes determined for developing resilience in a city against the climate change and for the managing stages of this process are defined under the CoM methodology. The "Urban Adaptation Support Tool" developed for this methodology helps support the cities, towns and other local authorities develop, implement and monitor their own climate change adaptation plans. 6 stages are pointed out to conduct the adaptation process with this tool.

9 <https://climate-adapt.eea.europa.eu/knowledge/tools/urban-ast/step-0-0>



- 1) Preparing the Ground for Adaptation
- 2) Assessing Climate Change Risks and Vulnerabilities
- 3) Identifying Adaptation Options
- 4) Assessing and Selecting Adaptation Options
- 5) Implementing Adaptation
- 6) Monitoring and Evaluating Adaptation

Figure 9: The CoM urban adaptation tool stages^{10*}

The first stage within the scope of Avcılar’s climate change reduction and adaptation study involves the identification of the current situation. The situations identified within this study allowed the categorization of risks and vulnerabilities the city is exposed to. At the stage of risk and affectability evaluation, the effects of current and predicted risks on the local government are examined. The aim of this is to reveal the adaptation targets that will enable the minimization of these effects. The next stage is to classify the adaptation actions by their importance with respect to the targets. These actions are thought to give results that will directly affect the climate risks positively and create a network of knowledge and experience. The next stage after the first three steps is sharing the obtained data related to the current risk and affectability situation and the adaptation actions with the actors and opening them for discussion within a series of workshops and meetings. As a result of the consultations, adaptation actions in line with the local context and effective against the vulnerabilities, contributing to the resilience of the city, have been determined. Avcılar Municipality will try to reach the CoM targets it has committed to by implementing local governmental actions in line with these steps taken at the first stage of the SECAP’s scope. At the last stage, the effectiveness of the city’s adaptation process will be monitored through certain methods and the outcomes of the reduction and adaptation strategies will be followed.

2.3.2. Scope and Content

Climate adaptation activities have been determined by taking the climatic dangers the settlement faced. In this context, the scope of the adaptation activities consist of actions towards fighting against flood and landslide due to excessive precipitation, hail, storms, sea level rise and drought. Sectoral risks against climatic dangers, affectible groups and areas, and the adaptation scorecard of the local government within the scope of climate adaptation activities have been evaluated under the topic of climate adaptation studies. These evaluations have been made in a manner that can be integrated to the CoM methodology and support the reporting processes within its scope.

¹⁰ <https://climate-adapt.eea.europa.eu/knowledge/tools/urban-ast/step-0-0>

Table 7: The scope of climate adaptation endeavors

Scope Element	Approach	
Climate Dangers	<p>Dangers identified in the CoM this study refers to are as follows:</p> <ul style="list-style-type: none"> · Excessive heat · Excessive cold · Excessive precipitation <p>Flood (stream / urban)</p>	<ul style="list-style-type: none"> · Drought · Storms (strong wind) · Landslide · Sea level rise
Base sectors	<p>The sectors dealt with in this study are as follows:</p> <ul style="list-style-type: none"> · Critical Infrastructure and Built Environment · Transportation · Biodiversity · Waste Management 	<ul style="list-style-type: none"> · Water Resources · Public Health · Industry · Waste Management
Implemented Risk Assessment Framework	<p>The assessment framework that has been chosen for the Risk and Affectedness Assessment is in line with the Covenant of Mayors¹¹ and the SECAP methodology and reporting template.(CoM). The assessment framework allows the identification of the risk level, considering the exposure to climate dangers and their likelihood.</p>	
Description of Affectedness	<p>This includes the description of social groups that are exposed to climate dangers, environmental features and physical infrastructure. Sociodemographic data and information related to urban and environmental structures have been gathered and evaluated for the aforementioned descriptions to be made.</p>	
Adaptation Scorecard	<p>Adaptation scorecard involves the strategies developed and studies made by the local government towards climate adaptation, its efforts in the assessment process of risks and affectedness caused by the climate change, and the situation assessment of processes for determining and implementing adaptation activities, and monitoring their results. Aforementioned assessment has been made in line with the CoM methodology of SECAP.</p>	

2.3.3. Identification of Climatic Dangers

Although some descriptions of climate change risks include all regions and localities, it is of utmost importance that they are also described by the geographical locations, and anthropogenic and economic features of regions. For this reason, the projected climatic situation of a region, geographical location contexts (whether a region is coastal or mountainous), the situation of sectors and urban services (transportation, energy, water, social welfare, infrastructure, etc.) that may be affected by the climate change, and the affected groups living in a region must be defined according to the context of local features.

¹¹ The Covenant of Mayors put into effect by the European Commission in 2008, Global Climate and Energy Covenant of Mayors.

The risk and affectibility assessment must be conducted by taking climatic disasters, vulnerable sectors, adaptation capacity and affectible social groups into consideration according to the Covenant of Mayors. The risk assessment must create prioritized affectible focus areas according to climate conditions and affectible assets. The affectibility assessment on the other hand focuses more on the subjects of adaptation capacity, sectors that may be exposed to the occurrence, sensitive groups and population.

The steps below have been taken specifically for the risk and affectibility identification of Avçılar based on the CoM methodology¹²:

- Defining previous and current climate effects
- Analyzing climate projections and their future effects
- Identifying affectible urban sectors
- Conducting risk and affectibility assessments
- Involving İstanbul scale in the process
- Identifying important adaptation risks and setting targets
- Determining climate change risk and affectibilities

2.3.4. Collection of Climatic Indicators

Because there is no database to access climatic data within the borders of Avçılar Municipality, data collecting process has been carried out by using internet resources and researching various reporting documents. In addition, it has become inevitable to use certain climate data on the provincial level based on İstanbul borders because of the limit availability of the climate data related to districts.

Observed Weather Conditions and Forecasted Climate Changes

Because there is no weather condition projections and forecasted climate change scenarios data set covering the area within the borders of the Avçılar district, “İstanbul Climate Change Action Plan, Final Report 2018” and “Turkish State Meteorological Service” open source platform have been used to obtain relevant information.

Previous Climatic Disasters

Analyzing previous extreme weather conditions and their results is an important step to demonstrate the effects of the climate change and manage the adaptation process. Reports open to public access, media resources, documents related to İstanbul and other online resources have been utilized to examine the disasters within this scope.

Adaptation Indicator Data

Adaptation indicator data are important both for identifying the current situation and planning the future in a right way. For this reason, a methodology for the adaptation indicators has been created in line with the Covenant of Mayors. According to this methodology, categories of adaptation process for the climate change have been defined and indicator groups belonging to each category have been determined. One of the necessary steps of the adaptation process is recording the values of these indicators currently and following them by measuring them at certain intervals. For this purpose, it is necessary to receive information from relevant organizations to gather the data related to the indicators.

¹² <https://climate-adapt.eea.europa.eu/knowledge/tools/urban-ast/step-2-0>

Adaptation indicators have been created by analyzing the current situation and assessing adaptation capacity as a result of the adaptation activities and risks. Data collection and monitoring processes related to the aforementioned indicators must be carried out within the implementation process of the SECAP. The information related to the monitoring process are detailed in the Section 5.2.

Current and Future Risk

Negative effects of the climate change on sustainable urbanization and sustainable societies are assessed with respect to climate dangers and the sectors affectable by these dangers. Climatic dangers such as heat waves and cold air waves, excessive precipitation, drought, strong winds, floods, landslides, and sea level rise as well as critical infrastructure and buildings, transportation, biodiversity, waste management, water resources, public health, industry, and disaster management sectors have been included in the scope of the assessment of risks imposed by climatic dangers on sectors and communities.

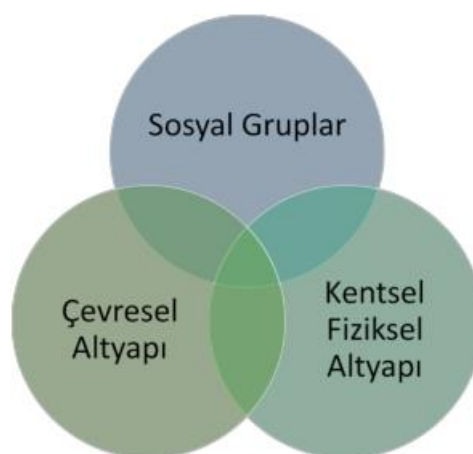
Assessment methodology has been created by taking the opinions of expert municipal officers into consideration as a priority and given its final form in the stakeholder workshop on adaptation. Experts from relevant public institutions, researchers from universities and members of CSOs such as TEMA participated in the workshop. The possibility of and exposure to a specific risk is marked on a five-level Likert scale in the risk assessment methodology.

$$\text{Risk} = \text{Exposure} \times \text{Possibility}$$

The level of risks (either low, medium or high) have been determined according to the results of calculations based on the formula given above. Detailed information about the assessment method used for risk calculation is given in the ATTACHMENT C.

Affectibility Definition

Affectibility by the climatic disasters caused by the effects of the climate change is examined under the three categories of environmental, socioeconomic and physical. Environmental affectibility includes the evaluations as to biodiversity and the water presence of a settlement. The dangers faced with respect to the sustainability of the assets linked to the ecosystem services in the whole of İstanbul metropolitan area have been defined. Definition of the social groups with low socioeconomic indexes in the settlement, and the number of elderly, women, children, and migrants with respect to the demographic structure of the settlement have been taken into consideration for the definition of socioeconomically affectible groups.



* Sosyal Gruplar = Social Groups
Çevresel Altyapı = Environmental Infrastructure
Kentsel Fiziksel Altyapı = Urban Physical Infrastructure

Figure 10: Areas of climate change affectibility examination*

For the definition of the areas that stand out with respect to the affectibility of the physical infrastructure, the areas in the settlement that are regarded risky and the areas where the urban population concentrated have been the main points of focus. Affectible groups and areas have been defined within the stakeholder adaptation workshop in which a multi-stakeholder, participatory process has been conducted.

Adaptation Scorecard

The adaptation scorecard which is a type of self-assessment of climate adaptation works of local governments shows the level of preparedness to creating strategies, and identifying, implementing and monitoring steps of climate adaptation activities for adapting to the climate change. The scale used for studies where the progress of activities conducted under the aforementioned steps is given below:

Table 8: Status indicator level

Status Scale	Status	Progress Level as Indicator
D	Not started, starting	0-25 %
C	Progress made	25-50 %
B	Moved ahead	50-75 %
A	Reached the level to lead	75-100 %

The results of the assessment of the current situation with respect to Avclar Municipality's realization of climate adaptation activities are detailed under Article 4.5.

2.4. Identification of Actions

2.4.1. Identification of Greenhouse Gas Reduction and Climate Adaptation Actions

Activities including greenhouse gas reduction and climate adaptation measures planned to be implemented under SECAP have been identified through a series of studies.

First, some environmental, social, economic, and institutional criteria were determined for the identification of SECAP reduction activities. A pool of criteria was formed and the criteria that best matched the Avclar Municipality's strategies were picked from this pool. 12 criteria out of a total 23 in the pool were picked. These 12 criteria shown in the Figure 11 were taken into consideration for the prioritization of reduction and adaptation activities within a study of Multi-criteria Assessment. A 4-level Likert scale was used for the Multi-criteria Assessment and each criterion was assessed.

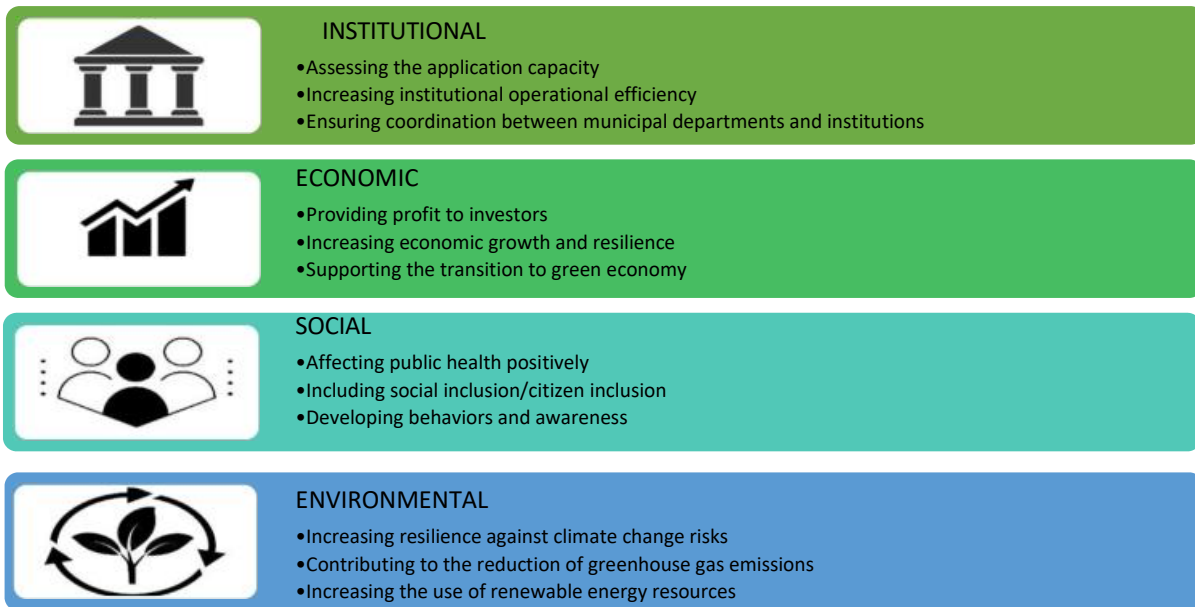


Figure 11: Criteria used in multi-criteria assessment analysis

A prioritization study was conducted by taking aforementioned criteria into consideration for all activity suggestions made by work groups¹³ of participants in the workshops held to identify the activities through a participatory process. How each activity is dealt with according to the criteria is given in the table below:

Table 9: The assessment scopes of the criteria used in activity prioritization

Category	Criterion	Assessment Content of the Criterion
Environmental	Increasing resilience against climate change risks	Activity increases the urban resilience ¹⁴ of the Avclar Municipality against the risks of climate change
	Contributing to the reduction of greenhouse gas emissions	Implementing the precautions for reducing the greenhouse gas emission rates in relevant sectors (buildings, transport, wastes)
	Increasing the use of renewable energy resources	Utilizing various renewable energy resources such as solar power, wind power etc.
Social	Effects on public health	Activity reduces the public health problems by improving a) water quality, b) air quality and c) resilience against climate dangers
	Inclusion of community/citizen participation	Activity includes the participation of the community/citizens
	Develop behaviors and awareness	Activity affects behaviors and increases citizen awareness
Economic	Providing economic benefits for the investors	Financial benefits gained by the investing person/organization
	Economic Growth & Resilience	Activity a) contributes to GDP, b) provides employment and/or c) increases economic resilience against the effects of climate change

¹³ While greenhouse gas emission reduction activities were identified in the Reduction Workshop on 26.10.2021, the climate adaptation activities were finalized in the Adaptation Workshop on 9.12.2020. Workshops were attended by experts and various stakeholders from relevant institutions and organizations.

¹⁴Urban Resilience is the capacity of the socioecologic structure to adapt to external effects, shocks and changes.

	Supporting the transition to a green economy	Activity helps a) reduce the carbon emissions and pollution, b) increase energy and resource efficiency and/or c) prevent loss of biologic diversity and ecosystem services.
Institutional	Evaluating implementation capacity	Provides information about the municipality's capacity to implement this action.
	Increasing institutional operational efficiency	Activity: a) increases the capacity of the municipalities, b) promotes coordination between departments and/or c) improves the performance of the personnel through increased skill.
	Ensuring coordination between municipal departments and partners	Activity promotes inclusion through stakeholder participation.

Reduction and climate adaptation activities to be included in the plan within the scope of the workshop are included in the upcoming chapters of the report along with sectoral breakdowns. The tables below show the high priority activities for sustainable energy and climate adaptation as well as the results of their applicability assessments.

Table 10: Assessment of the applicability of the high priority reduction activities according to workshop conclusions

● Low, ●● Medium, ●●● High

Buildings and Energy		
Activity	Priority Level	Applicability Level
Revising and updating the plans, regulations and guides related to zoning plan operations of the municipality and policies on the local level in accordance with the sustainability principles	●●●	●●●
Raising awareness among the citizens about energy efficient urban renewal and energy efficiency in industry	●●●	●●●
Heat insulation and energy transformation in existing residences	●●●	●●●
Use of energy efficient lighting systems in existing residences (LED lighting with cost saving)	●●●	●●●
Energy efficient renewals in existing tertiary buildings (heat insulation)	●●●	●●●
Energy efficient lighting in existing tertiary buildings	●●●	●●●
Use of efficient waterworks in new structures	●●●	●●●
Energy efficient urban renewal in residences	●●●	●●●
Renewal of residences with sustainable and low-emission technologies	●●●	●●●
Energy efficient and intelligent street lighting system	●●●	●●●
Developing medium- and long-term energy transformation strategies with infrastructure institutions	●●●	●●●
Heat pump usage	●●●	●●
Sanction options in energy efficient urban renewal and industry	●●●	●●
Creating sustainable design standards for new settlement areas	●●●	●●
25% energy efficiency in industry	●●●	●●
Renewable energy implementations in municipal buildings	●●●	●●
Substituting coal with low-carbon resources in residences	●●●	●
Transportation		
Activity	Priority Level	Applicability Level
Intelligent park applications	●●●	●●●

Conducting pedestrianization operations for increasing pedestrian transportation	●●●	●●●
Developing bicycle infrastructures, increasing their share in transportation through connection with E-5	●●●	●●●
“Park and continue” applications for reducing traffic	●●●	●●●
Using low-carbon options for municipal fleet and service vehicles	●●●	●●●
Developing and promoting applications for shared vehicle use	●●●	●●
Improving public transportation (network, infrastructure etc.)	●●●	●●
Optimization with intelligent signalization systems (for example, control center, traffic optimization arrangements with low investments etc.)	●●●	●●
Wastes and Wastewater		
Activity	Priority Level	Applicability Level
Making the separate collection of most important recyclable materials obligatory	●●●	●●●
Researching the potential of waste collection service in the food sector (restaurants, hotels etc.)	●●●	●●●
Encouraging local businesses to reduce the use of disposable plastic materials, banning them in the municipality	●●●	●●
Developing a financial rewarding system for waste sorting in Yeşilkent and Tahtakale neighborhoods	●●●	●●
Utilizing solar energy for waste management	●●●	●●
Promoting joint and at-home compost production (in parallel with public lands for sustainable food production)	●●●	●●

Table 11: Assessment of the applicability of the high priority climate adaptation activities according to workshop conclusions

● Low, ●● Medium ●●● High

Urban Heat Island (UHI) Effect and Green Space Management		
Activity	Priority Level	Applicability Level
Developing green infrastructure strategies according to future scenarios created within the framework of climate change adaptation	●●●	●●●
Creating green rings in neighborhoods to increase accessibility and connectivity of green spaces (e.g. designing bicycle roads and passive and active green spaces integrally)	●●●	●●●
Creating social projects/campaigns that promote civil society participation in the maintenance and innovation of green spaces	●●●	●●●
Taking tree inventory that includes assessments related to their effects on noise and air quality	●●●	●●●
Creating and commonizing PARKLETs – (certain areas have been identified, applications are in progress)	●●●	●●●
Afforestation of river bed surroundings, integration of green and blue infrastructure	●●●	●●
Water Management		
Activity	Priority Level	Applicability Level

Rainwater management storage system implementations: building level, underground, connected with green spaces	●●●	●●●
Organizing awareness-raising activities about drinking water and sea water management for businesses, industries and general public	●●●	●●●
Providing households with products for less water consumption (faucet caps) and making it obligatory with regulations	●●●	●●●
Raising awareness about reducing water and energy consumption	●●●	●●●
Reducing impermeable surfaces (e.g. Permavoid – hold, store and reuse water)	●●●	●●
Disaster Management		
Activity	Priority Level	Applicability Level
Identifying affectability by weather events such as excessive temperature, excessive precipitation, storms and hurricanes and developing a disaster management plan	●●●	●●●
Developing a “UHI Emergency Action Plan”, taking urban heat isle risk maps, identified infrastructure needs and affected groups into consideration	●●●	●●●
Identifying flood risks on all plan stage scales and drawing flood risk maps, (e.g. flood walls, ditch, diversion canal, detention dam etc.)	●●●	●●●
Identifying areas at landslide risk due to excessive precipitation and storm, identifying preventive and recovery measures for these areas	●●●	●●●
Creating concrete action plans for sudden climatic phenomena	●●●	●●●
Creating a Climate Adaptation Indicator Table (Green Indicator Table) that allows an efficient monitoring process and data sharing with decision makers, researchers and citizens	●●●	●●●
Developing monitoring methods and tools	●●●	●●●
Creating an efficient consultation committee with the city council and CSOs, ensuring integration and preparing guides in which the municipality is positioned as facilitator	●●●	●●●
Developing a shading strategy for green spaces	●●●	●●●
Identifying the extent of affectability of the urban infrastructure and building stock by hurricanes, storms and excessive precipitation	●●●	●●
Creating warning systems for cold and hot air waves	●●●	●●

After the multi-stakeholder workshop, reduction and climate adaptation activity list were created and submitted to the Avclar Municipality for approval, determining final reduction and adaptation activities within the scope of sustainable energy and climate adaptation. The full list including other activities prioritized by at the workshop is given in the Appendix B.

2.5. Avclar District Stakeholder Participation

Ensuring stakeholder participation is an essential element of the creation of the Sustainable Energy and Climate Action Plan. Two workshops, one about greenhouse gas reduction on 26 October 2020 and one about climate change adaptation on 9 December 2019, were held in the Avclar district during the preparation process of the action plan with the purpose of identifying the priority areas in the fight against the climate change and accessing the information specific to the locality. Sustainable Energy and Climate Action Plan preparation process was conducted through workshops with participants from the development agency, provincial directorates and professional chambers as well as representatives from district municipalities and the Metropolitan Municipality.

The workshops were organized with the relevant departments of the municipality along with external stakeholders to support the transition to the sustainable energy, and understand how greenhouse gas emissions can be reduced, how adaptation to the climate change can be achieved on a local level, and what data can be utilized in the process of monitoring the adaptation indicators. The workshops where inventory findings were shared and reduction measures were discussed were held online on “Microsoft Teams” due to the Covid-19 pandemic. Greenhouse gas emission workshop had 26 participants and the climate adaptation workshop had 18 participants reaching to a total of 44 participants from mentioned institutions and organizations. It was underlined that participation of all the stakeholders matter and the activities and priorities in the action plan were created through evaluation of suggestions from all the stakeholders specializing in different areas of expertise.

3.Greenhouse Gas Reduction

3.1. Greenhouse Gas Emission Inventory

Current situation emission inventory was taken based on the Avcılar Municipality data of the year 2019. The inventory taken for the year 2019 includes the buildings, transportation, wastes and waste management, agriculture, forestation and husbandry sectors.

During the preparation process of the Sustainable Energy and Climate Action Plan, short- and long-term strategic plans of the Avcılar Municipality and the opinions of academicians, İstanbul Planning Agency, industrial and commercial chambers, public institutions, provincial directorates and professional organizations were taken into consideration.

2019 current situation greenhouse gas emission inventory calculated for the SECAP is given in the Table 12 below.

Table 12: Avcılar greenhouse gas emission amounts, 2019

Sector	MWh	tCO ₂ e	%
Total (Avcılar Greenhouse Gas Inventory)	4.075.278	1.323.183	100
Buildings, Equipment/Site	2.528.635	793.712	60
Municipal Buildings/Sites	7.349	2.968	0,2
Tertiary Buildings/Sites except for the Municipality	550.760	194.457	14,7
Residences	1.363.479	358.265	27,1
Street Lightings	8.117	4.172	0,3
Industry	598.930	233.849	17,7
Transportation	1.546.524	415.533	31,4
Municipal Vehicle Fleet	16.451	4.456	0,3
Public Transportation (Municipal Buses)	112.812	30.572	2,3
City Vehicles	1.417.261	380.505	28,7
Other Emissions	120	113.937	8,6
Solid Waste Disposal		60.868	4,6
Wastewater Purification Facility		51.962	3,9
<i>Wastewater Purification Process CH₄</i>		28.260	2,1
<i>Wastewater Purification Process CO₂</i>		20.375	1,5
<i>Wastewater Purification Process Nit./Denit. N₂O</i>		937	0,1
<i>Wastewater Purification Process Nit./Not Denit.</i>		190	0
<i>Wastewater Purification Process N₂O</i>		2.199	0,2
Illegal Emissions		19	0
Agriculture, Husbandry and Fertilizer Management		1.027	0,1
Agricultural Irrigation	120	61	0

As seen in the table, Avcılar district energy consumption for 2019, including the industry, is calculated as 4.075.278 MWh and the greenhouse gas emission as 1.323.183 tCO₂e. According to the table, buildings' emissions caused by fuel and electric consumption account for 60% of the total emissions. Greenhouse gas emissions caused by transportation account for 31.4%. Greenhouse gas emissions caused by solid wastes and wastewater purification account for 8.5% and the rest amount to 0.1%.

Energy consumption of Avclar district excluding the industry is 3.476.548 MWh and greenhouse gas emissions amount to 1.089.334 tCO₂e. According to the calculations, emissions caused by buildings account for 51.4%, emissions caused by transportation account for 38.1%, emissions caused by solid wastes and wastewater account for 10.4% and emissions caused by other factors including agricultural irrigation and animal presence account for 0.1%.

3.2. Aim

Buildings in Avclar, as stated in detail in the Section 3.1 Greenhouse Gas Emission Inventory of this report have the highest share among all sectors in the inventory (60%). A reduction of 241.104 tCO₂e is targeted until 2030 in buildings sector with the activities detailed in the Section 3.3.2 Contents of Activities.

Transportation sector is the sector that has the second biggest share (31.4%) in the inventory. A reduction of 146.662 tCO₂e is targeted until 2030 in transportation sector with the activities detailed in the Section 3.3.2 Contents of Activities.

Reduction activities are stipulated for the emissions by wastes and wastewater and other sources constituting the 10.5% of the city inventory as seen in the examinations excluding the industry. A reduction of 73.798 tCO₂e is targeted until 2030 in these sectors with the activities detailed in the Section 3.3.2 Contents of Activities.

Considering all of these activities, the effects of the targets mentioned above can be observed on the image below that includes the current situation, BAU scenario and the reduction scenarios.

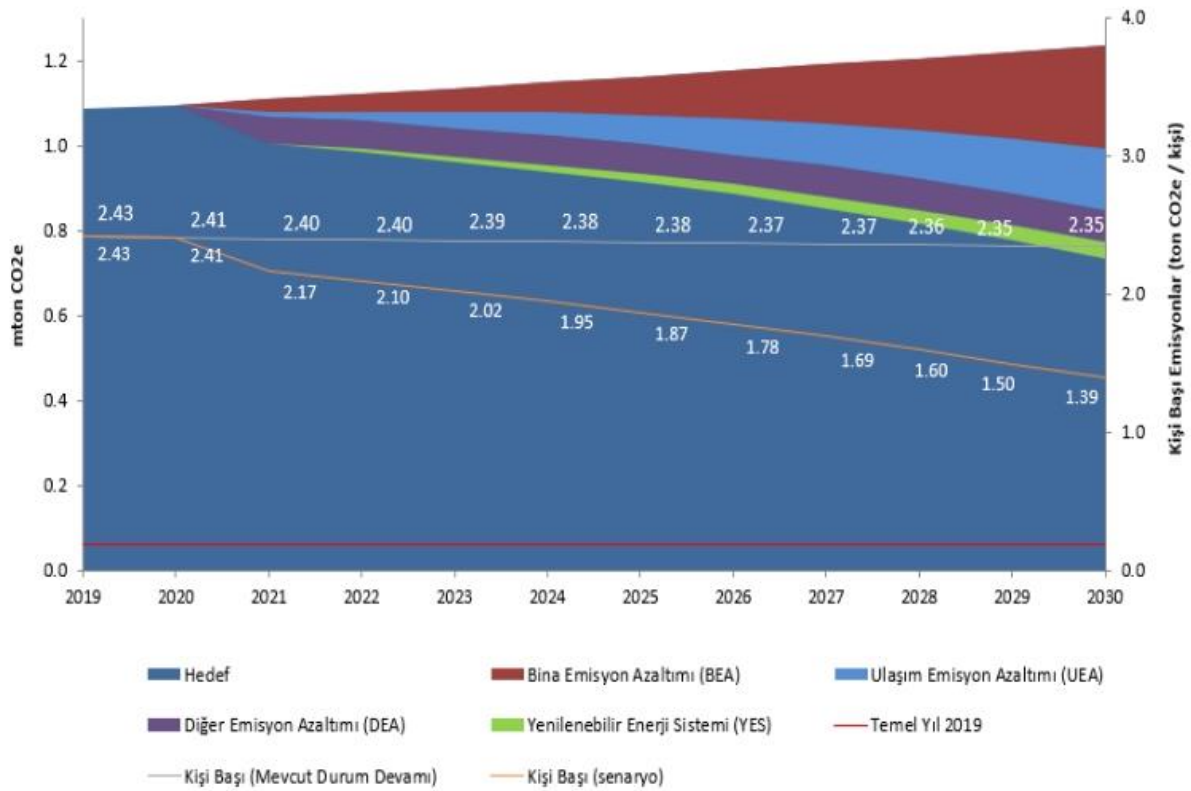


Figure 12: Avclar 2030 greenhouse gas reduction scenario

The table given in the next page summarizes the reduction targets of all sectors mentioned above.

Table 13: Sectoral reduction targets for 2030

	MWh Reduction 2030	CO ₂ e Tons Reduction 2030
Buildings Emission Reduction	694.058	241.104
Renewable Energy Emission Reduction	78.000	40.092
Transportation Emission Reduction	609.435	146.662
Wastes-Wastewater and Other Emissions Reduction	-	73.798
Total Reduction	1.381.493	501.656

3.3. Reduction Activities

In this section, reduction activities are specified by sector in detailed. Each activity is also made compatible with the Avclar Municipality Strategic Plan that covers the targets of the municipality through 2020-2024.

3.3.1. Types of Activities

Activities in the SECAP are separated into the categories given below:

- **Investment projects:** Infrastructure investments to be undertaken by the Avclar Municipality funded either by its own resources or with support from donating organizations.
- **Policy measures:** New regulations or policies introduced with the purpose of ensuring the conducted operations are more environmentally-friendly.
- **Plans and strategies:** Documents that provide a more detailed road map for improving the performance in certain sectors or localities. (for example. Climate Action Plan).
- **Behavioral:** Measures that aim to shift the behavior of a community towards a particularly desired direction (for example, using public transportation more). Although policy measures also have a behavioral component the activities in this category especially focus on behavior change through actions like awareness-raising campaigns.
- **Training:** B Activities that aim to increase capacity through information exchange.
- **Operations and sanctions:** I Measures that aim to improve compliance with the policies and regulations through monitoring and possible penalties.

3.3.2. Contents of Activities

a) Buildings and Energy

Buildings – Current situation

There are many national strategic plans and regulations in the buildings sector including Energy Efficiency Strategy Document (2012-2023) and National Energy Efficiency Action Plan (2017-2023) issued by the Ministry of Environment and Urbanization for the construction sector, Turkish Energy Efficiency Law and EU Regulations on Energy Performance in Buildings. Avclar district sets forth various activities to mitigate the effects of this sector on the global climate change through measures that especially aim to reduce the greenhouse gas emissions and resource consumption. These activities include the buildings that belong to the municipality, non-residential buildings and residential buildings. The third target under the heading of “increasing service quality and providing citizen-oriented services” which is the first purpose in the Avclar Municipality 2020-2024 Strategic Plan is stated as “improving the service quality and efficiency by using the resources effectively and efficiently”. Within this scope, improving the quality of the service buildings is at the forefront. Buildings greenhouse gas emission reduction actions are defined to comply with the Strategic Plan and the national plans.

There are many strategic national plans and regulations with regard to the energy efficiency and the general information related to these are provided in the Section 1.2. The regulations related to the buildings' energy efficiency standards are determined at the national level.

Buildings sector is the most important area for the greenhouse gas emissions reductions and creating effective actions in this sector is essential. However, because the data related to the buildings is limited, it becomes difficult to estimate the scale of improvement that can be achieved. The latest detailed research for all the current buildings has been conducted in 2000. Especially considering the changes that occurred as a result of the urban renewal efforts made by the Ministry as a response to the disastrous Gölcük earthquake in 1999, it can be said that this research is no longer up-to-date (see "The Law Numbered 6306 on Renewing Areas at the Risk of Natural Disasters"). In the last 20 years, a considerable amount of construction (and destruction) operations have been carried out in the cities of Turkey and this process is still ongoing. While on the one hand, this situation creates some opportunities for achieving large-scale energy efficiency especially in the destroyed and restructured areas, on the other, it is of great importance to mitigate the effects of the construction processes considering the related subjects such as circular economy and embodied carbon.

There are a total of 27,581 buildings, 172,538 residences and 24,045 stores in Avcılar district. The number of structures that experienced both of the earthquakes (except for the ones in the Yeşilkent and Tahtakale unplanned zone) is 11,893. The number of prioritized and high-risk buildings is 6,273 and the population at risk is 143,420. 55 thousand households are estimated to be renewed by 2030 in Avcılar, where the average household size is 2.6 person/household. The number of structures that applied for renewal and were renewed in last 9 years is shown below.¹⁵

Table 14: Number of buildings that applied to urban renewal and renewed

Neighborhood	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Cihangir	1	32	43	32	14	16	8	16	20	182
Denizköşkler	0	14	27	29	20	21	8	29	29	177
Mustafa Kemal Paşa	0	28	39	29	19	16	2	10	13	156
Gümüşpala	0	21	32	25	17	11	4	11	21	142
Merkez	0	6	16	15	8	12	17	22	45	141
Ambarlı	0	6	12	17	11	7	3	15	24	95
Üniversite	0	9	16	14	8	2	3	8	4	64
Firuzköy	0	0	7	9	9	3	1	4	2	35
Tahtakale	0	0	0	0	0	0	0	0	1	1
Yeşilkent	0	0	0	0	0	0	0	0	0	0
Total	1	116	192	170	106	88	46	115	159	993

The share of buildings sector in the total inventory of the Avcılar district is 42.3%. Excluding the industry, this share increases to 51.4%. This is the highest share of emission resources in all of the inventory. The breakdown in the buildings sector is shown as 63.99% by residences, 34.73% by commercial buildings and 1.28% by municipal buildings. Because buildings represent such an important share of the total emissions, achieving the reduction target mostly depends on the interventions to be made in this sector. Greenhouse gas emission amounts with breakdowns are shown in the Figure 13.

¹⁵ Avcılar Belediyesi, Avcılar Modeli-Kentsel Yenilenme Projesi, AVBEL Kentsel Yapı ve Tasarım A.Ş., 2020, İstanbul

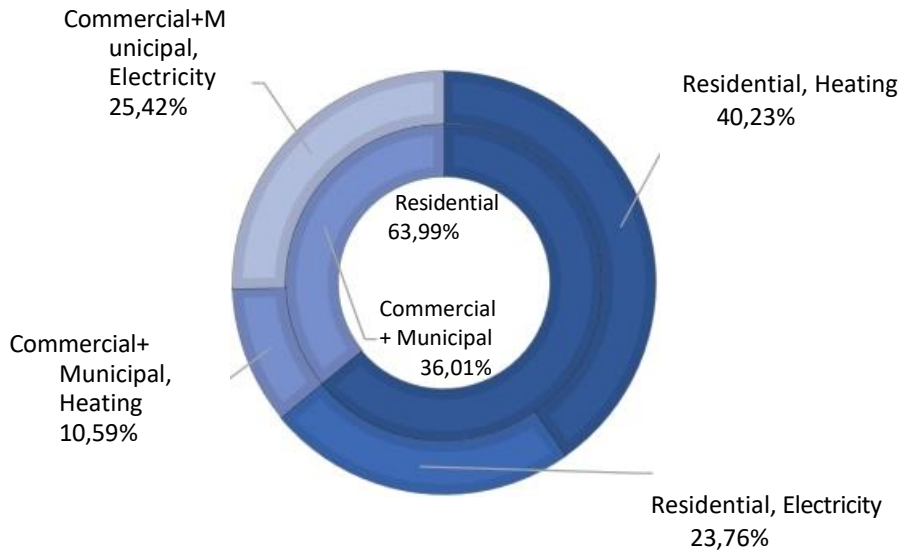


Figure 13: Greenhouse gas emissions breakdown of residential and commercial buildings caused by heating and electricity consumption

The figure given below shows the breakdown of residences' emissions through energy consumption by source type.

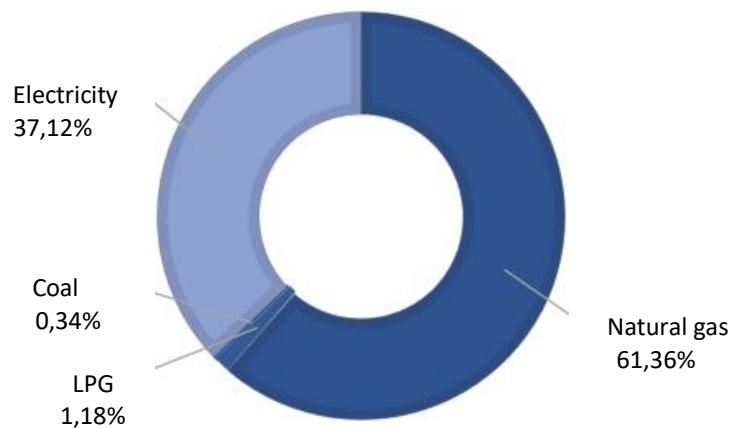


Figure 14: Greenhouse gas emissions breakdown of residences by type of fuel

Energy – Current Situation

According to the 11th Development Plan (2019-2023), the share of renewable sources in electricity production is targeted to be increased to 38.8% by 2023 and the avoided CO₂ emission amount is targeted to cumulatively reach to 18 million tons from 2018 to 2023 thanks to the newly founded renewable power plants.¹⁶ Increasing the share installed electricity power based on national and renewable resources in the total installed energy from 59% to 65% is stated as the first target in the 2019-2023 Strategic Plan of the Ministry of Energy and Natural Resources. Within this scope, reaching to a nation-wide total of 56,804 MW power based on renewable energy resources (10,000 MW by solar energy, 11,883 MW by wind energy, 32,037 MW by hydroelectricity, 2,884 MW by geothermal and biomass)

¹⁶ https://www.sbb.gov.tr/wp-content/uploads/2019/11/ON_BIRINCI_KALKINMA-PLANI_2019-2023.pdf

is targeted for 2023.¹⁷ According to the Turkey Climate Change Strategy 2010-2023, the share of renewable energy in the total electricity productions planned to be increased to 30% by 2023. In this context, our technical and economic hydraulic potential will be fully realized and electricity production capacity will increase to 20.000 MW in wind and 600 MW in geothermal. Electricity production through solar energy will be promoted.¹⁸

Increasing investments, applications and capacities in the energy sector in the short and medium term in Avcılar district is in accordance with the current plans and reports. Especially electricity production through solar energy as a renewable energy resource contributes to reaching the targets identified in this area.

After evaluating the renewable energy potential in Avcılar It can be seen that solar energy is prominent in Avcılar due to its potential as a renewable energy resource. Solar energy potential atlas below shows that although Avcılar is at a disadvantage regarding its insolation times and solar irradiance level compared to the average country-wide values, it has a potential for production through suitable project designs and area choices for solar energy investments.¹⁹



Figure 15: İstanbul solar radiation map

Total solar radiation data shows that although Avcılar has a 1400-1450 kWh/m²-year value which is lower than the 1527 kWh/m²-year Turkey average, it still has an important potential.²⁰ While Germany has a much lower solar radiation value than Avcılar (47.517 GWh/year), 10% of all energy consumption is sourced solely by solar energy.²¹ Especially the implementation and development of unlicensed distributed solar energy systems for self-consumption on the building scale in Avcılar are key for reducing emissions caused by buildings' energy consumption. Conducting coordinated operations in this area with all stakeholders in the sector and particularly the academic institutions is important.

¹⁷ https://sp.enerji.gov.tr/ETKB_2019_2023_Stratejik_Planı.pdf

¹⁸ <https://www.gmka.gov.tr/dokumanlar/yayinlar/Turkiye-Iklim-Degisikligi-Stratejisi.pdf>

¹⁹ <http://www.yegm.gov.tr/MyCalculator/pages/54.aspx>

²⁰ solargis.com

²¹ <https://www.statista.com/statistics/497549/solar-photovoltaic-power-electricity-production-volume-in-germany/>

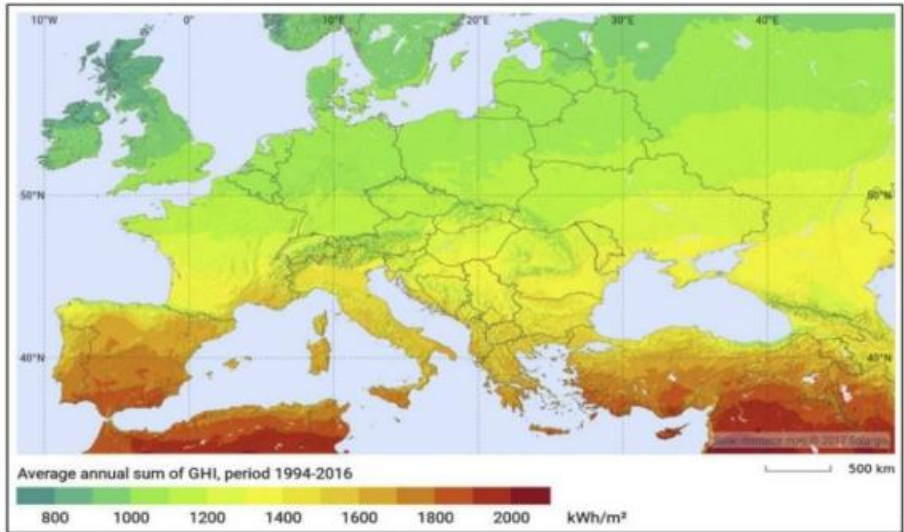


Figure 16: Europe solar radiation map

Avçılar Municipality 2020-2024 Strategic Plan includes the “developing environmentalist policies for reducing the negative effects of urbanization and the climate change” target under the strategic goal of “ensuring the development of the sustainable environment.” Thanks to the district’s long insolation duration due to its position, the matter of utilizing alternative energy resources is included in the mentioned plan.

In the figure below, the ratios of greenhouse gas emissions caused by electricity consumption in Avçılar are provided in detail. As stated in the figure, most of the electricity consumption happen respectively in industry with 40.03%, commerce with 30.99% and residences with 28.97%. The greenhouse gas emissions caused by the energy consumption in transportation in the district are respectively due to 84.70% diesel fuel consumption, 4.32% gas consumption and 3.61% LPG consumption. In addition, fuel consumption in public transportation activities account for 7.37% of all emissions caused by transportation.

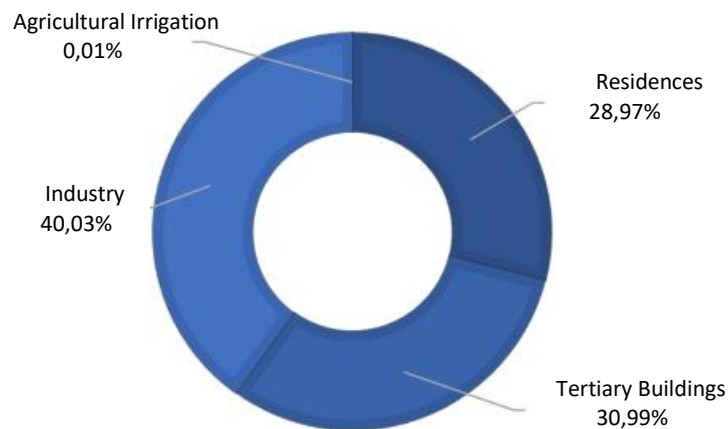


Figure 17: Distribution of emissions caused by electricity consumption, 2019

Sector Target

One sector target can be defined as improving the energy efficiency of the existing and future buildings, and supporting the wide adoption of use of sustainable construction techniques and environmentally-friendly materials. In addition, electricity consumption can be partly sourced by renewable resources especially through solar energy systems to be built integrally on the rooftops of residences and tertiary buildings. For the target year 2030, a reduction of 239.838 ton CO_{2e} is targeted in the area of buildings and energy.

Number of Activities: 8

Stakeholders: Ministry of Environment and Urbanization, Ministry of Energy and Natural Resources, Provincial Bank (İlbank), İstanbul Metropolitan Municipality, Earthquake Risk Management and Urban Improvement Department, Development and Urbanization Department, Avcılar Municipality Urban Renewal Directorate, Environmental Protection and Control Directorate, contractors, financing institutions, professional chambers, auditing companies and citizens

Table 15: Buildings and energy sector actions

Activity Code	Activity Title	Department In	Cost
Activity 1.1	Thermal insulation in residences, energy transformation and awareness-raising activities in these areas	Owners of Residences Avcılar Municipality	6.500 TL per Apartment
Activity 1.2	Ensuring that residential heating systems transition from coal, LPG and electricity sources to natural gas through urban renewal	Owners of Residences Avcılar Municipality	8.000 TL per Apartment
Activity 1.3	Awareness-raising activities for the insulation of non-residential buildings	Owners and operators of non-residential buildings, Avcılar Municipality	-
Activity 1.4	Energy efficient lighting substitutions in non-residential buildings	Owners and operators of non-residential buildings, Avcılar Municipality	-
Activity 1.5	Transition to buildings with better energy efficiency through urban renewal	Beneficiaries, Contractors Avcılar Municipality	20.000 TL per Apartment
Activity 1.6	Energy efficiency in Municipal Buildings	Avcılar Municipality	-
Activity 1.7	Energy-efficient transformation in street lamps	Avcılar Municipality, General Directorate of Highways, İBB	-
Activity 1.8	Increasing renewable energy applications in residential, commercial and industrial buildings	Building and residence owners, construction companies	900 € / kWp

Activity Details

Activity 1.1	Thermal insulation in residences, energy transformation and awareness-raising activities in these fields
Current Situation/Goal	Total fuel consumption in residential buildings in the reference year account for 67% of the emissions caused by fuels in the buildings industry and 17% of the whole inventory. Any changes to be made will have a vital impact on the CO _{2e} emissions in the district.

	<p>Due to the geographical and climatic conditions of Avcılar, heating needs of the buildings in the district are more intense than their cooling needs. Thermal insulation will reduce heating needs as well as cooling consumption.</p> <p>Natural gas is the most common source of heating in Avcılar and it is used in almost 88% of all households in the district. The rest of the households are thought to use mostly coal, LPG or electricity for heating.</p>	
Relation to Current Plan(s)	İDEP 2011-2023 Target B1.1 and EPEP 2017-2023 Action B1 and B5	
Actions/Steps	<ul style="list-style-type: none"> – Collaborating with the stakeholders such as sector representatives, CSOs and financing institutions – Working on incentivizing and inspecting mechanisms within the municipal jurisdiction – Examining the awareness level of the citizens – Creating a communication strategy for increasing awareness and providing information about the incentives, creating an awareness about the energy efficiency through informing points 	
Type of Activity	Investment (Citizens), Raising awareness (Municipality)	
Amount of Saving	<p>Decreases of 35% in the fuel consumption (natural gas, LPG, coal), 30% in the electric heating, and 10% in electric cooling are estimated for residential buildings.</p> <p>Insulation: 230.016 MWh and 54.918 tCO_{2e} in 2030 Lighting: 60.633 MWh and 31.165 tCO_{2e} with a 50% saving in all residences in 2030 Awareness: A reduction of 13.642 MWh and 7.012 tCO_{2e} will be achieved with a decrease of 15% in electricity consumption by other sources in all residences.</p>	
Delivery Plan	Incharge	Citizens
	Stakeholders	Avcılar Municipality, İBB, Ministry of Energy and Natural Resources, financing institutions
	Municipality Contribution	Awareness-raising operations, mobilizing the sector through collaborations
	Cost	6.500 TL per apartment
	Timeline	2021 - 2030
Risks	Lack of cooperation between organizations, lack of support on the national level, lack of awareness, unwillingness for behavioral change, high investment costs (for most of the households)	

Activity 1.2	Ensuring that residential heating systems transition from coal, LPG and electricity sources to natural gas through urban renewal
Current Situation/Goal	<p>Although emissions caused by coal consumption represent a very small share in the inventory, in all aspects, coal is the most polluting fuel that has negative effects on public health. Providing a more suitable environment for the coal users that enable them to transition to cleaner resources is essential. An urban renewal process is ongoing based on the “Law numbered 6306 On the Renewal of the Zones At Risk of Disaster”. Some of the buildings where coal is used as fuel are thought to be present in the planned urban renewal areas. It has been observed that there are buildings heated by LPG and electricity in addition to those heated by natural gas and coal. Although they do not have the same negative effects as coal, the use of these resources must be phased out or reduced. Even though it is more common to transition to using natural gas from these fuels, to achieve a thorough decarbonization, it is necessary to move away from fossil fuels and facilitate the use of zero carbon energy technologies.</p>
Relation to Current Plan(s)	İDEP 2011-2023 Target E2.1 EPEP 2017-2023 Action B11

Actions/Steps	<ul style="list-style-type: none"> – Identification of residential areas consuming coal and the amount consumed through, for example, surveys and CBS mapping – Tax incentives for those transitioning to using natural gas from coal – Transformation to cleaner resources from coal (transition to natural gas) – Reducing the number of buildings heated with LPG and electricity 	
Type of Activity	Investment (Citizens), Raising awareness (Municipality)	
Amount of Saving	A reduction of 992 MWh energy and 163 tCO ₂ e emission will be achieved by 2030.	
Delivery Plan	Incharge	Citizens
	Stakeholders	Avclar Municipality, İBB, Ministry of Energy and Natural Resources, financing institutions
	Municipality Contribution	Awareness-raising operations, mobilizing the sector through collaborations
	Cost	Cost of renewal per apartment 8.000 TL
	Timeline	2021 - 2030
Risks	Technical challenges due to the irregularity of residences where coal is used, lack of support on the national level, lack of awareness, unwillingness for behavioral change, high investment costs (for most of the households)	

Activity 1.3 Activity 1.4	Insulation of and energy efficient lighting substitutions in non-residential buildings and related awareness-raising activities	
Current Situation/Goal	Fuel consumption of commercial buildings account for the 35% of all emissions in the buildings sector. Cooling is more important in non-residential buildings in comparison with residences. Energy consumed for lighting in commercial buildings has a higher share compared to energy consumed for lighting residences.	
Relation to Current Plan(s)	İDEP 2011-2023 Target 1.1 and EYEP 2017-2023 Action B5	
Actions/Steps	<ul style="list-style-type: none"> – Collaborating with the stakeholders such as sector representatives, CSOs and financing institutions – Working on incentivizing and inspecting mechanisms within the municipal jurisdiction of Avclar and İstanbul Metropolitan Municipalities – Examining the property owners' level of awareness – Creating a communication strategy for increasing awareness and providing information about the incentives 	
Type of Activity	Investment (property owners), Raising awareness (Municipality)	
Amount of Saving	A 30% decrease in fuel consumption and a 40% decrease in electricity consumption is estimated for at least 80% of the non-residential buildings. Insulation: 69.267 MWh and 14.208 tCO ₂ e in 2030. Lighting: 92.938 MWh and 47.770 tCO ₂ e in 2030 Awareness: A 15% reduction amounting to 43.565 MWh and 32.270 tCO ₂ e will be achieved for all in 2030.	
Delivery Plan	Incharge	Citizens
	Stakeholders	Avclar Municipality, İBB, Ministry of Energy and Natural Resources, financing institutions
	Municipality Contribution	Awareness-raising operations, mobilizing the sector through collaborations
	Cost	Costs are not estimated because they will vary significantly due to commercial building sizes and used heating and cooling technologies.
	Timeline	2021 - 2030
Risks	Lack of cooperation between organizations, lack of support on the national level, lack of awareness, unwillingness for behavioral change, high investment costs	

Activity 1.5	Transition to buildings with better energy efficiency through urban renewal	
Current Situation/Goal	The importance of residences and their share in the total inventory is provided in the Activity 1.1 section. "AVCILAR MODEL – Urban Renewal Project" document has been utilized for the identification of the urban renewal potential of residences. The number of prioritized and high risk buildings in Avcılar is 6273 and the population facing the risk is 143,420. The average household size in Avcılar is 2.6 person/household and 55 thousand households are planned to be renewed by 2030.	
Relation to Current Plan(s)	İDEP 2011-2023 Target B2.1 ve B3.1 EVEP 2017-2023 Action B7, B8, B9 ve B11 Avcılar Municipality – Urban Renewal Project	
Actions/Steps	<ul style="list-style-type: none"> – Collaborating with the stakeholders such as sector representatives, CSOs and financing institutions – Detailed descriptions of energy consumption and resources used in the areas determined through maps and CBS operations for renewal – M Conducting awareness-raising operations for increasing the awareness of property owners and contractors – Making changes in the zoning plan notes of the areas within the licensing jurisdiction – Developing application samples for energy-efficient building designs and conducting incentivizing operations 	
Type of Activity	Investment	
Amount of Saving	The buildings to be built after the renewal are estimated to consume at least 40% less energy than those built before. In addition, future buildings are considered to transition to natural gas from coal, LPG and electricity for heating after the renewal. Based on these data, an energy saving of 174.855 MWh and an emission reduction of 49.483 tCO _{2e} is thought to be achieved by 2030.	
Delivery Plan	Incharge	Citizens, contractors
	Stakeholders	Local administration, Ministry of Energy and Natural Resources, professional chambers, inspection companies
	Municipality Contribution	Mobilizing the sector through planning and guiding awareness-raising operations and collaborations. Changes can be made in zoning plans of the areas within licensing jurisdiction. Sector can be guided through sustainable construction and life cycle analyses.
	Cost	Designing and building energy-efficient buildings in the areas currently chosen for urban renewal is estimated to increase the costs per apartment by 10%. Costs per apartment for an average 100 m ² apartment is approximately 20,000 TL.
	Timeline	2021 - 2030
Risks	High costs, lack of information, contractors' disregard for energy consumption	

Activity 1.6	Energy efficiency in Municipal Buildings
Current Situation/Goal	The share of the emissions caused by the buildings belonging to Avcılar Municipality in the total inventory is 0.6% while their share in the buildings sector is 1.28%. Although the reductions in the municipal buildings will not accomplish a great reduction, with a good communication strategy they will have a great effect on other organizations and citizens to lead by example. Demonstrating the efficient renewals in the municipal buildings as the originating point of the good applications of energy efficiency activities to the citizens and other stakeholders will accelerate the implementation of the activities of similar nature.

Relation to Current Plan(s)	İDEP 2011-2023 Target 1.5 and B2.1 EVEP 2017-2023 Action B3, B10	
Actions/Steps	<ul style="list-style-type: none"> – Collaborating with the stakeholders such as sector representatives, CSOs and financing institutions – Allocating resources for feasibility operations (financial, human, time, etc.) – Creating a communication strategy for increasing awareness of the citizens and property owners 	
Type of Activity	Investment	
Amount of Saving	A 15% energy saving based on the total energy consumption and reductions of 1.568 MWh and 730 tCO ₂ e are targeted in accordance with the Presidential Decree issued in 2019.	
Delivery Plan	Incharge	Avclar Municipality
	Stakeholders	Financing Institutions, Provincial Bank, engineering and application companies
	Municipality Contribution	As investor
	Cost	Costs will vary according to the different applications in different buildings. Distinct examinations are needed for each application.
	Timeline	2021 - 2030
Risks	High investment cost, insufficient human resources	

Activity 1.7	Energy-efficient transformation in street lightings	
Current Situation/Goal	The share of emissions caused by street lighting operations is approximately 3% in the tertiary buildings. Energy-efficient transformation in street lightings is estimated to accelerate in 10 years due to increasing electricity prices and technological lighting systems' becoming widespread.	
Relation to Current Plan(s)	İDEP 2011-2023 Target 1.5 and B2.1 EVEP 2017-2023 Action B3, B10	
Actions/Steps	<ul style="list-style-type: none"> – Allocating resources for feasibility operations (financial, human, time, etc.) – Increasing the level of awareness of all public institutions and collaborating for the necessary transformation 	
Type of Activity	Investment	
Amount of Saving	A 50% energy saving based on the total energy consumption and reductions of 6.582 MWh and 3.383 tCO ₂ e are targeted.	
Delivery Plan	Incharge	Avclar Municipality, İBB, General Directorate of Highways
	Stakeholders	Financing Institutions, Provincial Bank, engineering and application companies
	Municipality Contribution	As investor
	Cost	-
	Timeline	2021 - 2030
Risks	Investment cost, difficulties that may arise in collaboration between organizations	

Activity 1.8	Increasing renewable energy applications in residential, commercial and industrial buildings	
Current Situation/Goal	These buildings have a 51.4% share in the total inventory and emissions caused by electricity consumption account for almost half (49%) of this share.	

	<p>It is vital to achieve energy efficiency and utilize renewable energy with regard to electricity consumption.</p> <p>It is estimated that a significant reduction in the emissions caused by electric energy consumption and a considerable decrease in the buildings sector's share in the district's total emissions will be achieved through the application of electricity production based on Photovoltaic (PV) systems in the existing and future residential and tertiary buildings.</p> <p>"Electricity production without license" regulation removes the obligation to set up a company or apply for license for small-scale production capacities aimed at self-consumption. The current regulations allows the production applications of up to a 5 MW installed power capacity.</p> <p>Accordingly, the most effective method is reducing the need through the "energy efficiency first" approach and later utilizing renewable resources for meeting the rest of the energy need.</p> <p>The intensity of the urban renewal operations in the Avclar district causing the creation of new settlement areas and the renewal of old/risky building stock can be evaluated as an opportunity for also renewing the energy system. PV applications at certain rates and capacities in the residences and tertiary buildings can be encouraged and/or made obligatory especially through changes in the zoning plans and added plan notes on this matter. In addition, a subsidy program financed by the municipality can also be employed to promote and spread the application of PV systems.</p>	
Relation to Current Plan(s)	İDEP 2011-2023 Target E2.1	
Actions/Steps	<p>It is planned that PV systems up to 5 MW capacity will be allowed to be installed on rooftops of residential and tertiary buildings in Avclar by 2030. A total of 60 MWp installed PV capacity is targeted by 2030.</p> <ul style="list-style-type: none"> - Conducting type project, economic and technical preliminary feasibility operations in collaboration with universities. - Starting the efforts towards zoning plan changes for spreading the PV applications in the buildings sector. - Planning the subsidy programs to be financed by the municipality for encouraging and spreading the PV systems applications 	
Type of Activity	Investment Project (public & private)	
Amount of Saving	<p>If the targeted 60 MWp capacity installation is realized by 2030, it is estimated that an average electricity of 78,000 MWh per year will be produced via PV systems taking climate conditions into consideration and the produced amount will substitute the mains electricity. In this case, an emission reduction of 40.092 tCO₂ will be achieved. The substitution of mains power with the renewable resources will also ensure a saving of electricity in return of the electricity produced for an amount of 59.163.000 TL/year.²² 75.85kr/KWh</p>	
Delivery Plan	Incharge	Building owners
	Stakeholders	Building owners, private and public banks, Avclar Municipality, İBB, application companies, universities, Energy Distribution Companies
	Municipality Contribution	Awareness-raising activities
	Cost	900 € / kWp
	Timeline	2020-2030

²²Calculations are based on January-March 2020 period, one term business electricity tariff.

Risks

The decision makers (residence owners) in the buildings sector may not have any technical or economic information about the PV applications. Avcılar Municipality can conduct/guide informing and awareness-raising efforts in relation to the matter. Universities and other academic institutions can also collaborate with the municipality in these efforts.

Despite the fact that costs of the PV installations fell down in the recent years, the necessity to import many investment items and the dependence of import items on the foreign currencies negatively effect the investment decisions and feasibility. However, the energy efficiency measures which will considerably decrease the needed amount of capacity will also significantly reduce the first investment costs, resulting in improvements in the feasibility and return rates.

A distribution price is imposed on the amount of electricity produced via PV systems but fed to mains electricity grid instead of being used within the facility or the building it is produced. In this case, a cost of surplus energy arises. To prevent this and maximize the self-consumption rates, PV systems are generally designed with integrated electricity storing (chemical storing) systems. For this reason, mobility of the regulations on energy storing must be closely monitored. Especially the electrification of heating and cooling systems in Europe is considered as a key element of the energy transformation. Thanks to the developments in the high-efficiency heat pump technologies and fall in the prices of technological equipment, heating and cooling can be performed with heat pumps that run on electricity instead of solid, liquid or gas fossil fuels. Renewable energy systems like PV run 100% on renewable resources. In these cases, the electricity consumption and therefore the PV capacity of buildings will increase, however, the cooling and heating costs will be eliminated, resulting in significant savings. B Technical and economic feasibility of electrification of heating and cooling in buildings must be researched for Avcılar's specific conditions.

Evaluation of Low Priority Actions:

Certain actions that were discussed in the workshop on 26 October 2020, where many stakeholders shared their opinions, advice, current works and future plans with regard to the Avcılar district, do not yet have a reduction activity related to them. When assessed in connection with the detailed activities mentioned above, these are described as the low priority actions. The list below contains the low priority actions determined for the buildings sector.

- Encouraging the development of sustainability strategies and targets in the sector
- Meeting the heating needs of residences with regional heating
- Taking low carbon emission material, equipment etc. into consideration for the municipal purchases
- Carrying out lobbying activities on the national level for the purpose of creating binding sustainability policies for buildings and particularly residences
- Conducting feasibility studies with special focus on OISs (Organized Industrial Sites) on utilizing the waste heat
- Developing financial mechanisms that support the renewal of residences with higher and greener standards
- Conducting feasibility studies for tests on carbon capture and storing technologies for energy-intensive industrial facilities
- Evaluating the wastes created by the buildings destroyed in urban renewal projects for circular economy
- Renewing the rooftops of existing building stock with green and white roofs and encouraging the use of heat reflective glass
- Municipality committing to low energy consumption in all future public buildings

Actions that are determined as low priority in the discussions held on the energy table are listed below:

- Researching the renewable energy distribution network options

- Heat pump applications that use renewable resources for heating and cooling
- Researching the regional heating capacity and heating/cooling with waste heat applications
- Conducting studies for identifying CBS-based renewable potential
- Researching the applicability of energy storing solutions

b) Transportation

The measures related to transportation sector are listed in the National Energy Efficiency Action Plan. They act as a guide for the steps to be taken by the Avcılar Municipality in the transportation sector. The general actions in the plan related to the transportation sector are given below:

- Encouraging energy efficient vehicles
- Developing a comparative study of alternative fuels and new technologies
- Developing and improving bicycle transportation and pedestrianization
- Reducing the use of cars to decrease the traffic intensity
- Spreading the use of public transportation

In addition, the Turkey Transportation and Communication Strategy 2023 and the National Intelligent Transportation Systems Strategy Document (2014-2023) include items supportive of the National Energy Efficiency Action Plan.

In the Avcılar Municipality 2020-2024 Strategic Plan, the target of “improving the service quality and efficiency by using the resources effectively and efficiently” is described under the first purpose of “increasing service quality and providing citizen-oriented services”. Within the scope of this target, the need to provide timely, comfortable, integrated, respectful, environmentally conscious and innovative transportation services in the district is emphasized.

Greenhouse gas emissions caused by transportation in Avcılar are shown in the figure below. As can be seen on the figure, the share of transportation-related greenhouse gas emissions accounts for 31.4% of the whole inventory. However, if the emissions caused by industrial processes and fuel consumption for electricity production (for self-consumption) are omitted from the inventory because the local government cannot interfere with them, the share of transportation in the inventory increases to 38.1%. Measures related to the transportation sector are thought to have a significant impact for reducing the inventory of the whole district. The share of the diesel fuel consumption in the district is 92% including the public transportation. No data could be reached related to the vehicle presence in the district.

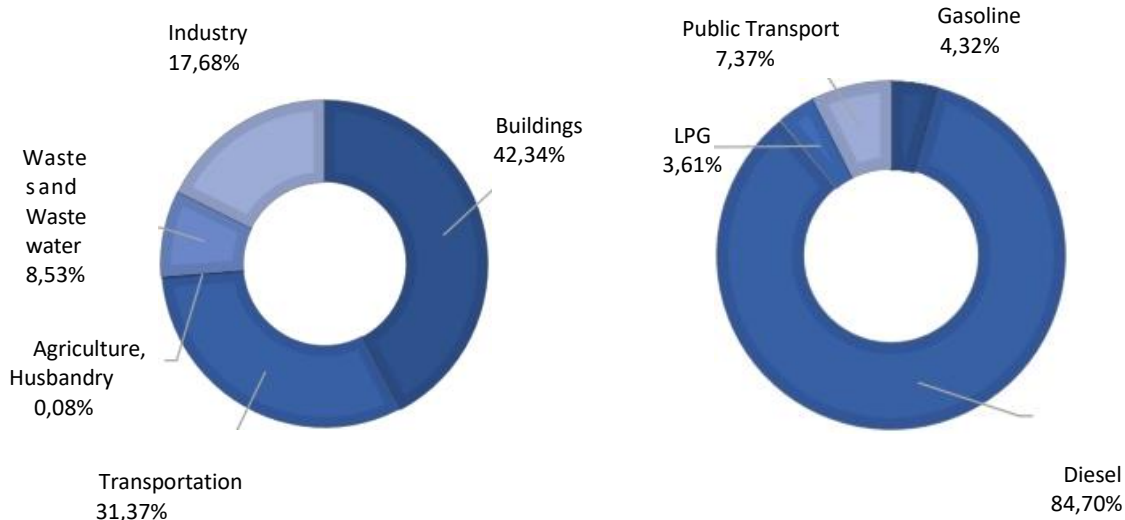


Figure 18: Avcilar greenhouse gas inventory breakdown, 2019, %

Figure 19: Greenhouse gas inventory distribution in transportation, 2019

Sector Target: Integrated and efficient solutions for public transportation, increasing the bicycle use rates and spreading pedestrianization, replacing municipal vehicles and service vehicles with low-carbon alternatives, conducting intelligent signalization and optimization studies, promoting vehicle share with applications like intelligent parking etc. and electric vehicles, replacing the public transportation vehicles with energy efficient ones, and ensuring behavior change in active drivers towards reducing the fuel consumption through providing them training on economical driving techniques to help secure an energy-efficient public transportation are the targets in this area. U Reductions in energy consumption and greenhouse gas emissions are targeted for the transportation sector by the target year 2030.

Number of Activities: 8

Stakeholders: Ministry of Transportation and Infrastructure, Police Forces Traffic General Directorate, İstanbul Metropolitan Municipality, İBB Transportation Main Department, Avcilar Municipality Transportation Services Department, financing institutions and citizens

Table 16: Transportation sector actions

Activity Code	Activity Title	Department In Charge	Cost
Activity 2.1	Pedestrianization operations for increasing pedestrian transportation	Avcilar Municipality	401.611.977 ₺
Activity 2.2	Improving bicycle infrastructures, increasing bicycle share in transportation which includes connecting bicycle roads with the E-5 road	Avcilar Municipality	-
Activity 2.3	Using low carbon alternatives for municipal fleet and service vehicles	Avcilar Municipality	-
Activity 2.4	Improving public transportation (network, infrastructure etc.)	Avcilar Municipality, İBB	108.880.695 ₺
Activity 2.5	Optimization through intelligent signalization systems (for example, control center, low investment traffic optimization arrangements etc.)	Avcilar Municipality, İBB	1.728.825.893 ₺

Activity 2.6	Intelligent parking applications Park and continue applications to reduce traffic Developing shared vehicle use applications and promoting them	Avçılar Municipality	Setting up an intelligent traffic management system: 2.000.000 ₺
Activity 2.7	Replacing public transportation vehicles with energy efficient ones	Avçılar Municipality	Cost of an electric charging station is approximately 40.000 ₺
Activity 2.8	Providing economical driving techniques training	Avçılar Municipality	250 TL/person

Activity Details

a) High Priority Activities

Activity 2.1	Pedestrianization operations for increasing pedestrian transportation	
Current Situation/Goal	Avçılar district center is a place that includes accessible public transportation connections and intense shopping activity along with many schools, cultural centers and sports complexes. In addition to these features, pedestrianization operations is effective against natural disasters. Reducing the vehicle traffic and increasing the public transportation options in this central place where congestion and parking are common problems is also being considered. This situation is closely connected to the Activity 2.4. Avçılar Municipality 2020-2024 Strategic Plan defines the Target 6.2 as “improving the livable infrastructure and superstructure in the public open areas” under its 6 th purpose of “enriching the living spaces by modernizing them against natural disasters.” This target includes the statement “a city square without vehicle traffic and an arrangement of pedestrianized roads and streets (m ²)” and the arrangement is proposed as 2000m ² for each year. (Avçılar Municipality Strategic Plan, 2020-2024, p.86). With this activity, pedestrianization operations for increasing pedestrian transportation is targeted.	
Relation to Current Plan(s)	Performance Indicators 6.2.1 under Strategic Plan Target 6.2 6.2.1 İDEP 2011-2023 Target U1.3 and U4.1 EVEP 2017-2023 Action U3	
Actions/Steps	<ul style="list-style-type: none"> • Preparing living road and street projects • Expanding existing pedestrian walkways and creating new ones in the district • Completing road symbol and traffic sign applications • Ensuring accessibility to public transportation stops and stations • Arranging healthy living activities 	
Type of Activity	Plan/Strategy	
Amount of Saving	An emission reduction of 20.834 tCO₂e and energy reduction of 78.560 MWh is targeted with a 5% energy saving by increasing pedestrian transportation.	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İBB Transportation Main Department, Avçılar Municipality Transportation Services Directorate, Provincial Health Directorate, various funds, Provincial Bank, citizens
	Municipality Contribution	Making the roads under local authority jurisdiction pedestrian-friendly and closing certain routes to vehicle traffic helps them be preferred more by pedestrians and bicycle riders.
	Cost	401.611.976,81 ₺ (Stratejik Plan, s.88).
	Timeline	2021-2025
Risks	Citizens not preferring the roads	

Activity 2.2	Improving bicycle infrastructures, increasing bicycle share in transportation which includes connecting bicycle roads with the E-5 road
Current Situation/Goal	The infrastructure related problem of lack of bicycle roads can be addressed by safe planning and low cost solutions. Avçılar district has a topology suitable for riding bicycles. 703 th article of the 11 th Development Plan includes the statement “construction of new bicycle roads”. In addition, İstanbul Regional Plan issued by İstanbul Development Agency includes “improving pedestrian and bicycle transportation” and İstanbul Provincial Landscaping Plan includes the statement “restricting vehicle traffic in central areas of the city, supporting pedestrian and bicycle transportation”.

	Within this scope, 2020-2024 Strategic Plan by İBB includes Target 2.6 “strengthening road systems, making them sustainable” under its second purpose that is “developing urban transportation within the scope of sustainable mobility”. This action aims at activities focused on increasing existing bicycle roads by 5%.	
Relation to Current Plan(s)	11 th Development Plan Article 703.3 and 703.4 İBB 2020-2024 Strategic Plan Target 2.6 İDEP 2011-2023 Target U1.3, Target U4.1 EVEP 2017-2023 Action U3	
Activities/Steps	<ul style="list-style-type: none"> • Conducting operations to increase opportunities for bicycle riders to use public transportation with bicycles • Making arrangements for the configuration of bicycle transportation network • Placing relevant road symbols and traffic signs • Encouraging the use of bicycle roads 	
Type of Activity	Investment project (public)	
Amount of Saving	An energy reduction of 78.560 MWh and an emission reduction of 20.834 ton CO_{2e} is targeted with this activity.	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İBB, various funds, Provincial Bank, citizens
	Municipality Contribution	In addition to playing an encouraging and guiding role, the municipality will carry out and implement bicycle road projects on the routes within its jurisdiction.
	Cost	The cost of bicycle roads vary depending on the used material and the topography. Bicycle roads are projected to be as long as 100 km by 2030.
	Timeline	2025-2030
Risks	Financial resource need, difficulty of changing passenger behaviors	

Activity 2.3	Using low carbon alternatives for municipal fleet and service vehicles	
Current Situation/Goal	Busing low carbon vehicles in municipal fleets and encouraging local people to use low carbon vehicles is important. The first purpose of the Avcılar Municipality Strategic Plan 2020-2024 is “increasing service quality and providing citizen-oriented services” and the Target 1.3 under this purpose is defined as “improving the service quality and efficiency by using the resources effectively and efficiently”. This activity is aimed at replacing the municipality’s vehicles with low carbon vehicles.	
Relation to Current Plan(s)	Performance Indicators 1.3.7 under Strategic Plan Target 1.3	
Actions/Steps	<ul style="list-style-type: none"> • Replacing the vehicles used by the municipality with low carbon vehicles 	
Type of Activity	Plan/strategy and investment project (public & private)	
Amount of Saving	An energy saving of 4.584 MWh and a greenhouse gas emission reduction of 1.986 ton CO_{2e} is targeted with this activity.	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İBB, various funds, Provincial Bank, vehicle producers, vehicle maintenance companies
	Municipality Contribution	Encouraging and guiding
	Cost	Costs of the activity will vary because of the projected cooperation with the private sector.
	Timeline	2021-2030

Risks	High investment costs	
Activity 2.4	Improving public transportation (network, infrastructure etc.)	
Current Situation/Goal	<p>“Integrated Urban Development Strategy and Action Plan” issued by the Ministry of Development includes the statement “making public transportation systems environmentally-conscious” under Action 5.5.3. İBB 2020-2024 Strategic Plan defines Target 2.2 as “increasing integration, accessibility and quality in public transportation” under its second purpose which is “developing urban transportation within the scope of sustainable mobility”. Avclar Municipality 2020-2024 Strategic Plan includes Target 1.3 “improving the service quality and efficiency by using the resources effectively and efficiently” under its first purpose which is “increasing service quality and providing citizen-oriented services”. This target aims at improving public transportation network and infrastructure.</p>	
Relation to Current Plan(s)	İBB 2020-2024 Strategic Plan Target 2.2 BKGSEP Action 5.5.3	
Actions/Steps	<ul style="list-style-type: none"> • Optimizing public transportation routes • Planning public transportation lines connecting existing transportation network and infrastructure with new development and urban renewal areas • Setting up alternative public transportation systems 	
Type of Activity	Plan/Strategy and Investment Project (public & private)	
Amount of Saving	A greenhouse gas emission reduction of 50.003 ton CO₂e and an energy reduction of 188.545 MWh is estimated to be achieved with this activity by 2030.	
Delivery Plan	Incharge	Avclar Municipality, İBB
	Stakeholders	Ministry of Transportation, İBB, Police Forces Traffic General Directorate Traffic Supervision Branch, Provincial Bank, Minibus/Taxi owners, various funds, public transportation vehicle producers
	Municipality Contribution	Implementing and guiding
	Cost	108.880.695 ₺ (İBB Strategic Plan, p.106)
	Timeline	2025-2030
Risks	Delay caused by financial restrictions, traffic congestion and various troubles in transportation during the implementation of necessary changes, difficult of changing passenger behavior patterns	

Activity 2.5	Optimization through intelligent signalization systems (for example, control center, low investment traffic optimization arrangements etc.)	
Current Situation/Goal	<p>The use of traffic lights with sensors is important because frequent traffic light placement increases the emissions caused by vehicles. In addition, lack of signalization in junctions poses a problem for both safety and fuel consumption.</p> <p>İBB 2020-2024 Strategic Plan defines Target 2.4 as “managing traffic effectively by increasing intelligent transportation systems and transportation infrastructure” under its second purpose which is “developing urban transportation within the scope of sustainable mobility”. This activity is aimed at reducing the intensity of vehicle standby in junctions, the standby duration of vehicles, and consumed energy by utilizing traffic lights and vehicle intensity and average vehicle speed data from intelligent traffic management system. In addition, the number of vehicles will be measured in real time with the fully adaptive traffic management system to be applied in the junctions used most and signalization will work based on these data.</p>	
Relation to Current Plan(s)	İBB 2020-2024 Strategic Plan Target 2.4 İDEP 2011-2023 Target U2.2, U4.1 EVEP 2017-2023 Action U4	

Actions/Steps	<ul style="list-style-type: none"> Replacing existing signalization system with an intelligent signalization system Junction planning and creating intelligent junctions Placing horizontal and vertical traffic signs and symbols 	
Type of Activity	Plan/Strategy and Investment Project (public)	
Amount of Saving	It is estimated that an energy saving of 78.560 MWh and a greenhouse gas emission reduction 20.834 ton CO_{2e} will be achieved by 2030.	
Delivery Plan	Incharge	Avclar Municipality
	Stakeholders	General Directorate of Highways, İBB Transportation Main Department, Data Processing Main Department, Avclar Municipality Transportation Services Directorate, Data Processing Directorate
	Municipality Contribution	Implementing and guiding
	Cost	1.728.825.893 ₺ (İBB Strategic Plan, p.108)
	Timeline	2021-2030
Risks	Communication infrastructure problems, lack of qualified personnel, infrastructure operations need, high investment costs	

Activity 2.6	Intelligent parking applications Park and continue applications to reduce traffic Developing shared vehicle use applications and promoting them	
Current Situation/Goal	İBB 2020-2024 Strategic Plan defines Target 2.4 as “managing traffic effectively by increasing intelligent transportation systems and transportation infrastructure” under its second purpose which is “developing urban transportation within the scope of sustainable mobility”. This activity is aimed at intelligent parking applications, spreading the use of electric vehicles, developing park-and-continue and shared vehicle use applications and promoting the developed applications.	
Relation to Current Plan(s)	İBB 2020-2024 Strategic Plan Target 2.4	
Actions/Steps	<ul style="list-style-type: none"> Conducting feasibility studies for realizing intelligent parking applications Organizing events etc. for promoting electric vehicle use in the district Developing applications for shared vehicle use Informing citizens of the determined applications 	
Type of Activity	Plan/Strategy and Investment Project (public)	
Amount of Saving	An energy saving of 125.696 MWh and greenhouse gas emission reduction reduction of 19.898 ton CO_{2e} is estimated to be achieved with these activities.	
Delivery Plan	Incharge	Avclar Municipality
	Stakeholders	İBB Transportation Main Department, Road Maintenance and Infrastructure Coordination Main Department, Data Processing Main Department, Institutional Development and Management Systems Main Department; Avclar Municipality Transportation Services Directorate, Data Processing Directorate, Civil Works Directorate, Planing and Projects Directorate
	Municipality Contribution	Implementing and guiding
	Cost	Installing intelligent traffic management systems: 2.000.000 ₺
	Timeline	2025-2030
Risks	Communication infrastructure problems, lack of qualified personnel, infrastructural operations need, high investment costs	

b) Medium Priority Activities

Activity 2.7	Replacing public transportation vehicles with energy efficient ones	
Current Situation/Goal	<p>“Integrated Urban Development Strategy and Action Plan” issued by the Ministry of Development includes the statement “making public transportation systems environmentally-conscious” under Action 5.5.3. İBB 2020-2024 Strategic Plan defines Target 2.2 as “increasing integration, accessibility and quality in public transportation” with the purpose of developing urban transportation within the scope of sustainable mobility.</p> <p>According to the Avclar district greenhouse gas emission inventory, the share of transportation in total district emissions is 31.41% and public transportation account for 7.37% of this amount. This activity aims at replacing public transportation vehicles with energy efficient ones and achieving a 30% energy saving.</p>	
Relation to Current Plan(s)	İBB 2020-2024 Strategic Plan Target 2.2 BKGSEP Action 5.5.3	
Actions/Steps	<ul style="list-style-type: none"> Identifying old public transportation vehicles Gradually transitioning into vehicles that run on electricity and biofuels Establishing the necessary cooperation for replacing public vehicles with energy efficient ones 	
Type of Activity	Investment project (public)	
Amount of Saving	A greenhouse gas emission reduction of 10.157 ton CO₂e and an energy reduction of 37.497 MWh is estimated to be achieved with this activity by 2030.	
Delivery Plan	Incharge	Avclar Municipality
	Stakeholders	İBB, various funds, Provincial Bank, vehicle producers, vehicle maintenance companies, citizens
	Municipality Contribution	Implementing and guiding
	Cost	The cost of electric buses is gradually decreasing as they become more widespread and the price difference between electric buses and their diesel counterparts is getting lower. It can be seen that economically advantageous deals can be arranged for bulk purchasing instances. The cost of a single electric charging station is approximately 40.000₺.
	Timeline	2025-2030
Risks	High initial investment costs, limited number of current applications,	

Activity 2.8	Providing economical driving techniques training	
Current Situation/Goal	<p>Providing economical driving techniques training for drivers of commercial and private vehicles including taxis and especially public transportation vehicles’ drivers ensures a lower fuel consumption. Various research conducted on the subject show that economical driving trainings help reduce the fuel consumption by up to 10%. This activity aims at providing economical driving techniques primarily to public transportation vehicles’ drivers.</p>	
Relation to Current Plan(s)	İDEP 2011-2023 Target U4.1 İBB 2020-2024 Strategic Plan Target 2.4	
Actions/Steps	<ul style="list-style-type: none"> Arranging online driving training courses or face to face courses in training centers allocated by the municipality 	
Type of Activity	Behavioral	
Amount of Saving	A greenhouse gas emission reduction of 2.116 ton CO₂e and an energy reduction of 17.433 MWh is estimated to be achieved with this activity by 2030.	
	Incharge	Avclar Municipality

Delivery Plan	Stakeholders	Ministry of National Education, İstanbul Metropolitan Municipality, public transportation vehicles' drivers, taxi drivers, logistics companies' drivers
	Municipality Contribution	Implementing and guiding
	Cost	Average economical driving techniques training cost is 250TL/person across Turkey. (Source: Interviews with private training institutions.) A total of 10,000 drivers are thought to be given training by public sector including municipal bus, minibus, taxi, and service drivers. Private sector can provide training for for logistics vehicles' drivers.
	Timeline	2025-2030
Risks	Limited time for training, social rejection, citizens unwillingness to change their behavior	

c) Wastes and wastewater

Wastewater is transferred to Ambarlı Advanced Biologic Facility and Küçükçekmece Wastewater Pretreatment Facility in Avcılar district. The facility in Ambarlı was commissioned in 2012 and its daily capacity is 400.000 m³. The working principle of the facility is based on removing carbon, nitrogen and phosphorus from water by bacteria biologically (anoxic) or in the ventilated pools (aerobic). Wastewater coming from biological phosphorus pools consecutively passes through ventilation part. With this method, carbon and nitrogen are removed (through denitrification and nitrification).²³ The purification facility in Küçükçekmece started operating in 2003 and has a daily purification capacity of 354.000 m³. 1135 ha of the facility is located in Avcılar. Collecting wastewater along the coast line with collectors, the facility contributes to reducing pollution in Küçükçekmece Lake which is one of the important lagoons in the world.²⁴

Solid wastes collected in Avcılar is sent to Halkalı Solid Waste Transfer Station. Solid wastes were being transferred to Odayeri Regular Storing Area from this point until 2019 but since that year they are being sent to Seymen Solid Waste Disposal and Regular Storing Facility. The total amount of collected waste in Avcılar in 2019 is 155,042 tons. In the Avcılar Municipality 2020-2024 Strategic Plan, the first target under the third purpose related to waste and wastewater management which is "sustainable environment and health management" is described as "achieving exemplary waste management implementations by developing environmentalist projects for reducing the negative effects of urbanization and the climate change." Within this scope, sorting wastes by type through waste management implementations and recycling efforts are included in the determined activities.²⁵ The share of the wastes and wastewater in the total city inventory are shown in the figure below.

²³ İSKİ Faaliyet Raporu, 2019, s.166.

²⁴ İSKİ Faaliyet Raporu, 2019, s.180.

²⁵ Avcılar Belediyesi, 2020-2024 Stratejik Plan, 2019, s.57.

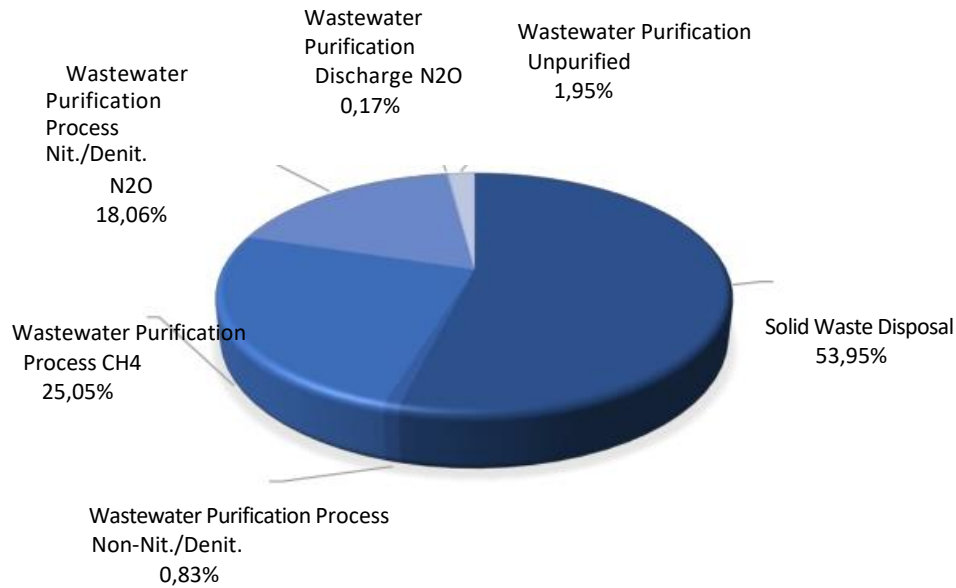


Figure 20: Avclar district greenhouse gas emissions caused by solid waste disposal and wastewater purification, 2019

Sector Target: Targets related to wastes sector are generally towards identification of wastes collection potential and measures for developing waste management, improving wastewater purification facilities and awareness-raising activities. An emission reduction of **73.747 ton CO₂e** is targeted for the target year 2030 with the wastes and wastewater activities.

Number of Activities: 5

Stakeholders: İSKİ, İSTAÇ, Ministry of Environment, Urbanization and Climate Change, Ministry of National Education, İstanbul Environment and Urbanization Provincial Directorate, İstanbul Metropolitan Municipality, İBB Environmental Protection and Control Main Department, Strategy Development Directorate, Avclar Municipality Environmental Protection and Control Directorate, Civil Works Directorate, Planing and Projects Directorate, financing institutions and citizens

Activities

Table 17: Waste and wastewater sector actions

Activity Code	Activity Title	Department In Charge	Cost
Activity 3.1	*Encouraging local businesses to reduce the use of disposable plastics, banning their municipal use *Developing a financial rewarding system for waste sorting in Yeşilkent and Tahtakale neighborhoods *Making the separate collection of most important recyclable materials obligatory	Avclar Municipality, İBB	712.500 ₺
Activity 3.2	Utilizing energy-efficient solutions in waste management	Avclar Municipality, İBB	385.423.600 ₺
Activity 3.3	*Researching the waste collection service potential for food sector (restaurants, hotels, etc.) *Encouraging and promoting joint compost production and compost production at homes (in parallel with the use of public lands for sustainable food production)	Avclar Municipality	18 € per ton for the compost production facility
Activity 3.4	Improving the conditions of the purification facility that processes the wastewater of the district	Avclar Municipality, İBB	-
Activity 3.5	Conducting awareness raising operations to indirectly reduce the energy consumption and increase the recycling rates in wastes industry	Avclar Municipality	1.650.000 ₺

Activity Details

Activity 3.1.	<p>*Encouraging local businesses to reduce the use of disposable plastics, banning their municipal use</p> <p>*Developing a financial rewarding system for waste sorting in Yeşilkent and Tahtakale neighborhoods</p> <p>*Making the separate collection of most important recyclable materials obligatory</p>	
Current Situation/Goal	<p>As stated in the 2019 Activity Report, Avclar Municipality organized 44 training courses in 2019 with the purpose of raising awareness and environmental consciousness in public through providing education in schools, implementing recycling and environmental projects and organizing environmental events. The number of projects related to environmental health and recycling is 12. The plan to found a “Waste Collection and Delivery Center” was designed to increase the efficiency and ensure the sustainability of waste collection efforts however it could not be commissioned in 2019. This activity aims at developing sustainable waste management and recycling mechanisms for Avclar District.</p>	
Relation to Current Plan(s)	<p>Strategic Plan Target 4.6 under Purpose 4</p>	
Actions/Steps	<ul style="list-style-type: none"> • Conduction of operations for waste sorting by type and recycling by district municipalities to ensure solid household wastes are collected efficiently • Separate collection of recyclable wastes from schools and local businesses • Completion of the “Transfer, Collection and Delivery Center” construction • Providing training on waste sorting in Yeşilkent and Tahtakale neighborhoods and promoting it through a rewarding system • Developing projects to increase separate collection of special wastes 	
Type of Activity	<p>Plan/Strategy</p>	
Amount of Saving	<p>A reduction amount belonging to this activity is not specified because its effects on reduction will be indirect. The reductions to be achieved thanks to the energy saved indirectly by the waste sorting applications are included in estimations made for the Activity 3.2.</p>	
Delivery Plan	Incharge	Avclar Municipality, İBB
	Stakeholders	Ministry of Environment, Urbanization and Climate Change, Ministry of National Education, İBB Environmental Protection and Control Main Department, Transportation Main Department, Institutional Development and Management Systems Main Department; Avclar Municipality Environmental Protection and Control Directorate, Planning and Projects Directorate, professional chambers, citizens
	Municipality Contribution	Implementing and guiding
	Cost	712.500 ₺ for increasing separate collection operations for special wastes
	Timeline	2021-2030
Risks	<p>Risks related to occupational health and safety, investment costs</p>	

Activity 3.2	Utilizing energy-efficient solutions in waste management
Current Situation/Goal	<p>Some of the wastewater in Avclar District is sent to Ambarlı Advanced Biologic Purification Facility. Biogas created in anaerobic mud digestion tanks in Ambarlı is transferred to two gas storing tanks with a volume of 4.100 m³ each.</p>

	This activity is aimed at effectively planning and increasing the capacity of waste management with energy efficient solutions.	
Relation to Current Plan(s)	Strategic Plan Target 4.1 under Purpose 4	
Actions/Steps	<p>The steps below will be taken to increase energy production in the solid waste facility through energy efficient solutions and ensure the operations of the solid waste facility to be founded are efficient:</p> <ul style="list-style-type: none"> • Preparing a solid waste management plan based on the zero waste principles • Increasing the capacity and number of solid waste collections centers • Producing electrical energy from organic household waste • Working with university students to carry out social projects 	
Type of Activity	Plan/Strategy	
Amount of Saving	A reduction amount of 71.312 ton CO_{2e} is estimated by 2030.	
Delivery Plan	Incharge	Avclar Municipality, İBB
	Stakeholders	İBB Environmental Protection and Control Main Department, Avclar Municipality Environmental Protection and Control Directorate, Planning and Projects Directorate, neighborhood administrations, schools, citizens
	Municipality Contribution	Implementing and guiding
	Cost	385.423.600 ₺ (Strategic Plan)
	Timeline	2021-2030
Risks	Risks related to occupational health and safety, investment costs	

Activity 3.3	<p>*Researching the waste collection service potential for food sector (restaurants, hotels, etc.)</p> <p>*Encouraging and promoting joint compost production and compost production at homes (in parallel with the use of public lands for sustainable food production)</p>	
Current Situation/Goal	<p>Considering the fact that existing resources are limited, it is understood that carrying out sustainable plans and projects is important. Purpose 5 of the Avclar Municipality 2020-2024 Strategic Plan is defined as “preventing problems related to the public and human health, making contributions to healthy social development and welfare”. In accordance with this purpose, inspecting the companies operating in the food sector becomes prominent in the light of Performance Indicators 5.2.1 under Target 5.2 which is defined as “making activities and inspections related to public order more effective”. In the organized workshop, it was proposed that there were many businesses in Avclar district and compost production from the wastes of them must be encouraged through interviews with the businesses. In addition to inspections, this action is aimed at achieving encouragement through providing training on the potential of waste collecting services in local businesses in the food sector and the benefits of compost production.</p>	
Relation to Current Plan(s)	Strategic Plan Performance Indicators 5.2.1 under Target 5.2	
Actions/Steps	<ul style="list-style-type: none"> • Researching the potential of waste collection in food sector • Evaluating the infrastructure and space required for separate waste collection and compost production • Determining the required amount of financial support to carry out separate collection, compost production and promotion operations • Planning the investments for compost production facility with the purpose of utilizing reusable wastes 	
Type of Activity	Behavioral, investment project	
Amount of Saving	No reduction is estimated for this activity.	
	Incharge	Avclar Municipality

Delivery Plan	Stakeholders	İstanbul Metropolitan Municipality, international financing institutions, public-private collaborations, private banks
	Municipality Contribution	Investing and guiding
	Cost	18 € per ton for the compost production facility
	Timeline	2021-2025
Risks	Investment costs, citizens unwillingness to change their behavior	

Medium

Activity 3.4	Improving the conditions of the purification facility that processes the wastewater of the district	
Current Situation/Goal	Wastewater of Avclar are sent to Ambarlı Advanced Biological Facility and Küçükçekmece Wastewater Pretreatment Facility. Ambarlı Advanced Biological Facility discharges the water to the Sea of Marmara after it is made harmless to nature through purification by a series of physical, biological, and chemical processes. Küçükçekmece Wastewater Pretreatment Facility only implements physical purification. This activity aims at reducing the greenhouse gas emissions by improving the operating conditions of the purification facilities in the district where wastewater are transferred.	
Relation to Current Plan(s)	Strategic Plan Performance Indicators 4.1.3 under Target 4.1	
Activities/Steps	<ul style="list-style-type: none"> Improving the operating conditions of the purification facilities where wastewater of Avclar district are sent A Replacing the technologies used in the purification facilities with more environmentally friendly ones 	
Type of Activity	Investment Project (public)	
Amount of Saving	A greenhouse gas emission reduction of 2.435 CO₂e is estimated by 2030.	
Delivery Plan	Incharge	Avclar Municipality, İBB
	Stakeholders	İBB Environmental Protection and Control Main Department, Studies and Projects Main Department, Avclar Municipality Environmental Protection and Control Directorate, Civil Works Directorate, İSKİ
	Municipality Contribution	Implementing and guiding
	Cost	-
	Timeline	2021-2030
Risks	Risks related to occupational health and safety, investment costs	

Activity 3.5	Conducting awareness raising operations to indirectly reduce the energy consumption and increase the recycling rates in wastes industry
Current Situation/Goal	Avclar Municipality 2019 Activity Report defines “organizing events to increase awareness and consciousness about the environment” activity under the purpose of “improving public and environmental health and well-being, creating a green and sustainable environment”. “Increasing public’s awareness and consciousness about recycling and environmental health through training courses related to environment” is defined as the first activity under Target 4.6. Organizing events for 5 June World Environment Day and increasing the public participation in the projects towards recycling and environmental health are other activities. This activity is aimed at raising awareness to increase the recycling rate in wastes sector.
Relation to Current Plan(s)	Strategic Plan Performance Indicators 4.1.2 under Target 4.1
Activities/Steps	<ul style="list-style-type: none"> Attract people’s attention to subject by holding contests related to recycling in schools

Type of Activity	<ul style="list-style-type: none"> Issuing monthly/yearly environment bulletins online, open to public access 	
Amount of Saving	A reduction amount belonging to this activity is not specified because its effects on reduction will be indirect. The indirect reductions to be achieved by these awareness-raising activities through increasing the efficiency of the actions within the scope of Activity 3.1 and 3.2 are included in the figures provided for Activity 3.2.	
Delivery Plan	Incharge	Avclar Municipality
	Stakeholders	Ministry of Environment, Urbanization and Climate Change, Ministry of National Education, Environmental Protection and Control Directorate
	Municipality Contribution	Implementing and guiding
	Cost	1.650.000 ₺
	Timeline	2021-2030
Risks	Risks related to occupational health and safety, investment costs	

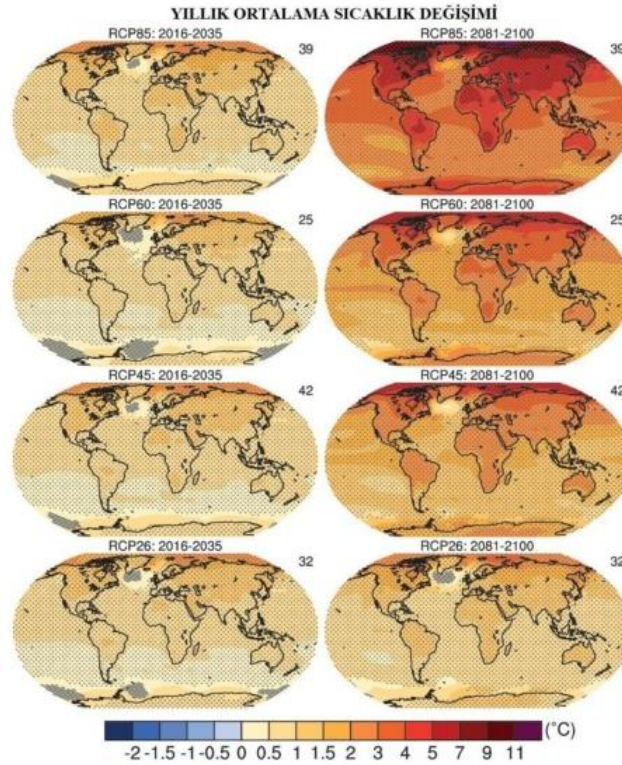
4. Adaptation

4.1. Climate Change Projections and Climatic Disasters

Avclar district climate change projections and physical and social qualities analysis have been conducted by researching many data sources and collecting data in different scales. As a result of a source review, the data set used in this section has been taken from the İstanbul Climate Change Action Plan Final Report issued in 2018. In addition, quantitative studies provided by Avclar Municipality, Turkish State Meteorological Service sources, İstanbul reports and other online sources are considered for the studies in this section.

4.1.1. Climate Change Projections

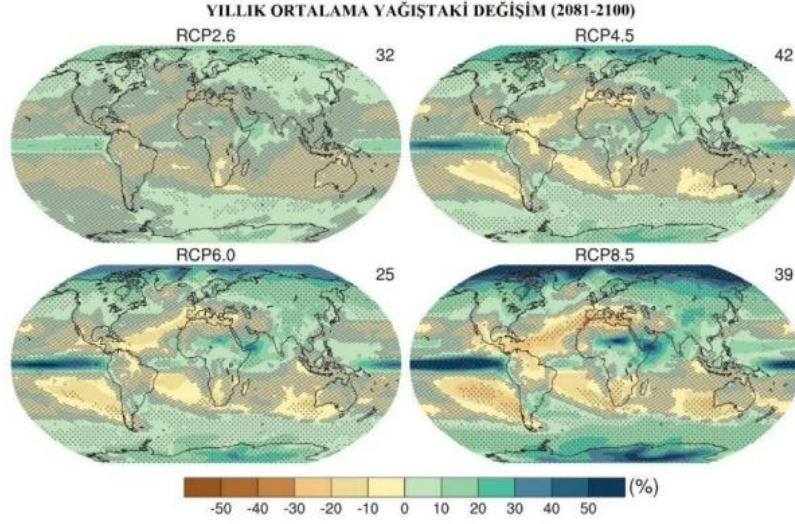
Modeling studies conducted in accordance with the latest 5th Assessment Report issued by the IPCC has been explained in four global climate scenarios: RCP2.6, RCP4.5, RCP6.0, RCP8.5. These models are based on subjects such as agricultural production, urbanization, economic and technological developments, which are met with strong reaction by the society. As a result of these models, it can be seen in Figure 21 that Turkey is in a region where temperatures are rising in each period. In addition, precipitation models shown in the Figure 22 points to the fact that yearly amount of precipitation in the region will fall.



*YILLIK ORTALAMA SICAKLIK DEĞİŞİMİ = Yearly average temperature change

Figure 21: Yearly Total Precipitation Anomaly Projections*²⁶

²⁶ <https://mgm.gov.tr/iklim/iklim-degisikligi.aspx?s=kuresel> (Created via IPCC 5th Assessment Report)



*YILLIK ORTALAMA YAĞIŞTAKİ DEĞİŞİM = YEARLY AVERAGE PRECIPITATION AMOUNT CHANGE

Figure 22: Yearly Total Precipitation Anomaly Projections* ²⁷

As seen even in the low resolution models, west part of Turkey situated within the borders of Mediterranean basin is among the regions to be affected most by the climate change. İstanbul, the biggest city in Turkey and a megacity in the world scale, is one of the first cities that will most intensely experience the climate change.

The effects of the climate change on İstanbul are detailed in the İstanbul Climate Change Action Plan Final Report. The report shows the possible challenges the city may face, on the climatic models with higher resolutions and serves as a guide for the necessary precautions against them. Within this scope, the contents of the report show studies on temperature change, urban heat isle effects, precipitation change and drought, and sea level rise in relation to climate change scenarios.

Temperature change scenarios: According to the 4 different scenarios in IPCC studies, İstanbul projections show that a temperature rise of 1.5-4.8°C is expected until 2100 in comparison with the temperature in the period from 1986 to 2005. (Figure 23). In addition to these models, “How will the climate change affect the cities of the world?” study conducted by World Meteorological Organization and Climate Central that covers certain cities including İstanbul, states that the average temperature of the megacity will rise from 27.4°C to 33.7°C in 2100.²⁸

²⁷ <https://mgm.gov.tr/iklim/iklim-degisikligi.aspx?s=kuresel> (Created via IPCC 5th Assessment Report)

²⁸ İstanbul Çevre Durum Raporu, TMMOB Çevre Mühendisleri Odası İstanbul Şubesi, 2019, sf:28.

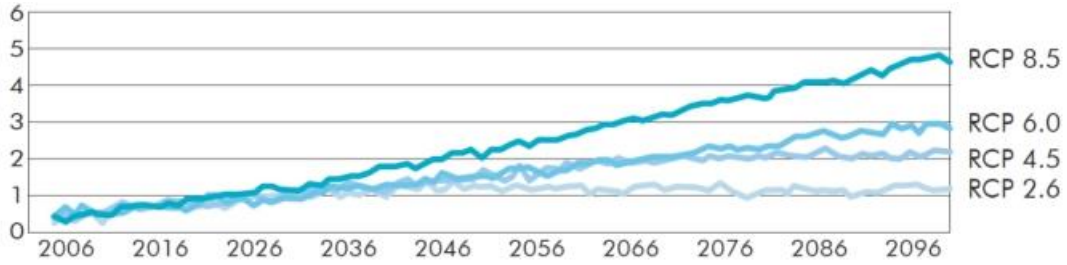
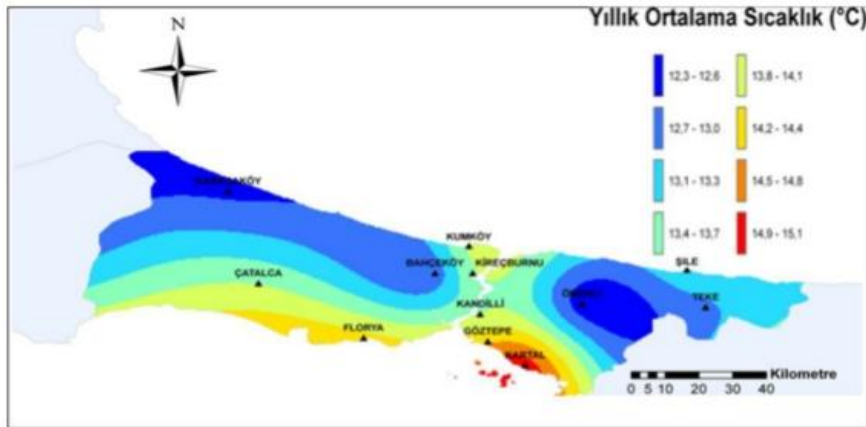


Figure 23: Amount of yearly heating (°C) in 1986-2005 period²⁹

Figure 24 shows the heat distribution across İstanbul as seen in the Fight Against Agricultural Drought Strategy and Action Plan issued by the İstanbul Governorship in 2018 shows. The areas that are less urbanized have lower average temperature while the areas that are more urbanized have higher average temperature. Especially the coastal parts of the Avcılar district are in the higher temperature zones.



* Yıllık Ortalama Sıcaklık = Yearly Average Temperature
Kilometre = Kilometer

Figure 24: İstanbul yearly average temperature map, 2017³⁰

Urban Heat Island Effect Scenarios: Urban heat island effect is the climate change that occurs because of the reduction of evaporation surfaces and green spaces in urban areas. These changes happen due to urbanization pressure and a heat and water cycle that is experienced in a different way than that occurs in the rural areas.³¹ Land use change in a megacity like İstanbul constitutes a high risk position. The fact that forest presence is reducing and urbanization pressure is increasing by the day escalates this risk.

As for the land use in Avcılar, although structuring rate in the district seems lower than other areas (Table 18) structure density and scarcity of green spaces mean that Avcılar is at a risky state in terms of urban heat island effects. In addition, as seen in **Hata! Başvuru kaynağı bulunamadı**** land use study concerning Avcılar demonstrates that active and passive green spaces only account for 6.5% of the total area of the district.³² The intense structuring and scarcity of the green spaces standing out in current situation increase the risk of urban heat island effects.

²⁹ İstanbul İklim Değişikliği Eylem Planı, Final Raporu, 2018, sf:10.

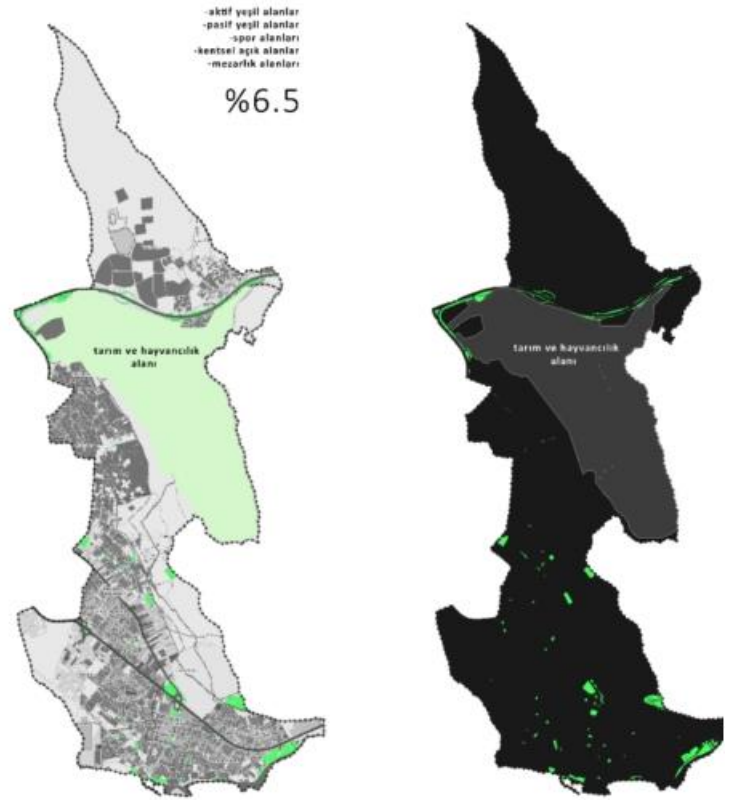
³⁰ Tarımsal Kuraklıkla Mücadele Strateji ve Eylem Planı, İstanbul Valiliği, 2018, sf:51.

³¹ Tabanoğlu, O., Antalya için İklim Değişikliğine Uyum Stratejileri Önerisi, İstanbul Teknik Üniversitesi, Yüksek Lisans Tezi, 2018, sf:77.

³² Avcılar İlçesi Kentsel Dönüşüm Master Planı, Arazi Kullanım Analizi Paftası, Avcılar Belediyesi.

Table 18: Avcılar district land use, 2011

Land Use	Area (ha)	Percentage (%)
Settled Area	1416,12	36,5%
Empty Area	1417,06	36,5%
Agricultural Area	1047,44	27,0%
Total	3880,62	100,0%
Land Use for Settled Space Functions	Area (ha)	Percentage (%)
Residence Area	669,84	47,3%
Residences + Commerce	175,08	12,4%
Residences + Production	8,28	0,6%
Commerce Area	58,8	4,2%
Production Area	135,69	9,6%
Service Area	4,9	0,3%
Storage Area	8	0,6%
Educational Facility Area	154,55	10,9%
Governmental Facility Area	31,16	2,2%
Healthcare Facility Area	1,84	0,1%
Religious Facility Area	2,88	0,2%
Sociocultural Facility Area	0,87	0,1%
Infrastructure Area	7,06	0,5%
Construction Area	16,87	1,2%
Military Area	0,95	0,1%
Coastal Area	34,32	2,4%
Sports Facility Area	6,86	0,5%
Burial Ground Area	7,1	0,5%
Active Green Space Area	29,89	2,1%
Passive Green Space Area	39,84	2,8%
Urban Open Area	8,68	0,6%
Empty Structure Area	12,64	0,9%
Total	1416,12	100%



*tarım ve hayvancılık alanı = agriculture and breeding area
aktif yeşil alanlar = active green space areas
pasif yeşil alanlar = passive green space areas
spor alanları = sports facility areas
kentsel açık alanlar = urban open areas
mezarlık alanları = cemetery areas

Figure 25: Avcılar green space scarcity map*

In addition, an urban heat island projection was made for İstanbul³³. Figure 26 shows the urban heat island effects scenario over İstanbul until 2072. According to this projection, temperature rise is currently 1.2°C. This scenario means that the increase may go up to 1.5°C in 2030 and may go over 1.7°C in 2050.

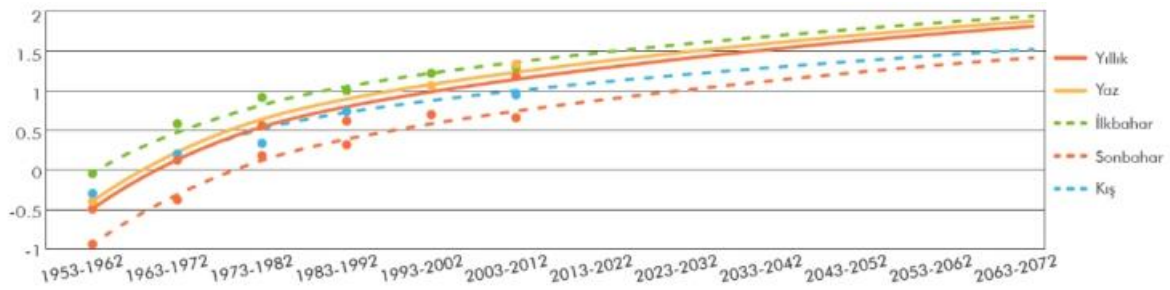


Figure 26: İstanbul urban heat island future projection (°C)³⁴

Precipitation Change and Drought Scenario: Among precipitation projection scenarios for İstanbul covering the period until 2100, while the optimistic one (RCP2.6) shows that no significant change will occur, the negative scenario (RCP 6.0) shows that the amount of precipitation will dramatically decrease (Figure 27). As a result of reduced precipitation and increased temperatures, 45 days long drought period will be as long as 50 to 57 days in 2050s and 49 to 68 days in the end of 2100. This increases the risk of drought.

³³ İstanbul İklim Değişikliği Eylem Planı, Final Raporu, 2018, sf:10.

³⁴ İstanbul İklim Değişikliği Eylem Planı, Final Raporu, 2018, sf:10.

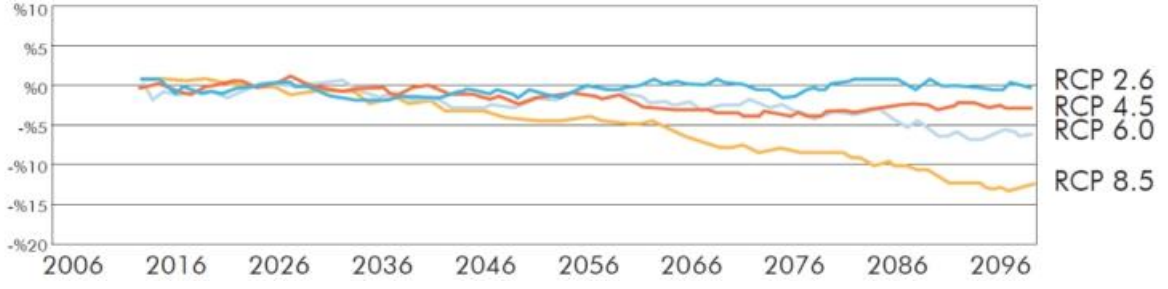


Figure 27: Precipitation change in 1986-2005 period (%)³⁵

Another important issue related to precipitation is the forecast that the total precipitation will reduce whereas precipitation amount will be more in the days with precipitation. The most negative scenario (RCP 8.5) estimates that the precipitation amount will be 20% more than that on sunny days and 59% more than that on days with precipitation, increasing the flood risk. In addition, projections of temperature anomaly, which is another reason for the drought, are shown in Figure 28.

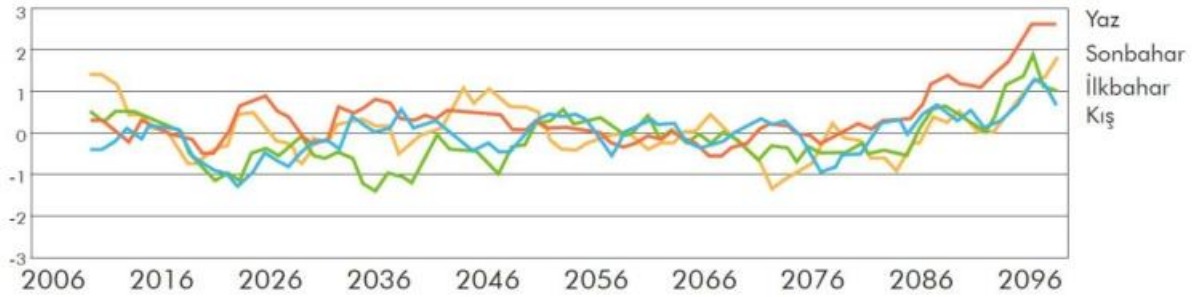


Figure 28: Temperature anomaly (°C)

The situation Turkey, and especially İstanbul, is in shows the importance of the drought risk. According to the Precipitation in İstanbul and Drought in Turkey Report issued by the Water Policies Association, the precipitation amount in İstanbul for 2020 September and November months are respectively 30% and 54% below average. For this reason, meteorologic drought is thought to be transforming into a hydrological drought. Moreover, all regions of Turkey experienced 20% less precipitation than average in 2020.³⁶

Turkey's water use indicators identified by the European Environment Agency also points to the fact that the risk of drought is a serious problem. Figure 29 shows the water use in Turkey among other European countries along with the risk it poses on renewable water resources. In addition, the change of water use in Turkey from 1990 to 2017 is also shown in the figure.

³⁵ İstanbul İklim Değişikliği Eylem Planı, Final Raporu, 2018, sf:11.

³⁶ <https://supolitikalariderneği.org/2020/12/19/spd-istanbul-yagislari-ve-turkiyede-kuraklik-raporu-yayinladi-2021-kurak-gecebilir/>

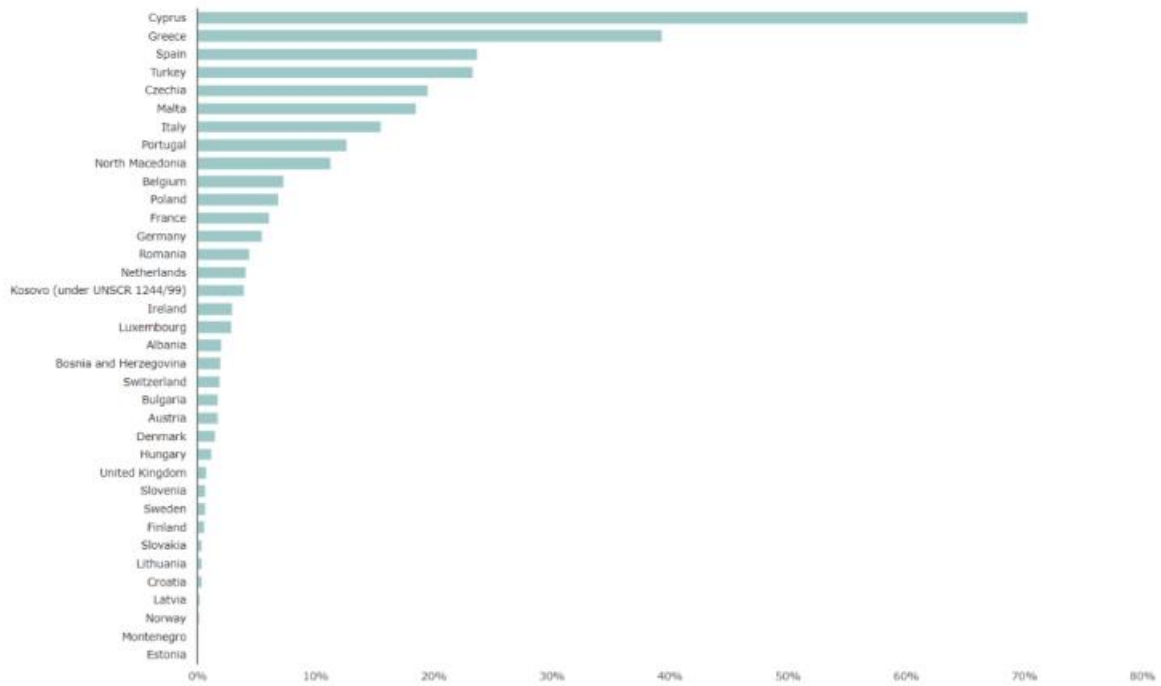


Figure 29: Turkey’s water use (risking water resources) indicator among EU countries, 2017 ³⁷

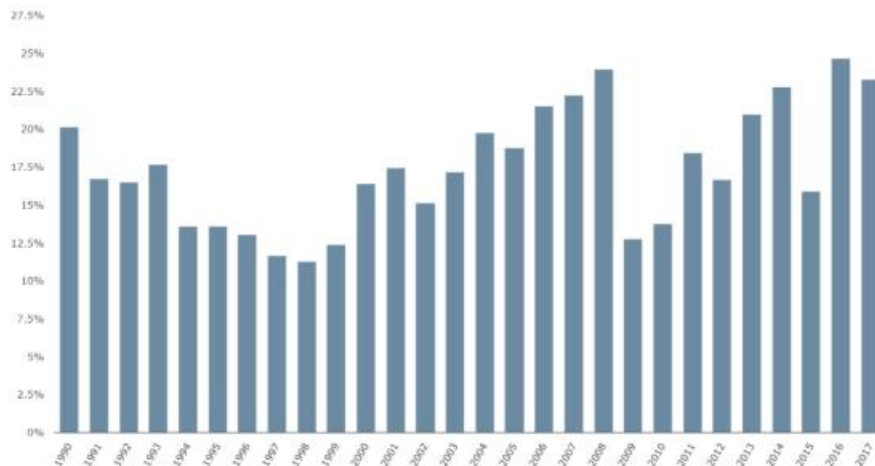


Figure 30: Turkey’s water use (risking water resources) change by years, 2017 ³⁸

In conclusion; the drought risk caused by urbanization pressure, reduced forest presence, population increase and climate crisis is not a future risk to be faced in the years to come, but a current risk and a great danger that is taking effect now.

Sea Level Rise: According to the İstanbul Action Plan, melting glaciers and expansion of heated water as a result of the global warming will cause a rise of 45 to 75 cm in the sea level in 2100 by comparison to 1985-2005 period. There is no detailed study on İstanbul, a coastal city, but it is thought to be affected by this sea level rise. The need of a detailed study with projections, especially for the low altitude areas, has become apparent.³⁹

³⁷ <https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-3/assessment-4>

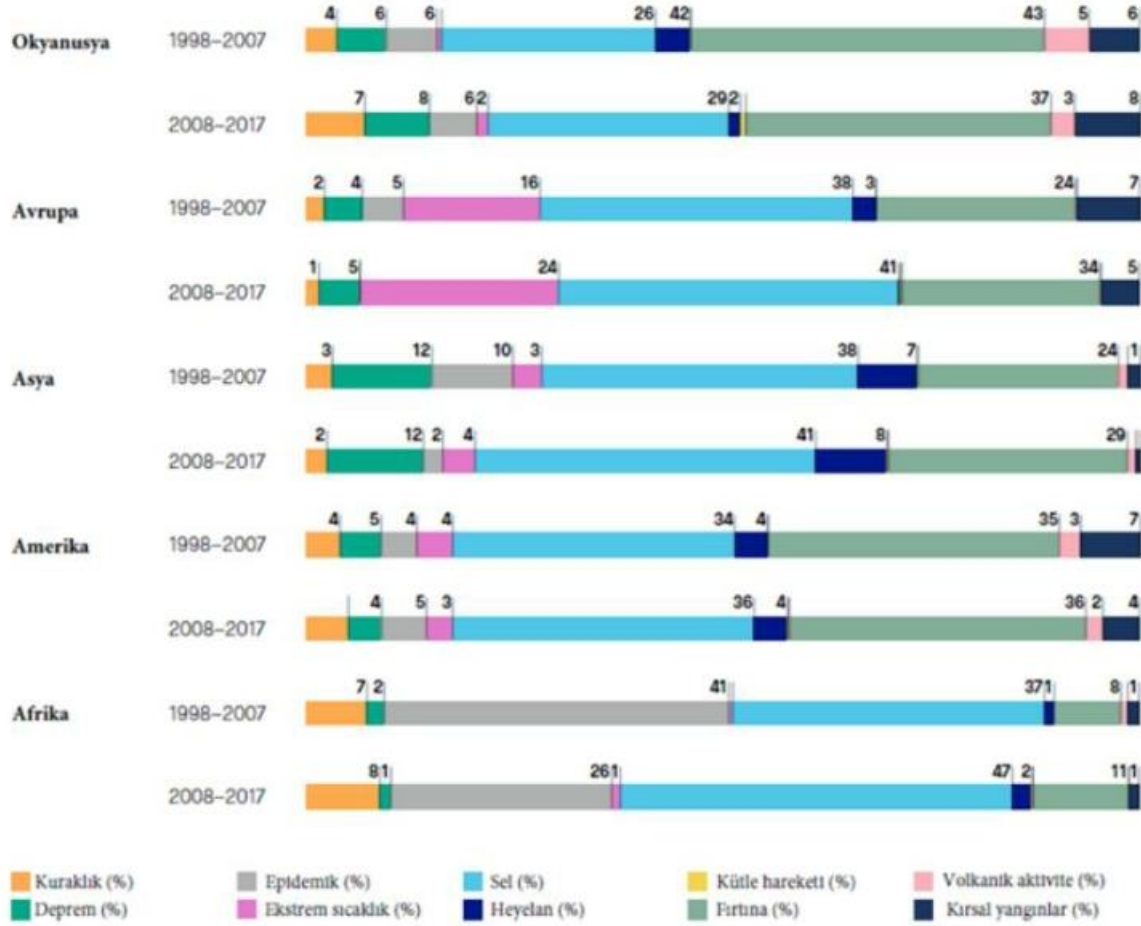
³⁸ <https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-3/assessment-4>

³⁹ İstanbul Çevre Durum Raporu, TMMOB Çevre Mühendisleri Odası İstanbul Şubesi, 2019, sf:28.

4.1.2. Climatic Disasters

The severity, frequency, duration and area of the recently occurring climatic disasters are gradually increasing.⁴⁰ Due to the natural disasters across the world caused by climate-related and geophysical reasons between 1998 and 2017, approximately 1.3 million people died and 4.4 billion people were directly affected by these disasters. 91% of the disasters happened in this period are caused by floods, storms, droughts, hot air waves and other extreme weather conditions.⁴¹

The proportional distribution of natural disasters across the world between 1998 and 2017 by type and continent are shown in the figure below. According to the figure, it can be deduced that flood- and storm-related disasters happen intensively in all continents.⁴²



*Okyanusya = Ocenia Avrupa = Europe Asya = Asia Amerika = America Afrika = Africa Kuraklık = Drought Epidemik = Epidemic Sel = Flood Kütle hareketi = Mass move Volkanik aktivite = Volcanic activity Deprem = Earthquake Ekstrem sıcaklık = Extreme temperature Heyelan = Landslide Fırtına = Storm Kırsal yangınlar = Rural fires

Figure 31: Distribution of natural disasters around the world in 1998-2007 and 2008-2017 periods by continent and type (%)*

A research conducted by the Cambridge University Risk Research Center includes an analysis demonstrating the possible economic results of the natural and human-induced threats to be faced in 279 metropolises in the world in a 10 year period (2015-2025). Metropolises in the world are receiving intensive migration because of the increasing population and economic problems in the world. Today, 54% of the world's population live in cities. People living in areas vulnerable to climatic disasters also effected by unplanned and irregular urbanization are often left in difficult situations.

⁴⁰ Meteoroloji Genel Müdürlüğü, 2019 Yılı Meteorolojik Afet Değerlendirmesi Raporu, 2020.

⁴¹ UNISDR&CRED, Economic Losses, Poverty & Disasters 1998-2017, 2018.

⁴² World Disaster Report, "The International Federation of Red Cross and Red Crescent Societies", 2018.

Istanbul is among the cities that may be affected by the meteorological disasters occurring in the world according to the Lloyd's City Risk Index research shown in Figure 32.

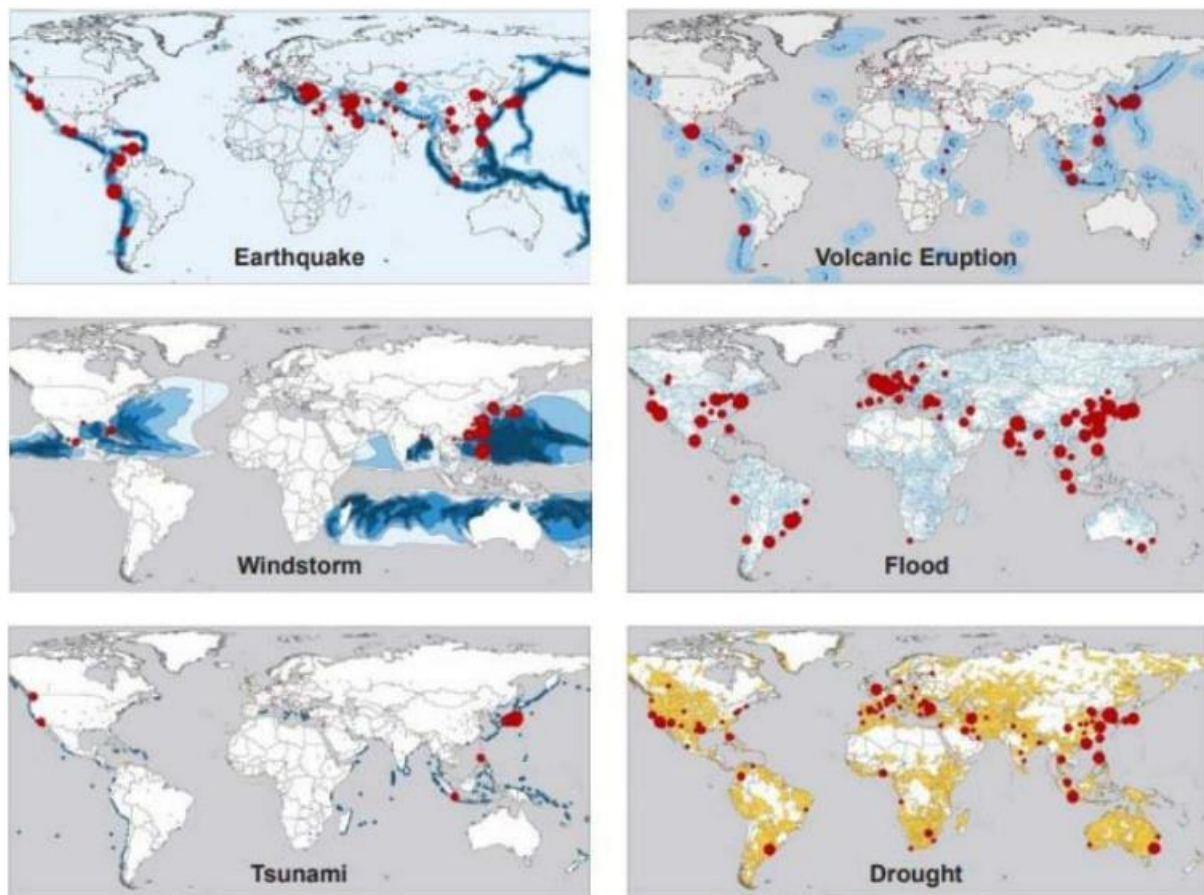


Figure 32: Metropolises in the World that May Suffer Various Natural Disasters (2015-2025)⁴³

Many various severe meteorological events leading to disasters can be observed in our country with varied climatic features. Climatic disasters such as storms, floods, hail, frosts, snow and droughts happen often in our country and cause a significant amount of casualties and damages in property. Especially after 2000s, the number of climatic disasters considerably increased. In the period between 1940 and 2019, 2019 is the year most meteorologic disasters happened. Climatic disasters on various scales that affect the different parts of our country occurred in 2019. The total number of reported natural disasters of meteorologic characteristics happened in our country in 2019 is 936. According to the Turkish State Meteorological Service's 2019 meteorologic disaster assessment the frequency of disaster occurrences are shown in the Figure 33. The average number of disaster occurrences in İstanbul, which includes Avcılar, is approximately 17. In this context, the number of severe precipitation- and flood-related disasters is 4 and the number of hail disasters is 2 in 2019.

⁴³ Cambridge Center for Risk Studies, Cambridge Risk Atlas, Part II: Methodology Documentation, "World Cities Risk 2015-2025", 2015



*Meteorolojik Afetler Şube Müdürlüğü = Meteorologic Disasters Branch Directorate, Görülme Sayısı = Number of Occurrence

Figure 33: Number of meteorologic disasters seen in Turkey in 2019*

As seen in the figure, the most frequent natural disaster with meteorologic characteristics occurring in Turkey in 2019 is severe precipitations/floods. The total number of reported severe precipitation-/flood-related disaster occurrences in 2019 is 332 (36%). The second most frequent disaster type is storms with 257 total occurrences (27%). Climatic disasters of floods and storms were seen in most parts of the country in 2019. The third most frequent disaster seen in the country in 2019 is hail with 167 occurrences (%18). Snow disasters were seen 44 times in the country in the same year and its share in the totals meteorologic disasters is 5%.

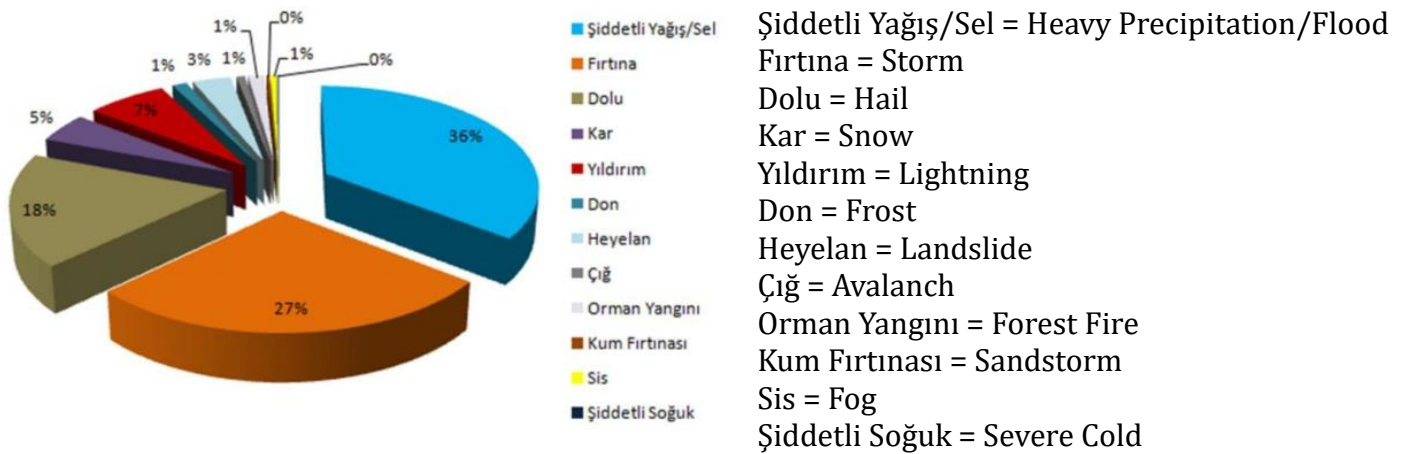


Figure 34: Percentages of Natural Disaster Occurrences with Meteorologic Characteristics in Turkey in 2019

Disasters Caused by Extreme Precipitation (Floods and Hail):

The flood that occurred on 9 September 2009 affecting Marmara region and the European side of İstanbul caused 40 casualties and significant economic losses. The flood that occurred in Esenyurt district on 23 June 2020 damaged 437 businesses, homes and vehicles. 362 homes, 56 businesses and 19 vehicles became unusable. (Ongoing İBB rehabilitation works in Haramidere are estimated to be completed in 2021.)



Figure 35: 9 September 2009 flood⁴⁴



Figure 36: 23 June 2020 flood⁴⁵

The table shows information related to the floods and inundations responded by the Fire Department from 2015 to 2020. According to the table the total number inundations due to severe precipitation/floods in 2019 is 633.

Table 19: Floods and inundations responded by fire department (2015-2020)⁴⁶

Event	Year / Number										
	2015	2016	2017	2018	2019	2019	2020	Change in numbers		Change in rate	
						Jan-Nov	Jan-Nov	2019 Jan - Nov	2020 Jan - Nov	2019 Jan - Nov	2020 Jan - Nov
Flood/Inundation	1.006	824	1.578	1.280	633	599	860	261↑	-373↓	43,6%↑	-37,1%↓

4.2. Risk Assessment

The results of the Risk and Affectability Assessment that assesses the risks regarding climatic dangers that occur due to the climate change in Avclar district are reassessed in the related workshop. In this context, the critical structures and infrastructures in the city are assessed with regard to environment, transportation system, biodiversity, waste management, water presence, public health, industry and disaster management. In addition, the climatic dangers covered by the assessment are hot and cold air waves, excessive precipitation and storms, drought, landslide (already an area at risk), floods and sea level rise (because it's a city on the coastal line).

⁴⁴ <https://www.havaforum.com/2009-marmara-istanbul-sel-felaketi/>

⁴⁵ <https://www.birgun.net/haber/istanbul-valiligi-yasanan-sel-felaketinin-bilancosunu-acikladi-305749>

⁴⁶ İstanbul Büyükşehir Belediyesi İtfaiye Daire Başkanlığı, 2020 İstatistikleri

Table 20: Avcilar district risk and affectibility analysis

Climatic Dangers	Sectors							
	Critical Infrastructure and Built Environment	Transportation	Biodiversity	Waste Management	Water Resources	Public Health	Industry	Disaster Management
Cold Air Wave	Low	Low	High	Medium	Low	Medium	Low	Low
Hot Air Wave	Low	Medium	High	Medium	High	Medium	Low	Medium
Days of Drought	Low	Low	High	Low	High	Medium	Medium	Medium
Excessive Precipitation	Medium	Medium	High	Medium	Medium	High	Medium	High
Severe Winds	Medium	High	High	Medium	Medium	Medium	Low	Medium
Flood	High	High	High	Medium	Medium	High	Medium	High
Landslide	High	High	Medium	Medium	Medium	Low	Medium	Medium
Sea Level Rise	Low	Low	Low	Low	Low	Low	Low	Low

4.2.1. Critical Infrastructure and Built Environment

The building analyses conducted across İstanbul show that the number of defective buildings in İstanbul that are inconsistent with their blueprints or built with low-quality labor is high. Considering the fact that there are also buildings without any license and or blueprints at all, the scale of the problem becomes apparent. Although planning efforts in Avcilar are ongoing, there are still two unplanned neighborhoods.

The new building stock that arose with the urban renewal projects will solve these problems if they are constructed in compliance with the new regulations, however, the threat of the risks such as high energy consumption (and related greenhouse gas emissions), flood, storm, sensitivity against excessively hot and cold weather continue for the buildings that are not renewed. Especially excessive precipitation and floods are identified as high risk, hot air waves and severe winds are identified as medium risk, and cold air waves and droughts are identified as low risk.

An intensive urban renewal study will take place in Avcilar. With regard to this, it is important to supervise that new buildings are constructed in compliance with the regulations. Although a significant part of the old building stock will be renewed until 2030, risks for the older buildings will persist.

The potential effects of the climate change on the existing building stock can be listed as increased cooling need and related energy need due to excessive heat, value loss in heat island areas, inundated buildings and blown away roofs due to floods and storms. It has been observed that roofs and insulation materials of the buildings have been harmed due to hails in recent years. Although it is thought that it will not be effective until 2030, expected long-term sea level rise poses a risk for the buildings on the coastline.

Average and summer temperature rise, hot air waves and, in the long term, droughts are expected as a result of the climate change. Because of this, critical buildings (buildings where healthcare services are provided, educational institutions, buildings older than 30 years old) face fire risks. For all the other buildings, hot and dry air brought about by the climate change will cause frequent and intense fires especially in highly populated areas. The climate change will gradually increase fires. Fires will impair the air quality. High temperatures will increase the allergens in the air and air pollution. For instance, longer and hotter seasons mean exposure to more pollen and ozone.

The increase in the number of days where excessive precipitation is experienced in İstanbul and the related floods and inundations is an element of threat for the buildings that are not sufficiently resistant to them. The resistance of the building stock in İstanbul must be increased not only against earthquake, but also against excessive precipitation and storms. An increase in the loss of lives and property due to inundation in residences and workplaces has been observed in the recent years. Although many mechanisms worked towards post-disaster recovery and most of the damage was compensated, the increase in the disasters carries a risk for these damages to become impossible to be compensated.

Creating guides for the contractors that take the climate change into consideration in addition to the earthquake and answer the regional needs, and developing different architectural approaches may be an important step. Green roof applications, rainwater harvesting, water saving armatures, natural air conditioning, strong insulation for low-carbon transformation, renewable energy production integrated to the building stock, and energy efficiency applications are among the steps that can be taken. Inspections to make sure that regulations are observed should be increased.

Increased temperatures will also increase the energy demand for cooling purposes in İstanbul. This means additional work load for energy networks. On the other hand, making electricity and natural gas networks resilient against floods, inundations and storms is an important issue. Excessive temperatures may cause technical losses in electricity network transmission and distribution cables. Severe precipitation, floods, inundations and storms pose a substantial risk for the energy infrastructure. Relevant energy distribution companies should work in coordination on this issue.

In addition to the extra load to be created by the consumption side, technical losses due to heating in the transmission and distribution cables caused by temperature increase will increase and create even further load on the network. Extreme weather conditions like severe precipitation, floods, inundations and storms brought about by the climate change may cause damage to electricity transmission and distribution network. In the current situation, average outage duration per customer for the two electricity distribution areas of İstanbul, Bosphorus and Anatolia, are respectively 12.6 and 6.7 minutes. These numbers are estimated to increase due to extreme events caused by the climate change.

Although the energy need for heating purposes in winter is estimated to decrease because of the temperature increase, the temperature increase in summer will cause a rise in the cumulative energy consumption. Increase in the energy consumption due to aforementioned reasons will create additional load on the energy networks. On the other hand, making electricity and natural gas networks resilient against floods, inundations and storms is an important issue. İstanbul has the greatest electricity and natural gas network lines.

When the natural gas inventory is examined, it is understood that the share of natural gas in heating is high. Therefore, natural gas distribution system is critical for the district. Natural gas transmission system includes many auxiliary components such as pipe lines, valves, pumps, compressors, and measuring stations. High air temperatures affect the efficiency of energy production in a way that reduces the produced energy outcome. Increase in water temperature negatively affects the operation of the plant's cooling system.

In addition, as highlighted in the "Sustainable Energy Action Plan", developing photovoltaic applications that include storing systems of residences and workplaces, central heating systems and ground source heat pumps, and systems with alternative fuels; and commonizing energy efficient applications to reduce the rising energy consumption.

4.2.2. Transportation

Transportation is both a major cause of the climate change due to the intense greenhouse gas emissions and one of the sectors that will be affected by it most.

Because İstanbul is a very densely populated city, public transportation use in İstanbul is also very intensive. Unfortunately, most of the transportation in the city, including public transportation, depends on road transportation. Transportation infrastructure will be affected most by severe precipitation, storms, hot air waves, summer temperature increase, floods and inundations, and changes in the sea level. Excessive temperatures may cause melting in the asphalt roads and expansion in the rail systems. Floods and inundations as a result of excessive precipitation cause hardships for public transportation, logistics services related to commercial activities, and private vehicle users; sometimes bringing the daily life to a standstill.

At the same time, transportation sector is a major cause of air pollution in cities. The increase in the vehicle ownership can be counted as a sign showing that air pollution and related health problems will also increase.

Excessive temperatures and precipitation are identified as medium-level risks while floods, inundations, severe winds and storms are identified as high-level risks. The days of excessive cold, that are expected to decrease, and the drought are thought to be medium level risks. Medium and high risk climate dangers will negatively affect the life in the densely populated districts. Water buses, buses, and Metrobus are intensively used in Avcılar district. It is important to work in coordination with the Metropolitan Municipality for strengthening the public transport network in the district and making the infrastructure resilient.

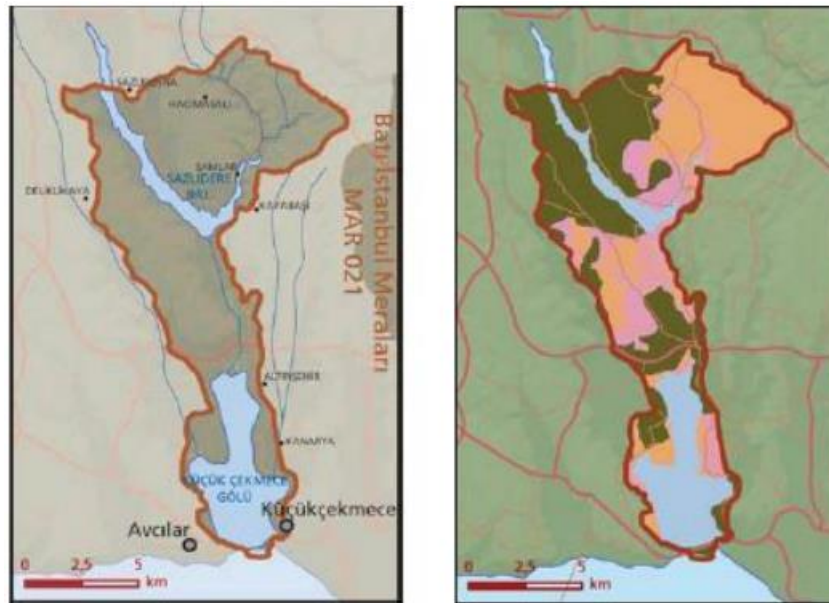
Another matter in the district municipalities' jurisdiction is bicycle roads and safe and resistant pavements for pedestrians. Bicycle roads and pavements provide an alternative transportation mode to citizens for walking and cycling during the times when arterial roads are negatively affected by all types of disasters (excessive precipitation, excessive temperature, winds, floods, etc.). Reducing the traffic congestion and pollution in the city is another issue of importance. Making pavement designs resistant to disasters and accessible for disabled people's use is a must.

4.2.3. Biodiversity

The most special place in connection with Avcılar district is the Küçükçekmece Lake and its basin, which cover an approximately 12-hectare area. This area is a protected natural area and it is between Avcılar and Küçükçekmece districts. The lake is fed by Sazlıdere, Hadımköy and Nakkaşdere rivers. The southern part of the lake is surrounded by a coast line parallel to the Sea of Marmara.

The lake ecosystem consists of agricultural areas, reed beds, scrub lands, dry shrubbery, and oak forests. In the northern part of the lake coast, artificial sand, mud plains, ponds, and reeds constitute an important living space for various bird species.

Küçükçekmece Lake has been harmed by the pollution created by the surrounding residences, industrial facilities and roads gradually increasing in the area for many years. The lake coasts were filled for the construction of the purification facility, TEM highway and settlements. The construction of connection roads with the D-100 considerably harmed the ecosystem in the area.



*Batı İstanbul Meraları = West İstanbul Meadows - Küçükçekmece Gölü = Küçükçekmece Lake

Figure 37: Küçükçekmece Lake basin key biodiversity area topography map and key biodiversity area vegetation map*⁴⁷

For example, when examined in terms of forests, expected climate change effects (temperature rise, decrease in the precipitation, increase in the storms, etc.) pose a great fire risk in İstanbul. Especially coniferous afforestation is threatened. Besides, future droughts to be caused by increased temperature and reduced precipitation may increase the harmful bugs and fungi formations.

Another expected negative effect of the climate change on forests is the increase in storms. Even today, it is known that old oaks and beeches that could not develop deep root systems because of the argillaceous soil along with especially maritime pine afforestation fall down.

Some invasive species like *Carassius gibelio*, *Atherina boyeri*, and *Gambusia sp.* are known to spread in the in the basins of lakes and dams in İstanbul.⁴⁸

Potential climate scenarios for İstanbul show that water temperature may change, water quality may deteriorate, and even some small and shallow wetlands may completely dry out. Similarly, the possibility that Küçükçekmece basin, which is very important for the bird species, gets harmed and the bird population becomes scarcer as a result poses another threat. It is though that the urban pressure exposes vulnerabilities and the pressure is expected to increase. For this reason, climate dangers are identified as high-risk in terms of biodiversity.

⁴⁷ Doğa Derneği Marmara Bölgesi Önemli Doğa Alanları (ÖDA), 2018.

⁴⁸ Çevre ve Şehircilik Bakanlığı, "İklim Değişikliği 6. Ulusal Bildirimi", Çevre ve Şehircilik Bakanlığı, 2016, Ankara.

4.2.4. Wastes

Environmental disasters such as storms, floods and inundations that will occur more frequently as a result of the climate change affect the waste management negatively. The negative effects of the climate change on waste management start with the waste collection system. The problems that may arise in the city infrastructure include the disruption of waste collection services. Another issue that will be effected by the climate change is waste storage and wastewater purification facilities. Especially in flood and inundation related disasters, there is a risk that leakages caused by the storage of dangerous wastes get mixed with the surface and underground waters.

According to the Metropolitan Municipalities Law numbered 5216 and the Municipalities Law numbered 5293, solid household wastes (garbage) collection services are provided by district municipalities. Solid household wastes collected by district municipalities are brought to the closest solid waste transfer stations and then transferred to regular storage sites and recovery facilities by İBB.

Average daily waste generation in Avcılar is approximately 425 tons.⁴⁹ The municipality, like other district municipalities, collects household wastes and delivers them to the Halkalı waste transfer station later to be directed to Seymen regular storage facility outside of the district borders.

On the other hand, there are recycling projects and separate collection operations at the source for package wastes (paper, plastic, glass and metal wastes), electronic wastes, vegetable oil wastes, waste batteries, and textile wastes conducted by the municipality. Recyclable or reusable wastes collected by companies with environmental licenses from the Ministry of Environment, Urbanization and Climate Change are first brought to collection and separation facilities with environmental licenses for separation operations and then sent to recovery facilities to be treated.

Waste collection and transfer services are mediocly affected by precipitation, floods and inundations. Similarly, cold air waves are thought to have a mediocre effect but this risk is reduced because it is expected that temperatures below 0° will be experienced less in İstanbul.

Increasing the resistance of dangerous waste management against climatic dangers is another important issue. Medical wastes created by healthcare institutions in İstanbul are collected by İBB personnel with special training and outfit with specially protected and dressed vehicles to be sent to incineration facilities. The amount of waste created in Avcılar district is 379 thousand tons.⁵⁰ Chemical wastes created by industry in the district are also classified as dangerous wastes and such chemical wastes are collected and sent to the incineration facilities by private businesses with special licenses from the Ministry of Environment, Urbanization and Climate Change.

Avcılar can reduce the risks caused by the climate change by focusing on waste collection critical infrastructure risk reduction issue with regard to waste collection in its own jurisdiction.

Generating less waste reduces risks not only for waste collection services and storage facilities but also for all critical infrastructure related to the waste sector. Avcılar Municipality's current and future operations on this issue are stated in the reduction actions section.

4.2.5. Water Resources

The great drought we suffered in 2020 reminded us once more the fact that water is the most important source of life. İstanbul's water resources depend mostly (40%) on surface waters outside the city borders and water is brought to İstanbul from cities such as Sakarya, Düzce and Kırklareli.

⁴⁹ İBB açık veri, evsel atık miktarı, data.ibb.gov.tr

⁵⁰ İBB açık veri, tıbbi atık miktarı, data.ibb.gov.tr

In addition, many sources indicate that loss and leakage rates in the water network is high.

The management of water purification systems in İstanbul is carried out by İSKİ, which is an İBB SPV. The total capacity of İSKİ's water purification facilities providing drinking water to İstanbul is approximately 4.3 million m³/day. Avcılar district drinking water network length is approximately 413 km. There is a water tank in the district with a volume of 10 thousand m³. Urban heat isle effects to be experienced in Alibeyköy, Büyükçekmece, Sazlıdere and Elmalı dams, which are relatively close to the city center, are expected to increase the average temperature of the area and as a result increase the evaporation and reduce the water presence.

Avcılar district is fed by Büyükçekmece and İkitelli drinking water purification facilities. İkitelli drinking water facility purifies the water coming from Terkos and Sazlıdere dams. Büyükçekmece purification facility purifies the water from Büyükçekmece lake.



Figure 38: Drinking water purification facilities closest to Avcılar district, İSKİ activity report, 2019*

Figure 39: Wastewater purification facilities closest to Avcılar district, İSKİ activity report, 2019

- * Büyükçekmece içme suyu arıtma tesisi = Büyükçekmece drinking water purification facility
- İkitelli içme suyu arıtma tesisi = İkitelli drinking water purification facility
- Büyükçekmece ileri biyolojik atıksu arıtma tesisi = Büyükçekmece advanced biological wastewater purification facility
- Ambarlı ileri biyolojik atıksu arıtma tesisi = Ambarlı advanced biological wastewater purification facility
- Ataköy ileri biyolojik atıksu arıtma tesisi = Ataköy advanced biological wastewater purification facility
- Küçükçekmece atıksu arıtma tesisi = Küçükçekmece wastewater purification facility
- Küçükçekmece gölü = Küçükçekmece Lake
- Büyükçekmece gölü = büyükçekmece Lake

Because of the temperature rise to be experienced especially in summers will increase the evaporation, it probable that there will be significant losses in the potential water resources. The average temperature rise, summer temperature rise, hot air waves, and days of drought are high-level risks for resources providing water to Avcılar district while excessive precipitation, winds and floods are medium-level risks due to the damage infliction on the infrastructure and water pollution. Cold air waves are identified as low-level risks because of the expected reduction in their number.

In addition to the measures to be taken with regard to water resources and infrastructure, raising awareness among the citizens about consuming less water will help reduce the pressure on the water resources by ensuring demand management.



Figure 40: Sea level rise projection in the cases of temperature increases of 2°C and 4°C⁵¹

Avcılar district has an approximately 34 ha of coastal area. The activities in the southern and western coastal areas of the district mostly focus on energy production, and residential, commercial and public areas are concentrated in these parts. Around the Küçükçekmece coastline, there is an archaeological excavation site and a natural site under protection. Although sea level rise is a long-term risk, it must be taken into consideration because it will affect the mentioned areas, their uses and the urban infrastructure.

4.2.6. Public Health

Health problems and the increase in injuries caused by extreme weather events like hot air waves, floods and inundations, and storms may reach to a point where the healthcare service capacity falls short of the need. The same weather events affecting the hospital infrastructures also worsens the situation. Access to healthy and sufficient food will also be important during potential emergencies related to drought and food security. To be prepared to such situations, it is necessary to develop separate Action Plans against these risks.

Excessive temperatures increasing the internal body temperature may damage the central nervous system. Excessive temperatures can also negatively affect the cardiovascular system of especially older citizens or cause chronic renal insufficiency due to dehydration. Increase in the air pollution may cause, again, especially in older people, health problems related to cardiovascular and pulmonary diseases.

Floods and inundations may cause vector-borne diseases originating from water sources, diarrhea, and related dehydration. Drinking water becoming saltier may negatively affect vulnerable groups such as pregnant people, children and older people.

The intensity of the ultraviolet light beams reaching earth as a result of the dilution in the stratospheric ozone is increasing. This increase causes significant increases in skin cancer and cataract cases. Conducted research proved that skin cancer is directly related to the UV lights.

Hospitals must meticulously prepare themselves for disasters beforehand. Measures must be taken in this regard against possible dangers inside and outside the hospitals and preparedness plans must be devised. In addition, considering excessive precipitation, roads that lead to hospitals must be open at all times and the infrastructure must be reviewed against possible floods. There are 4 hospitals in Avcılar with a bed capacity of 366

⁵¹ <https://sealevel.climatecentral.org>

and they answer the needs of the people in the region.⁵² However, it is important to collaborate with these institutions in accordance with the requirements and keeping these institutions and the roads leading to them open.

4.2.7. Industry

Avcılar district has 377 large and small industrial institutions. Some of them export. In addition to the fact that they might be physically affected by the climate change especially in the cases of excessive precipitation, storms and floods, they can also suffer from labor loss due to damages inflicted on the regions their personnel live and/or the transportation they use. Problems that may arise in the supply chains, communication lines and energy provision may also cause production losses and an increase in the costs. In addition to be affected by the climate change, industry also hurts the ecosystems around it with the pollution it creates. Although industrialization in Avcılar grew in the 1960s, because appropriate infrastructure (sewage, wastewater purification, etc.) was not built accordingly and the supervision conducted by the authorities was insufficient, the pollutants created by the industrial institutions were dumped into the Küçükçekmece Lake, creating bottom mud and negatively affecting the lake ecosystem.

4.2.8. Waste Management

In the last 25 years, both the temperature regime of Turkey shifted towards more temperate and hotter conditions and the frequency and severity of hot air waves significantly increased. The increase in the number of tropical and summer days and the decrease in the number of nip cases and snowy days are a manifestation of this situation. Extreme weather events like excessive precipitation, floods, inundations, thunders, lightnings and hurricanes on the one hand and problems related to the climate crisis like droughts on the other, which were already being included in Turkey's agenda, also started to be included in İstanbul's agenda.

When the yearly Meteorologic Evaluation report of the Turkish State Meteorology Service is examined, it can be seen that İstanbul has been greatly affected by the disaster related to the climate change in recent years. For example, in 2017, it is one of the cities that experienced the most floods and severe precipitation events in summer and winter months. Storms, severe storms and hails were also experienced in the same year. The most experienced meteorologic disasters are hails and lightnings in 2018 and fogs and landslides in 2019. Although 2020 is not over yet, intense droughts are being observed. All these disasters require different planning approaches towards urban infrastructure, environment and green spaces.

On the other hand, after the 1999 Kocaeli and Düzce earthquakes Avcılar is now considered as one of the most risky districts of İstanbul in this regard. In addition to the buildings constructed before the new regulations, natural gas, drinking water and wastewater infrastructures in the city are also at risk. According to the "Avcılar Possible Earthquake Loss Estimates" study issued by the İstanbul Metropolitan Municipality in the beginning of 2020, the neighborhoods that are expected to be affected by the earthquake most are Cihangir, Denizköşkler and Yeşilkent. Narrow roads in especially older neighborhoods and localities in the districts with a dense population, like Avcılar, may be closed due to collapsed buildings. This complicates and sometimes completely prevents rescue and aid operations after earthquakes.

The need to underline the earthquake issue in a study that constitutes the main pillar of the climate change arises from the fact that risk management, be it with regard to the climate change or any other disaster, must be conducted with an integrated approach. Urban renewal operations related to the earthquake risk are the backbone of the greenhouse gas emission reduction strategy and they create many opportunities within the scope of climate change adaptation studies.

⁵² <http://avcilar.gov.tr/ilcemiz-saglik-ve-sosyal-durumu>

Increasing the green areas against hot air waves, constructing buildings in the right locations or with the right technologies against possible floods and inundations, developing different car park alternatives especially in the areas with narrow roads to keep them open for disaster response issues are examples of these opportunities.

4.3. Affectibility

Taking Avcılar's social, environmental and physical features into account, certain affectible groups and areas that can be more easily affected have been identified with regard to being exposed to climatic dangers and disasters. Avcılar is the 15th most populous district of the 39 districts in the İstanbul metropolitan area. Its neighboring districts, Esenyurt and Küçükçekmece are the first two most populous districts in the metropolitan area.⁵³ Climatic disasters will directly affect the urban services and citizens regardless of the administrative borders. Although SECAP's focus on the climate change, the need to take earthquake into consideration within the scope of climate adaptation activities for disaster management is underlined because earthquake as a natural disaster is a great risk for İstanbul.

The scope of the Risk and Affectibility Assessment for Avcılar covers the dangers of hot and cold air waves, drought, severe winds, excessive precipitation, floods, landslides and sea level rise. The most affectible social groups and urban areas with regard to the mentioned climate dangers have been described through a workshop. Sociospatial analyses for identified areas must be carried out to be used in emergency action plans that will be issued within the scope of the adaptation activities.

Socioeconomic affectibilities: While affectible groups vary according to the type of climate danger, households in the conditions characterized by low standards with respect to income and quality of life and communities living in the areas at risk from flood, landslide and/or sea level rise are affected more by the disasters increased and aggravated by the climate change. Factors like age group and gender are also among the demographic characteristics taken into consideration for the identification of the affectible social groups. Economic, demographic and health-related indicators are important for identifying and defining the level of affectibilities.

Approximately 6% of Avcılar's population consists of migrants. Migrants, homeless people, older people (especially those who live alone), people with chronic diseases like upper respiratory diseases and allergies, women, children and disabled people are the prominent groups in the society with regard to affectibility by climate disasters. In the development index, Avcılar is ranked 30th out of 39 districts within the metropolitan area (Mahallem İstanbul, 2016). Among the neighborhoods in Avcılar, the residents of Yeşilkent and Firuzköy are the ones to be affected most by the effects of the climate change in respect of their socioeconomic level.

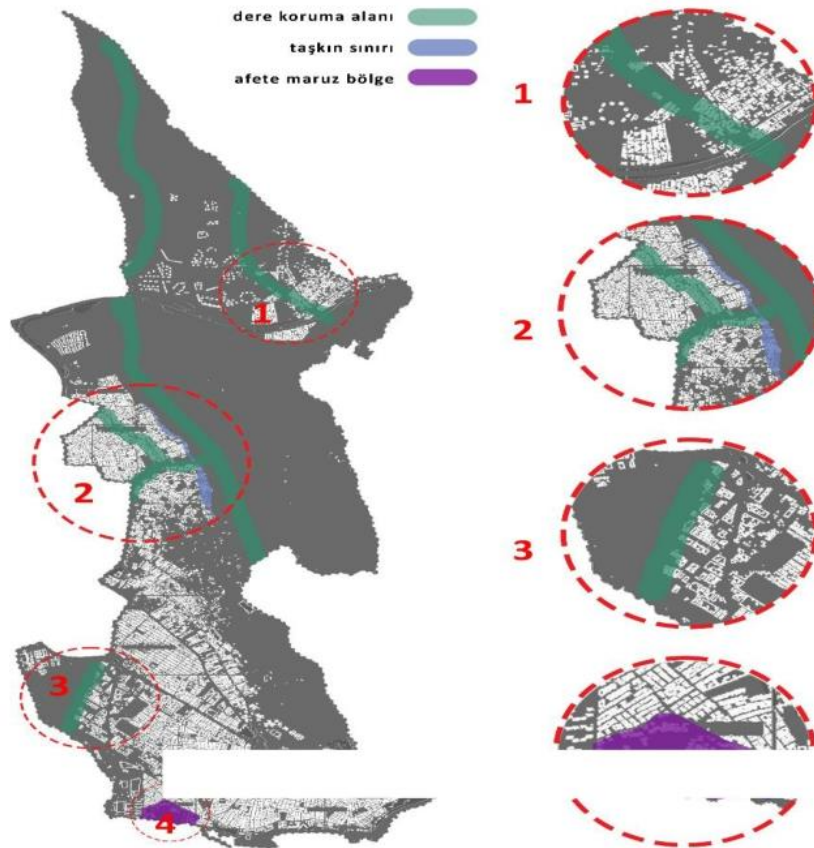
Physical and environmental affectibilities: Densely settled and populated areas with with intense urban activities are the places where urban heat isle effects are felt most.

⁵³ Among the most populous districts, Esenyurt is in the 1st place in 2019 with its population of 954,579. Küçükçekmece is 2nd with 792,821. Avcılar is in the 15th place with 448,882 people. (<https://www.nufusu.com/ilceleri/istanbul-ilceleri-nufusu>)

Because the city center is an area where transportation and commerce activities are intense, Kemalpaşa neighborhood that includes densely settled areas and Yeşilkent neighborhood with a very little green space presence are the areas that are most affectible by the urban heat isle effects.

Water cycle and biodiversity of the protected natural areas are defined as natural areas that are most vulnerable to pressure and effects due both to the climate change and upper scale planning decisions. It has been identified that sea level rise risk is present, although low, for the district with a 34 ha coastal area. There is an area in the south part of the district, in Ambarlı, facing the risk of landslide with increased affectibility due to climatic events such as excessive precipitation and storms.

Flood and inundation instances that may occur due to excessive precipitation affect both urban infrastructure and services and citizens. Therefore, completing necessary preparations with regard to sustainable urban drainage and disaster emergency action plans included in the adaptation activities is important. Buildings on the river protection areas, buildings with residencies under inundation level, and areas with identified inadequacies in rain water and sewage infrastructure are affectible elements by the mentioned climate dangers.



* dere koruma alanı = river protection area
 taşkın sınırı = flood limit
 afete maruz bölge = disaster-prone area

Figure 41: Settled areas within the limits of risky zones*

4.4. Climate Change Adaptation Activities

The climate change adaptation activities include investment projects, policy measures, plans and strategies, activities aiming at behavioral shift towards a sustainable lifestyle, and activities aiming at capacity increase through education.

4.4.1. Urban Heat Islands and Green Spaces

a. Urban Heat Isle Effect and Green Spaces

İstanbul Metropolitan Municipality 2020-2024 Strategic Plan states the “conducting urban renewal services through transparent and participatory methods” target under its first strategic purpose “creating a resilient city by developing quality and functional living spaces.”⁵⁴

Avcılar district consists of 10 neighborhoods and has a population of 448,882 people. The district has 27,581 buildings, 172,538 households and 24,045 shops. There are a total of 7948 risky structures in the district.⁵⁵ It is a settlement where urban renewal works are being carried out intensively. Target 6.1 “building living spaces that extend modern architecture, protecting the cultural urban memory” is stated under the sixth strategic purpose “enriching the living spaces by modernizing them against natural disasters” in the strategic plan devised by Avcılar Municipality covering the years 2020-2024. In accordance with this target, for five years, “identifying risky areas and devising the urban renewal plan” description is given in the performance indicators 6.1.2.⁵⁶ Inspecting the construction of new buildings to ensure that they are constructed in accordance with the regulations is important. 993 thousand buildings in Avcılar were assessed in terms of urban renewal until September 2020. The neighborhoods with the most buildings renewed are Cihangir, Denizköşkler, Mustafa Kemal Paşa, Gümüşpala and Merkez neighborhoods.

Target 3.3 in the İstanbul Metropolitan Municipality 2020-2024 Strategic Report is described as “creating sustainable green spaces and increasing the active green space area per person” under the heading “strengthening sustainable environment and energy management” which is the third strategic purpose related to the green spaces. In the current strategic plan of Avcılar Municipality, “creating areas for physical activity and sports purposes in the parks, recreational areas and green spaces in the district” target is included. Within this scope, developing a livable superstructure in public areas is possible.

b. Biodiversity

The most special place in connection with Avcılar district is the Küçükçekmece Lake and its basin, which cover an approximately 12-hectare area. The lake ecosystem consists of agricultural areas, reed beds, scrub lands, dry shrubbery, and oak forests. The lake has been being harmed by the pollution caused by increasing residential buildings, industrial facilities, and roads around it. Lake coasts were filled for purification facility construction, TEM road construction and settlements. The construction of D-100 and connection roads greatly harmed the ecosystem in the area.

Cephalaria tuteliana, a plant species endemic only to Avcılar in the world is threatened because of intense constructions and change in the climatic conditions.

⁵⁴ İBB Stratejik Plan, 2020-2024, s.91.

⁵⁵ Avcılar belediyesi, “Avcılar Modeli-Kentsel Yenileme Projesi”, AVBEL Kentsel Yapı Tasarım A.Ş., 2020.

⁵⁶ Avcılar Belediyesi, Stratejik Plan, 2020-2024, s.83.

This species was attempted to be protected and promoted through partnerships between the ministry and the university. The location of Avcılar district is also important for the bird population. Various efforts are being carried out in this matter through the bird ringing station in the İstanbul University Avcılar campus.

Sector Target: To prevent or mitigate the effects of the climate change, attempts are being made to improve urban quality of life through developing activities targeting green spaces. Activities targeting green spaces are important for adaptation to the climate change in terms of their positive effects on biodiversity, public health, air quality and water cycle. Within this scope, activities targeting green spaces aim to mitigate the urban heat isle effects, increase the area of green spaces and forming green corridors.

Number of Activities: 7 main activities; 12 activities in total

Activity 1	Afforestation of river bed surroundings, integration of green and blue infrastructure	
Current Situation/Goal	Performing the relevant activity within the scope of river protection areas within city borders, Afforestation and connecting the area with other green spaces in the region through green space creation activities.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.5	
Type of Activity	Investment project (public)	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, DSİ, Provincial Environment and Urbanization Directorate
	Municipality Contribution	Facilitating the relevant activity by collaborating with the relevant stakeholders.
	Timeline	2021-2030
Related Sectors	Buildings, Green Spaces, Biodiversity, Water Management, Public Health	

Activity 2.1	Developing green infrastructure strategies according to future scenarios created within the frame of climate change adaptation	
Current Situation/Goal	The area of green spaces in the district is far below the standards. The district makes use of open public areas as green spaces (42.52 ha). Küçükçekmece Lake and the green belt that formed in its surroundings is considered as an important potential for the district. Taking the lake's ventilation corridors on the migration routes of birds into consideration is important. It is indicated that landscape projects in the filling area reserved for the green space need are below the standards.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.5, Target O4.1	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Green Spaces, Biodiversity, Water Management, Public Health	

Activity 2.2	Developing strategies to detect the opportunities with regard to increase the interconnection between the green spaces.	
Current Situation/Goal	The presence of currently unsettled areas within district borders is a convenience for the area in terms of green space problem. The areas planned to be developed as green spaces are thought to be insufficient even including those added with the plans, because government-owned areas are not large enough. It is important to carry out operations with regard to the relevant activity for the creation of green corridors.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.5, Target O4.1	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Green Spaces, Public Health	

Activity 2.3	Creating green rings in neighborhoods to increase accessibility and connectivity of green spaces (e.g. designing bicycle roads and passive and active green spaces integrally)	
Current Situation/Goal	Designing and implementing pedestrian roads and bicycle roads integrated with the “Funicular Line” that connects “Bakırköy-Beylikdüzü Rail System Line” with E5 and coastal road, reflected in the municipal zoning plans as an upper scale plan decision. Organizing these areas within the scope of green infrastructure strategy.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.5	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity within the local government jurisdiction
	Timeline	2021-2025
Related Sectors	Energy, Transport, Green Spaces, Public Health	

Activity 2.4	Taking tree inventory that includes assessments related to their effects on noise and air quality	
Current Situation/Goal	Including information regarding the characteristics of the plants that help mitigate the negative effects of the climate change in the inventory that will be produced about green spaces.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.1, Target O3.5	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Green Spaces, Biodiversity, Public Health	

Activity 2.5	Locating potential afforestation areas, afforestation and use of natural/local plant species consistent with the ecosystem	
Current Situation/Goal	Contacting governmental institutions and organizations along with civil society organizations such as TEMA to conduct the activities for increasing the green space presence in the district is aimed with this activity.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.5	
Type of Activity	Plan/Strategy, Investment project (public)	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Regional Forest Directorate, Provincial Environment and Urbanization Directorate
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Biodiversity, Green Spaces, Land Use, Public Health	

Activity 2.6	Planting plant species consistent with the ecosystem in unused areas	
Current Situation/Goal	Carrying out ongoing planting operations in unsettled areas, taking consistency with the ecosystem and the climate change (drought, increasing greenhouse gas emissions) into consideration.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.1, Target O3.5	
Type of Activity	Investment Project (public)	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Provincial Environment and Urbanization Directorate
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Green Spaces, Biodiversity, Public Health	

Activity 3	Light-colored materials and green roof applications in flooring, buildings and facilities, water use in public areas	
Current Situation/Goal	Use of light color and permeable materials in ground coverings in busy locations and municipal buildings and facilities for mitigating urban heat island effects. Mitigating the effects of high temperature by creating water surfaces in public areas.	
Relation to Current Plan(s)	İDEP 2011-2023, Target UİS1.2, Target U2.2, Target O3.1	
Type of Activity	Investment project (public), investment project (private)	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity
	Timeline	2021-2030
Related Sectors	Buildings, Energy, Green Spaces, Public Health	

Activity 4	Identifying criteria for urban renewal and spatial planning taking UHI effect into consideration, setting standards for the amount of green space area in new development areas	
Current Situation/Goal	Urban heat isle effects must be taken into consideration in the implementation of plan decisions and urban design projects that affect the building and population density. Due to the presence of currently unsettled areas in the district, the green space standards must be revised taking the climate change into consideration and the revised standards with increased green space areas must be met in these unsettled areas.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O3.1, Target UİS 1.2	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Provincial Environment and Urbanization Directorate
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Buildings, Land Use, Green Spaces, Public Health	

Activity 5	Creating and commonizing PARKLETS	
Current Situation/Goal	The local government has already identified several areas for PARKLET applications. Application operations are ongoing. It is important that data related to issues such as air quality and temperature is included in the certain sociospatial analyses with the purpose of commonizing PARKLETS. These areas will provide a shading and, although small in scale, a green space for the citizens.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O4.1	
Type of Activity	Investment Project (public)	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity on the roads within local government borders
	Timeline	2021-2030
Related Sectors	Green Spaces, Public Health	

Activity 6	Operations related to invasive species and their monitoring	
Current Situation/Goal	There are important areas within district borders classified as protected natural areas. These areas must be studied to conserve their sustainability against the effects of the climate change and urbanization. Aquatic and terrestrial ecosystems changing due to the increase in temperature may cause the spread of invasive species in fauna and flora. Therefore, operations are being conducted to monitor the presence of biodiversity. Collaborating with various organizations, research institutions and universities on this matter is important.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.1, Target O3..5	
Type of Activity	Plan/Strategy, investment project (public)	
Delivery Plan	Incharge	Avcılar Municipality

	Stakeholders	İstanbul Metropolitan Municipality, Provincial Agriculture and Forestry Directorate, Regional Forestry Directorate, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2030
Related Sectors	Buildings, Energy, Green Spaces, Water Management, Public Health	

Activity 7	Organizing social projects/campaigns that encourage civil society participation in the green space maintenance and renewals	
Current Situation/Goal	The local government conducts landscaping operations to plant unused areas in order to increase the green space area in the district. Carrying out social projects to raise awareness about the maintenance and conservation of these areas is important.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O4.2	
Type of Activity	Behavioral	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity
	Timeline	2021-2030
Related Sectors	Green Spaces	

4.4.2. Water Management

According to the OECD Environmental Assessment Report, Türkiye has made progress in water management. Approximately 40% of the water sources of İstanbul originate from surface waters outside the city and are brought to İstanbul from cities like Sakarya, Düzce and Kırklareli. In addition, many sources indicate that loss and leakage rates in the water network is high. In this regard İBB Strategic Plan (2020-2024) emphasizes the need to focus on greywater projects and reuse of wastewater.

Target 6.2 in the Avcılar Municipality 2020-2024 strategic plan is described as “improving the livable infrastructure and superstructure in the public open areas.” With regard to water management, some prominent contents of this target include increasing the length of rainwater canals and increasing the irrigation rate of trees. Seasonal tree plantation and the maintenance of all plants’ in and around the parks, gardens, roads and streets that involves pruning, fertilization, irrigation, etc. is included as an activity.⁵⁷ Because the temperature increases, especially in summer seasons, will increase the evaporation rate, it is possible that water resources potentially will suffer significant losses. Average temperature rise, summer temperature rise, hot air waves, and days of drought are considered as high level risks for Avcılar’s water resources, excessive precipitation, winds and floods are considered as medium level risks because of the potential damage on the infrastructure and water pollution.

⁵⁷ Avcılar Belediyesi Stratejik Plan, 2020-2024, s.87.

Sector Target: The targets are protection and efficient use of water resources for sustainability, improvement of urban drainage systems against water-induced disasters, and preparedness with the help of disaster emergency plans. In addition to rainwater storage and utilization systems against water scarcity, measures to reduce the water consumption on the household scale are aimed to be implemented. **Number of Activities: 7 main activities, 10 activities in total**

Activity 8	Reducing impermeable surfaces (e.g. Permavoid – hold, store and reuse water)	
Current Situation/Goal	It is important to increase the share of permeable surfaces to achieve sustainable urban drainage, prevent inundations caused by excessive precipitation and help the fertilization of the soil with minerals.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US3.1, Target US3.2, Target US4.1, Target US4.2	
Type of Activity	Investment Project (public)	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Provincial Environment and Urbanization Directorate
	Municipality Contribution	Performer of the activity within the local government jurisdiction, collaborator to other organizations and institutions in other areas
	Timeline	2021-2030
Related Sectors	Water Management, Public Health, Disaster Management	

Activity 9	Rainwater management storage system implementations	
Current Situation/Goal	Water scarcity is a serious threat for the Marmara Region which includes İstanbul. Therefore, the building level of rainwater storage systems are aimed to be planned in connection with underground and green spaces with the purpose of taking full advantage of water resources and using them efficiently.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US3.2, Target US4.1, Target US4.2	
Type of Activity	Investment project (public, public&private)	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Water Management, Public Health, Disaster Management	

Activity 10	Organizing awareness-raising activities about drinking water and sea water management for businesses, industries and general public	
Current Situation/Goal	Organizing events and informing activities that will raise awareness about efficient resource use and waste management in urban operations where great amounts of water are used. Increasing frequency of related supervisions and their follow-up.	

Relation to Current Plan(s)	İDEP 2011-2023, Target US2.1, Target US3.2	
Type of Activity	Educational	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Chamber of Commerce, Chamber of Industry, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2030
Related Sectors	Water Management, Industry	

Activity 11.1	Integrating proper wastewater and rainwater management principles with the building and planing regulations.	
Current Situation/Goal	Avcılar is the 15 th most populous of the 39 districts of İstanbul. It is contiguous with the two most densely populated districts in the metropolitan area. In terms of water scarcity the area where the district is situated includes the people that will be affected most by this possible threat across the city. Therefore, wastewater and rainwater management issue must be immediately addressed with regard to planning, regulation and implementation.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US4.1	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Water Management	

Activity 11.2	Providing households with products for less water consumption (faucet caps) and making it obligatory with regulations	
Current Situation/Goal	Measures towards reducing the water consumption and use of technologies that reduce the water consumption in residences are important steps. In this regard, the district municipality must lead by example to distribute low-flow faucet caps with aerators that may help achieve 15 to 50% reduction in water consumption with low costs as a part of this activity.	
Relation to Current Plan(s)	İDEP 2011-2023, Target UİS 1.1, Target US4.1	
Type of Activity	Investment project (public), Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Water Management	

Activity 11.3	Raising awareness about reducing water and energy consumption	
Current Situation/Goal	Avçılar Municipality has detected a need to implement measures for reducing the water consumption in residences and raising awareness in the households about reducing the water consumption. This activity covers the planning and implementing awareness-raising programs towards reducing the water and energy consumption.	
Relation to Current Plan(s)	İDEP 2011-2023, Target UİS 1.1, Target US4.1	
Type of Activity	Behavioral, Education	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Water Management	

Activity 12.1	Revising current design and application standards to increase the efficiency of new infrastructure lines	
Current Situation/Goal	Conveying local needs on remedying the infrastructural deficiencies to relevant organizations and institutions is important in terms of improving the current systems. The goal of this activity is contributing to the reinforcement of the urban infrastructure, identifying the infrastructures that are threatened by the climatic dangers in light of local government actions on this matter.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US4.1	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Universities, Professional Chambers
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Water Management, Disaster Management	

Activity 12.2	Enhancing the current water management infrastructure, arranging and implementing maintenance programs	
Current Situation/Goal	Identifying the needs related to the water infrastructure across the district in cooperation with the relevant organization taking the climate change into consideration, collaborating towards performing the necessary actions.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US3.1, Target US3.2, Target US4.1, Target US4.2	
Type of Activity	Investment project (public)	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, İSKİ
	Municipality Contribution	Collaborator and facilitator to the relevant stakeholders who will perform the activity
	Timeline	2021-2030

Activity 12.3	Incorporating sustainable urban drainage principles into all current and planned public buildings	
Current Situation/Goal	The sustainable urban drainage issue must be considered based on its aspects such as circular economy, waste and wastewater management, water resources management, and resilient urban infrastructure. The aim of this activity is incorporating sustainable urban drainage principles and, in this context, nature-based solutions into the planning, regulations and implementations in mentioned areas within local government’s jurisdiction.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US4.1	
Type of Activity	Plan/Strategy, Investment Project (public)	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2030
Related Sectors	Water Management	

Activity 13	Reinforcing the discouraging/encouraging effects of punishment and reward systems for the pollution and protection of water resources	
Current Situation/Goal	This activity aims at supervision of and follow-up on urban functions such as industry and commerce operating in the Avcılar district to ensure their correct use of water resources.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US3.1, Target US3.2	
Type of Activity	Execution and sanction	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, İSKİ
	Municipality Contribution	Facilitator for the performance of the activity
	Timeline	2021-2025
Related Sectors	Water Management	

4.4.3. Disaster Management

a. Disaster management

İstanbul’s **heat isle** map demonstrates that heat isles in İstanbul are clustered mostly in the densely settled parts of the districts such as Esenler, Bağcılar, Küçükçekmece, Güngören, and Zeytinburnu, in addition to Barbaros Avenue and the following Büyükdere Street, parts of Maltepe and Kartal districts over the E5 road, and partly Üsküdar district. Although Avcılar is fortunate in that it is a coastal district, it is among the districts that are thought to severely suffer from urban heat isle effects due to the dense settlement in its central area and scarcity of green spaces in the district. Green spaces have an important role in mitigation and prevention strategies against urban heat isle effects due to their natural cooling functions through evaporation and evapotranspiration.

Therefore, within the scope of adaptation strategies, green systems and intraurban waters must be planned with an approach that involves the goal of mitigating the urban heat isle effects.

Flooding, which is basically a natural phenomenon, is considered as a disaster due to the significance of the losses it causes. Although floods' disastrous consequences are a result of human actions, it can be said that the factors listed below affect their magnitude and occurrence. Only first two factors listed below are natural while the rest are related to human actions.

- Physical magnitude of flood
- Land's vegetation and topography
- Distance to settlements
- Poverty and underdevelopment
- Rapid population growth, unsupervised industrialization
- Harm to the environment
- Illiteracy and society's methods for fighting disasters

On the other hand, risk management bears extra importance for flood risks because flooding is a much more predictable phenomenon compared to other natural disasters. Within this framework, risk management, defined as "identifying dangers and their probability of occurrence, predicting them, identifying the risk mitigation measures for them and taking actions that will mitigate the dangers" corresponds with flood phenomena. In addition, the condition for successful risk management is reducing the risk to an acceptable level while success in risk management for floods can even be defined as completely eliminating the risk. Because the cause of an urban flood is mostly insufficient rainwater drainage or sewage system, what increases the risks for human health is flood water mixing with the sewage water besides the cost of the harm done to the properties⁵⁸. İstanbul Fire Department Avcılar Directorate participating in the organized workshop stated that events that are classified as inundations, rather than intensive floods, take place in Avcılar district.



Floods as a result of sudden heavy rains in densely settled areas where impermeable surfaces are prevalent and the **sea level rise** that is expected to increase in speed are among the common problems of İstanbul. These floods become disasters based on several factors. As a result of the flood in June 2020, it was observed that coastal sand in Avcılar district poured out, coastal roads were inundated due to clogged sewer holes, and some roads even collapsed. New applications such as shifting to combined drainage grating use is becoming more common in areas with these types of problems. Other frequently encountered measures include applications of creating recreational areas or rain gardens where rainwater can be accumulated and used when needed.

Because forest areas in the densely settled district are sparse, forest fire risks in the district is low. According to the İstanbul Fire Department Statistics, 90% of the fires that broke out were human-induced⁵⁹. However, a matter that should be dealt with within the scope of disaster management is two-sided parking habit issue that negatively affects the response time of fire department vehicles. As a result of two sided-parking, especially in the district center where roads are narrow, fire department vehicles have difficulty responding emergencies.

⁵⁸ Kadiođlu M, "Kent Selleri", Marmara Belediyeler Birliđi, s.183

⁵⁹ http://itfaiye.ibb.gov.tr/img/_14442614122020_.pdf

Car parking issue which also holds importance in terms of sustainable transportation must be solved through underground car parks via urban renewal and multistorey car parks in busy areas in addition to raising awareness among the citizens to ensure behavioral changes.

Activities identified below are mostly relate to the climate change within the scope of the action plan being prepared. However, it is critical to evaluate all disasters in an integrated manner with a general risk management approach. While this renewal is taking place in a district where earthquake threat is constantly being discussed and urban renewal is always a popular topic, excluding other disasters would be an approach that is far from completely solving the issues in the city. It is necessary to consider whether flood/inundation risks in urban renewal areas are high and solutions must be produced beginning from the designing stage. In this regard, a method lately being used by the city governments and councils for mobilizing stakeholders is declaring “**Climate Emergency**”. The declaration of a climate emergency by the authorities can be a strong catalyst for actions across the society if it is accompanied by a clear action plan.

People expect a declaration of emergency in case of a life-threatening event and they hesitate to take action if no one else seems to be taking the threat seriously. A leader of the society saying that the climate change poses an important risk and volunteering to take action on this matter is an important step to mobilize everyone else.

Oxford Dictionary that traditionally chooses the word of the year each year chose “climate emergency” as the word of the year for 2019.

b. Public Health

Excessive temperatures related to the climate change increasing internal body temperature may cause damage to central nervous system. It also pressures especially older citizens’ cardiovascular systems and may cause chronic renal insufficiency due to dehydration. Increasing air pollution is also said to be causing cardiovascular and pulmonary diseases, again especially in older people. With the increasing temperatures due to the climate change, the need to take special precautions for vulnerable groups living in Avcılar district becomes prominent.

Sector Target: The target is to develop a concrete action plan, identify areas and social groups to be affected by the risks, identify and follow up the needs on this matter, and inform the citizens to increase the settlement’s resilience against climatic disasters and establish preparedness for current and potential future risks arising from climatic dangers.

Number of Activities: 8 main activities, 14 activities in total

Activity 15.1	Identifying affectibility by weather events such as excessive temperature, excessive precipitation, storms and hurricanes and developing a disaster management plan
Current Situation/Goal	Türkiye spans a wide geographical area that includes regions with different climates. Due to its geographical location and its sensitivity to atmospheric conditions, meteorologic and hydrologic disasters most prominently including storms, floods, droughts, hails and strong snowstorms occur very frequently and cause significant loss of lives and property. Most recent meteorologic dangers in İstanbul were mentioned in the risk assessment section. (Section 4.2)

	<p>Scientific studies conducted in our country also warn us all against temperature increase, changes in regional precipitation regimes, increase in drought risk, increase in continuous precipitation amounts despite the decrease in total precipitation amounts and related potential disasters⁶⁰. Action Plans for sudden floods and hot air waves must be developed with the participation of many institutions. Actions listed below must be taken in coordination with the stakeholders:</p> <ul style="list-style-type: none"> • Detecting sudden climatic events by stage or by region (neighborhoods or higher resolutions) • Raising awareness among the public • Taking precautions against insects and disease carriers • Developing early warning systems. (activity 15.6) <p>In this regard, Town Houses and Youth Centers in various neighborhoods can be utilized, billboards and active social media accounts can be used for this purpose and early warning systems based on SMS notifications can be developed for people who don't use smartphones. For the implementation of these measures, identifying affectible areas and developing separate plans for each of them is necessary.</p>	
Relation to Current Plan(s)	<p>İDEP 2011-2023, Target US1.1 İDEP 2011-2023, Target UT2.2, Target UT5.1, Target UT5.2 AFAD 2019-2023, Target H2.1, H2.2, H2.3, H2.4, H3.4</p>	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	Provincial Meteorology General Directorate, İBB Disaster Coordination Center, AFAD, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Disaster Management, Public Health	

Activity 15.2	Identifying the extent to which urban infrastructure and building stock will be affected by potential hurricane, storm and excessive precipitation events
Current Situation/Goal	<p>Risky buildings have been being studied at intervals since 1999 İzmit earthquake and, Avcılar is among the districts where these studies have been conducted because it is considered as a high-risk district. The study conducted by İBB in 2020 was cited in various sections in the relevant report. It is stated that 10% of the buildings in the district were built before 1980 and 53% of them were built in between 1980 and 2000. Various renewal models related to the earthquake risk in the city are being examined in parallel with these studies.</p> <p>From this point on, the necessity to implement improvements by determining the infrastructure and building stock that is likely to be damaged by the dangers and disasters caused by the climate change and taking risks that were identified with the maintenance and repair works into consideration in the works to be carried must be kept in mind. This activity must be performed in coordination with the previous one and it is important to identify the affectible areas in the action plans' stages of development.</p>

⁶⁰ Climate Change Projections for Turkey: Three Models and Two Scenarios, Mesut DEMİRCAN1 , Hüdaverdi GÜRKAN1 , Osman ESKİOĞLU1 , Hüseyin ARABACI1 , Mustafa COŞKUN, Turkish Journal of Water Science and Management

Relation to Current Plan(s)	İDEP 2011-2023, Target UA1., Target O4.1	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	Provincial Meteorology General Directorate, İBB Disaster Coordination Center, AFAD, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Buildings, Disaster Management, Public Health	

Activity 15.3 15.7, 15.4, 15.5, 15.8	Developing a “UHI Emergency Action Plan”, taking urban heat isle risk maps, identified infrastructure needs and affected groups into consideration	
Relation to Current Plan(s)	<p>The hot air waves, characterized by 5 consecutive days of higher temperature than seasonal average temperatures, occurring frequently in the recent years, have been negatively effecting human health severely. Related casualties, especially of older people, are numerous especially in Europe. While there is no statistical information on the issue in Türkiye, problems have arisen in the areas where urbanization is intense, due to increasing temperatures. To minimize these effects, it is important to support the cities’ green and blue spaces and reduce the felt temperature. Several activities have been described in this regard under the green spaces section.</p> <p>Issues that must be considered for the development of the action plan related to Urban Heat Isle effects are listed below:</p> <ul style="list-style-type: none"> • Informing and educating citizens about the negative effects of hot air waves on human health and related symptoms • Identifying the areas where healthcare services will be provided in advance in case the number of people affected by the heat wave events exceeds the capacity of hospitals and healthcare centers • Completing necessary arrangements for transferring healthcare professionals from other healthcare centers to increase the healthcare service capacity in areas where UHI effects are felt more intensely during heat wave events are experienced • Carrying out public informing activities to raise awareness about the action plan to be implemented by the government in a potential heat wave event 	
Relation to Current Plan(s)	İDEP 2011-2023 Target UA1.1, Target UA1.2, Target UA2.3, Target UİS1.1, UİS 1.2, UİS2.2 AFAD 2019-2023, Target H1.1, Target H1.2, Target H1.3, Target H1.4, Target H3.5, Target H4.1, Target H4.2, Target H4.3, Target H4.4, Target H2.1, Target H2.2, Target H2.3, Target H2.4, Target H3.4	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality

	Stakeholders	Provincial Health Directorate, District Health Directorate, Provincial and District National Education Directorate, Universities, İBB Disaster Coordination Center, AFAD, Provincial Meteorology Directorate
	Municipality Contribution	Implementer
	Timeline	2021-2025
Related Sectors	Buildings, Disaster Management, Public Health, Critical Infrastructure	

Activity 16	Identifying flood risks on all plan stage scales and drawing flood risk maps, (e.g. flood walls, ditch, diversion canal, detention dam etc.)	
Current Situation/Goal	<p>Higher resolution research conducted in the recent years show that the coastal part of Avcılar is at risk in the long term⁶¹.</p> <p>There are certain special challenges today to reducing the intraurban floods. First, the lack of permeable soil and materials makes cities especially vulnerable against sudden floods that may occur very rapidly on a small scale. Because urban floods are generally caused by insufficient rainwater drainage or a sewage system, the risks on human health increase due to flood water mixing with the sewage water in addition to damage inflicted on property.⁶² Besides the prominent solutions listed below that will mitigate the risks, the solutions specific for Avcılar context must be researched:</p> <ul style="list-style-type: none"> • Identifying risky areas • Preventing illegal settlements • Creating alternative rainwater collection line routes to lighten the rainwater load on rivers • Preferring permeable materials on firm ground surfaces (pavements, main roads etc.) • Creating rain gardens in areas where it is deemed necessary 	
Relation to Current Plan(s)	İDEP 2011-2023, Target UA1.1 AFAD 2019-2023, Target H2.1, Target H2.2, Target H2.3, Target H2.4, Target H3.4	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Provincial Environment and Urbanization Directorate, Turkish State Meteorological Service, Provincial Agriculture and Forestry Directorate, Ministry of Agriculture and Forestry, DSİ, İBB Disaster Coordination Center, AFAD, Universities, İstanbul Main Fire Department
	Municipality Contribution	Facilitator for the performance of the activity, helping stakeholders work on the subject
	Timeline	2021-2025
Related Sectors	Disaster Management, Public Health	

⁶¹ <https://www.bbc.com/turkce/haberler-turkiye-50788891>

⁶² Kadioğlu M, "Kent Selleri", Marmara Belediyeler Birliği, s.183

Activity 17	Identifying areas at landslide risk due to excessive precipitation and storm, identifying preventive and recovery measures for these areas	
Current Situation/Goal	After the sliding ground movements occurring in 2004, the buildings in Avcılar were damaged. An area in Ambarlı neighborhood was declared as disaster area in 2005. Again in 2005, areas that were not fit for settlement, areas fit for settlement with measures and areas that need to be closely examined were identified through detailed studies. Ministry of Public Works at the time made destruction decisions in several areas. ⁶³ Identifying all areas at landslide risk, starting with the ones where the risk is known, including those that may be threatened as a result of excessive precipitation and undischarged waters, and conducting studies to take necessary measures is necessary to create a city resistant to the climate change.	
Relation to Current Plan(s)	İDEP 2011-2023, Target UA1.1 AFAD 2019-2023, Target H2.1, Target H2.2, Target H2.3, Target H2.4, Target H3.4	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Provincial Environment and Urbanization Directorate, Provincial Agriculture and Forestry Directorate, Ministry of Agriculture and Forestry, Turkish State Meteorology Service, İBB Disaster Coordination Center, AFAD, Universities
	Municipality Contribution	Performer of the activity in coordination with the relevant stakeholders
	Timeline	2021-2025
Related Sectors	Disaster Management, Public Health	

Activity 20 (Activities 19 and 18 added as sub-activities)	Developing monitoring methods and tools
Current Situation/Goal	National and international climate change scenarios are being developed and related possible dangers are being identified. However, the problem being multifaceted leads to different results of these scenarios where potential events happen at faster or slower rates. Therefore, supporting qualitative risk assessments with quantitative studies as much as possible is important for taking right measures at right times. Continuously monitoring the various indicators shown in the monitoring plan section with regard to the city and adding or removing indicators according to the changing needs is an important step for increasing the resilience of the city. For this reason, it may be useful to create a Climate Adaptation Indicator Table (Green Indicator Table) which allows an efficient monitoring process and sharing the information with decision makers, researchers and citizens.

⁶³ İstanbul Avcılar ilçesi Ambarlı mahallesi güneyindeki Zemin hareketlerine yönelik (Ayrıntılı Jeolojik Jeoteknik) Duyarlılık Etüdü çalışması, ELC Group Mühendislik ve Müşavirlik Ltd. Şti., Mart 2005, İstanbul

	<p>Indicators transparently shared with the stakeholders will have a dramatic impact on both raising awareness and making the citizens a part of the solution.</p> <p>Indicators may be limited to the jurisdiction of a district municipality or to the extent of accessible data, just as an environment may be created to enable the future monitoring of the indicators especially related to increasing the adaptation capacity. Creating guides about measures for which the municipality acts as a facilitator, ensuring the integration of an advisory board that includes the city council and CSOs might be an important step to raise awareness among citizens.</p>	
Relation to Current Plan(s)	İDEP 2011-2023, Target UYK1.2, Target Y2.1, Target Y6.1 İDEP 2011-2023, Target UYK 1.4, Target Y5.2	
Type of Activity	Investment project (public), education	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Universities
	Municipality Contribution	Developing relevant tools in collaboration with İBB as the performer of the activity
	Timeline	2021-2025
Relevant Sectors	All relevant sectors	

Activity 15.9	Developing a shading strategy for green spaces	
Current Situation/Goal	The activity, which must be considered together with the Green Infrastructure Strategy, involves identifying areas suffering problems related to air quality such as humidity and pollution and developing strategies that will guide the greening activities for these areas in addition to other areas where UHI effects are experienced. This shading strategy will aim to identify which sub-areas in urban environments have what type of needs. Other matters that will be included in the scope of this activity can be listed as providing services in the central area where human movements are intense, without interruption due to negative effects of increased summer temperature and precipitation, mitigating UHI effects, and positively affecting the air quality.	
Relation to Current Plan(s)	İDEP 2011-2023, Target O2.1, Target O3.5	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avçılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Provincial Environment and Urbanization, Universities
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Green Spaces, Disaster Management, Public Health	

Activity 21	Identifying or developing integrated strategies that can be employed compatibly with climate adaptation strategies within the current strategies. Integrating climate adaptation strategy to Disaster and Emergency Plans
Current Situation/Goal	Climate adaptation activities aim at minimizing the effects of the climate change on the resilience of urban infrastructure, sustainability of urban services, and the social structure, in addition to preventing or reducing related risks.

	Therefore, they must be considered, designed and implemented together with urban strategies. This activity includes identifying the activities in the existing urban strategies and plans that will work integrally with the climate adaptation activities, extending the scope of existing Disaster and Action Plans to include the climate change and climatic dangers, and integrating them.	
Relation to Current Plan(s)	İDEP 2011-2023, Target US1.1	
Type of Activity	Plan/Strategy	
Delivery Plan	Incharge	Avcılar Municipality
	Stakeholders	İstanbul Metropolitan Municipality, Universities, İBB Disaster Coordination Center, AFAD
	Municipality Contribution	Performer of the activity
	Timeline	2021-2025
Related Sectors	Disaster Management	

4.5. Adaptation Score Chart

By signing the Covenant of Mayors (CoM) in 2021, Avcılar Municipality will accelerate its operations on the fight against the climate change challenges. The municipality developed its Sustainable Energy and Climate Action Plan (SECAP) as part of its strategies aiming to mitigate the negative effects of the climate change on cities and reduce the greenhouse gas emissions. Avcılar District has started to operate and work on these matters with the completion of its SECAP. The Adaptation Score Chart assesses the current situation of Avcılar Municipality with regard to its targets, with a view to making progress and achieving its goals in fighting against the climate change challenges through the implementation of its SECAP activities.

Within the scope of the Adaptation Score Chart, the level of progress of several activities identified by the CoM for adaptation to the climate change is assessed.

Status Measure	Status	Completion Level as Indicator
D	Not started yet or starting	0-25 %
C	Progress made	25-50 %
B	Advanced	50-75 %
A	At a leading level	75-100 %

Table 21: Avcılar Municipality Adaptation Score Chart, assessment within the scope of the Covenant of Mayors

Steps	Activity	Status Assessment
	Existence of identified/integrated commitments in the local climate policy	A
	Identifying human, technical and financial resources	C
	Existence of a designated adaptation operations team (officials) within municipality and clearly designated responsibilities	B
	Establishing horizontal (between departments) coordination mechanisms	D

Step 1: Laying the groundwork for adaptation "STRATEGY"	Establishing vertical (on different government levels, between institutions (central-local)) coordination mechanisms	D
	Establishing advisory and participatory mechanisms, Encouraging multi-stakeholder participation in the adaptation process	C
	Managing the continuous local communication (for the participation of different audiences)	C
Step 2: Assessing the risks and affectibilities by the climate change "RISK&AFFECTIBILITY"	Mapping out potential methods and data sources for carrying out the Risk and Affectibility Assessment	C
	Assessing climate risks and affectibilities	B
	Identifying and prioritizing potential sectors for action	A
	Periodically reviewing existing information and integrating new evidence	D
Step 3 & 4: U Identifying, assessing and choosing adaptation options "ACTIVITIES"	Compiling, a portfolio of all adaptation options documenting and assessing them	B
	Identifying the options' possibility to align with the existing assessed policy and plans, potential synergies and conflicts (aligning national and local strategies)	B
	Developing and accepting adaptation activities (as part of SECAP and/or other planning documents)	A
Step 5: Implementation "ACTIVITIES"	Identifying the implementation framework with distinct milestones	C
	Implementing and commonizing (if applicable) adaptation activities in the approved SECAP and/or other planning documents	D
	Carrying our reduction and adaptation activities in coordination	D
Step 6: Monitoring and Assessment "INDICATORS"	Developing an On-site Monitoring Framework for adaptation activities	C
	Identifying proper Monitoring&Assessment indicators	B
	Regularly monitoring the progress and reporting to relevant decision makers	D
	Updating, revising and restructuring the adaptation strategy and/or the Action Plan	D

5. Monitoring Plan

This report is based on targets for reducing emissions caused by energy consumption in different sectors, identified together with the stakeholders who took part in the workshop. It is important to develop clearly stated assessment and reporting conditions, and monitoring methods that enable performance assessment in order to implement the climate change mitigation policy and activities successfully. Cities must pay their efforts thoroughly to achieve their goals for mitigating the climate change effects and reducing the greenhouse gas emissions, and the teams that work to this end must operate in coordination with various main departments, institutions, CSOs, private actors and citizens. Including standardized tools in the monitoring system created for performance criteria is important for performance and assessing policies.

The most important foundations of this report, that includes a greenhouse gas inventory on district scale, are reports made or had made by either Avcılar Municipality, İstanbul Metropolitan Municipality or other organizations with regard to the future of the district and the vision the city stakeholders developed for the city's future.

Promoting a better improvement of policy progress, especially with the urban climate policy networks helping the participation of regional and local civil society stakeholders at different stages, can extend the local scientific information in designing and implementing coordinated and integrated greenhouse gas reduction strategies and integrate the local points of view in the process.

5.1. Reduction

This report presents goals for reducing the emissions caused by energy consumption in various sectors, identified with the participation of district stakeholders. Starting off from the greenhouse gas inventory on the district scale, this report's most important foundations are reports made or had made by either Avcılar Municipality, İstanbul Metropolitan Municipality or other organizations with regard to the future of the district and the vision the city stakeholders developed for the city's future.

Examination and monitoring of data sources for inventory calculation must be included in the performance assessment process. The table below generally shows some necessary data, taking into consideration that data quality is essential for the monitoring process.

Table 22: Certain data sets to be followed in the process of monitoring

Sector	Necessary Data	Department in charge (Data, Effect mitigation)	Data Collection Frequency	Improvement Areas
Buildings and Facilities				
Municipal Buildings/Facilities	All fuel and electricity	Avcılar Municipality (AM) Environmental Protection and Control Directorate Technical Works	Yearly	Data can be collected regularly from departments with templates for data collection.
Tertiary Building	All fuel and electricity	AB Environmental Protection and Control Directorate, Urban Renewal Directorate, Urban Planning	Yearly	More information about the building stock (Year of construction, building features, m ² , fuel type, etc.)

Sector	Necessary Data	Department in charge (Data, Effect mitigation)	Data Collection Frequency	Improvement Areas
Settlement	All fuel and electricity	AM Environmental Protection and Control Directorate, Urban Renewal Directorate, Urban Planning	Yearly	More information about the building stock (Year of construction, building features, m2, fuel type, etc.) High uncertainty about solid waste consumption
Street Lighting	Electricity	AM Environmental Protection and Control Directorate, Technical Works, Parks and Gardens, Highways Directorate, Ministry of Transportation, District Municipalities	Yearly	Lighting post (number and current change)
Transportation				
Municipal Fleet	All fuel and electricity	AM Environmental Protection and Control Directorate, Transportation Directorate	Yearly	A data collection and storing system may be implemented within AM
Public Transport	All fuel and electricity	AM Environmental Protection and Control Directorate, Transportation Directorate	Yearly	-
Private Cars	All fuel and electricity	AM Environmental Protection and Control Directorate, Transportation Directorate	Yearly	-
Other Sources				
Solid wastes	Waste amount	AM Environmental Protection and Control Directorate	Yearly	-
Wastewater	Waste water amount	AM Environmental Protection and Control Directorate, İSKİ	Yearly	-
Agriculture	Animal stock, fertilizer, irrigation	AM Environmental Protection and Control Directorate,	Yearly	-
Local energy production	Sun, wind, biogas, geothermal, etc.	AM Environmental Protection and Control Directorate	Yearly	Production amount info may be requested from the distribution company Licensed and unlicensed installations may be requested from EMRA

5.2. Adaptation

It is important to assess the progress of the planned and implemented activities and check the situation in comparison with the goals identified in the strategy to ensure that Avclar's adaptation process becomes both effective and sustainable in time. The plan can be revised for making necessary reviews in certain activities through assessing the results of monitoring and a more efficient path may be taken to adapt to the climate change.

The adaptation indicators, essential components of the monitoring and assessment process, demonstrate that a thorough study must be conducted for the selection of proper indicators and collection and assessment of information that will lead the future activities. It is important to conduct focused group interviews with relevant organizations and institutions for the collection of necessary data and the selection of these indicators, which are a part of the SECAP process. While the Covenant of Mayors includes several indicators defined for the processes like SECAP, local governments are provided the flexibility to create their own indicators and monitor them. The CoM process emphasizes that it is vital to determine at least one adaptation indicator for each of the major activities. This will make sure that risk and affectibility assessments are conducted based on the data specific to the locality. The table below, showing the adaptation indicators defined in accordance with the CoM, is provided with the purpose of creating a roadmap for the local government with regard to the monitoring process. Shown indicators may be employed as they are and/or others that are suitable based on the accessible data may be created and monitored.

Table 23: Adaptation indicators list

Sector	Indicators related to effect
Buildings	Number or % of buildings damaged due to extreme weather conditions/events (public/residential/non-residential)
Transportation, Energy, Water, Wastes, Civil Defense, & Emergency	Number or % of transport/energy/water/wastes/ICT infrastructure damaged due to extreme weather conditions/events
Land Use	% of gray/blue/green spaces affected by extreme weather conditions/events (e.g. Urban Heat Isle effect, flood, rockfall and/or landslide, forest/land fire)
Transportation, Energy, Water, Wastes, Civil Defense, & Emergency	Number of days where public service is interrupted (e.g. energy/water provision, healthcare/civil defense/emergency services, wastes)
Transportation, Energy, Water, Wastes, Civil Defense, & Emergency	Average duration of public service interruptions (in hours) (e.g. energy/water provision, public transport traffic, healthcare/civil defense/emergency services)
Public Health	Number of people injured/rescued/resettled due to extreme weather conditions/events (e.g. hot or cold air waves)
Public Health	Casualties due to extreme weather conditions/events (e.g. hot or cold air waves)
Civil Defense & Emergency	Police/fire department/emergency service teams average response times (in minutes) in case of extreme weather events
Public Health	Number of water quality warnings given
Public Health	Number of air quality warnings given
Environment & Biodiversity	% of area affected by soil erosion/soil quality impairment
Environment & Biodiversity	% of habitat lost due to extreme weather conditions/events
Environment & Biodiversity	% of change in the number of local species
Environment & Biodiversity	% of local species (animal/plant) affected by diseases caused by extreme weather conditions/events
Agriculture & Forestry	% of agricultural loss due to extreme weather conditions/events (e.g. drought/water scarcity, soil erosion)
Agriculture & Forestry	% of animal stock lost due to extreme weather conditions
Agriculture & Forestry	% of yearly grazing efficiency change in product efficiency/evolution
Agriculture & Forestry	% of animal stock lost due to pests/pathogens
Agriculture & Forestry	% of lumber lost due to pests/pathogens
Agriculture & Forestry	% of change in forest composition
Agriculture & Forestry	% of change in water extraction
Finance	Yearly direct economic loss (in euros) due to extreme weather conditions/events (e.g. in commerce, agriculture, industry, tourism sectors)
Finance	Amount of yearly compensation received (in euros) (e.g. insurance)

Sector	Indicators related to sensitivity
Climate	Number of days/nights with extreme temperature (day/night time according to reference yearly/seasonal temperatures)
Climate	Frequency of hot/cold air waves
Climate	Number of days/nights with extreme precipitation (day/night time according to reference yearly/seasonal precipitation)
Climate	Consecutive number of days/nights without rain
Socioeconomic	Comparison of actual population with 2020/2030/2050 projections
Socioeconomic	Population density (with respect to national/regional average in X country/region in X year)
Socioeconomic	% share of sensitive groups in the population (e.g. older (+65)/younger (-25) people, single retired persons' households, low-income/unemployed persons' households) – with respect to national average in X year in X country
Socioeconomic	% of population living in risky areas (e.g. flood/drought/hot air wave/forest or land fire)
Socioeconomic	% of areas without access to emergency/fire department services
Physical & Environmental	% of change in average yearly/monthly temperatures
Physical & Environmental	% of change in average yearly/monthly precipitation amount
Physical & Environmental	Length of transportation network in risky areas (e.g. roads/railways) (e.g. flood/drought/hot air waves/forest or land fires)
Physical & Environmental	Length of coasts/river affected by extreme weather conditions/soil erosion (without adaptation)
Physical & Environmental	% of areas with low altitude or below ground level
Physical & Environmental	% of coastal areas including rivers
Physical & Environmental	% of protected areas (ecologically or culturally sensitive)/% of forest cover
Physical & Environmental	% of risky (e.g. flood/drought/hot air wave/forest or land fire) areas (e.g. settlement/commercial/agricultural/industrial/touristic)
Physical & Environmental	Comparison of actual energy consumption per person with 2020/2030/2050 projections
Physical & Environmental	Comparison of actual water consumption per person with 2020/2030/2050 projections
Socioeconomic	% of area of industrial/agricultural lands at risk from climate dangers (flood, drought, hot air wave, forest fire or fire that is difficult to extinguish)
Sector	Indicators related to adaptation capacity
Socioeconomic	% of existing public funds directed at a climatic danger or its effects (e.g. fire, flood, hot air wave, etc.)
Socioeconomic	% share of sensitive groups in the population (e.g. older (+65)/younger (-25) people, single retired persons' households, low-income/unemployed persons' households) – with respect to national average in X year in X country
Socioeconomic	Number of households that received education on energy/water/waste management
Socioeconomic	Population density (with respect to national/regional average in X country/region in X year)
Socioeconomic	% of population living in risky areas (e.g. flood/drought/hot air wave/forest or land fire)
Government & Institutional	% of change in the area of city's green/blue infrastructure
Physical & Environmental	Length of transportation network in risky areas (e.g. roads/railways) (e.g. flood/drought/hot air waves/forest or land fires)
Physical & Environmental	Average time needed to reach a medical institution (min/hr)

6. Conclusion

Reduction

This report presents goals for reducing the emissions caused by energy consumption and greenhouse gases in various sectors, identified with the participation of district stakeholders. Starting off from the greenhouse gas inventory on the district scale, this report's most important foundations are reports made or had made by either Avcılar Municipality, İstanbul Metropolitan Municipality or other organizations with regard to the future of the district and the vision the city stakeholders developed for the city's future.

Avcılar's greenhouse gas emissions including industry for the base year 2019 is 1.323.183 tCO_{2e}. Avcılar's greenhouse gas emissions excluding industry for 2019 is 1.089.334 tCO_{2e}. Because reduction goals of the district do not include the industry sector, this sector is excluded from the calculations.

51.4% of Avcılar's total greenhouse gas emissions excluding industry is caused by residences, commercial buildings and street lights in the category of Extent 1, 38.1% is caused by transport, and 10.5% by solid wastes&wastewater, agriculture and husbandry. Vehicles' fuel consumption has the greatest share in the emissions with 34.9%. The greatest share in buildings belong to residences with 32.9% of the total inventory. Tertiary buildings, meaning non-residential buildings, is in the second place with a share of 17.9%. The share of street lights in the emissions is 0.38% and the share of municipal buildings is 0.27%. Industry is excluded from the 2030 greenhouse gas emission reduction projection and the calculated value for the year 2030 is 1.234.995 tCO_{2e}. If necessary measures are taken, this can be reduced down to 733.340 tCO_{2e}.

Thanks to the reduction measures determined for each sector, the amount of emissions in Avcılar is estimated to be reduced by 42% in 2030 in comparison with 2019. BAU scenario (Business as Usual, or, current situation remaining as it is) of Avcılar evaluates and shows estimates of different organizations with regard to the population and sectors' growths. According to this scenario, calculated emissions for 2030 are 1.234.995 tCO_{2e}. The population is estimated to rise to 525,902 in 2030 from 448,882 in 2019.

According to the inventory taken with the data of 2019, total energy consumed in the district excluding industry is 3,476,548 MWh, the greenhouse gas emission is 1,089,334 tCO_{2e}, and the greenhouse gas emission amount per person is 2.43 tCO_{2e}/person. Emission per person is recorded very low in comparison with the Türkiye average which rose to 6.6 tCO_{2e}/person by the end of 2019.

Table 24: District inventory distribution by scope, 2019

Emissions	City tCO _{2e}
Buildings	559.863
Transport	415.533
Other	113.937
Total	1.089.334

Because it is not possible to speak of absolute emission reductions at the growth rates in Türkiye, it is correct to express the emission reduction goal in terms of emission per person. According to the BAU scenario, emissions per person are estimated to be reduced by 3.3% from 2.43 tons CO_{2e} to 2.35 tons. The major reasons for this are that energy and fossil fuel consumption does not increase proportionally with the population growth rate; and technological developments increasing the energy efficiency and reducing the fuel consumption.

As shown in the Action Plan, a reduction of approximately 42% can be achieved by 2030 in comparison with 2019 for emissions per person through reduction measures determined for each sector. The goals, targets and activities identified in this study must be considered as the first step taken by the Avclar Municipality to fight against the effects of the climate change. If any change occurs with regard to the data or the district’s perspective towards the issue, goals and activities must be reviewed and updated accordingly.

As seen in the chart below, growth estimates for different emission sources over the 2019 city inventory are projected taking current transport energy consumption rise trends and various parameters into consideration. As shown in the Action Plan, a reduction of approximately 42% can be achieved by 2030 in comparison with 2019 for emissions per person through reduction measures determined for each sector.

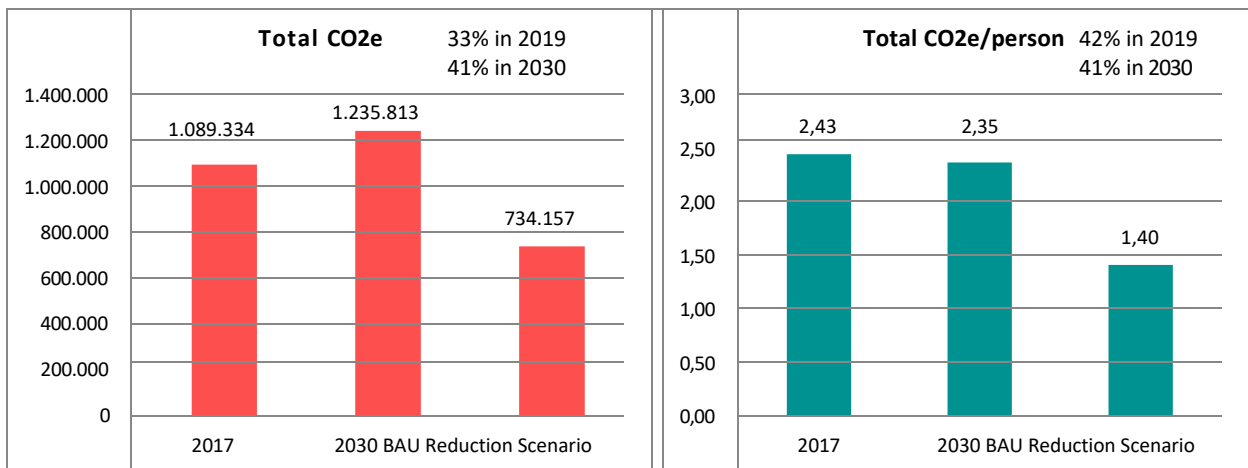


Figure 42: Greenhouse gas emissions per person and total 2019 and 2030 current situation and reduction scenario comparison

The results of the comparison of the “Buildings”, “Transport” and “Other” sectors in Current Situation Scenarios are shown below. Renewable energy investments for the installations to be made in the city are included in the buildings sector.

The second most important element of emissions is the buildings sector. The figures below demonstrate absolute and per person values for reduction scenarios and the emissions caused by the buildings sector in Avclar.

A reduction of 281 thousand tons is estimated by 2030 for the emissions in buildings through various measures to be taken and uptake of renewable energy.

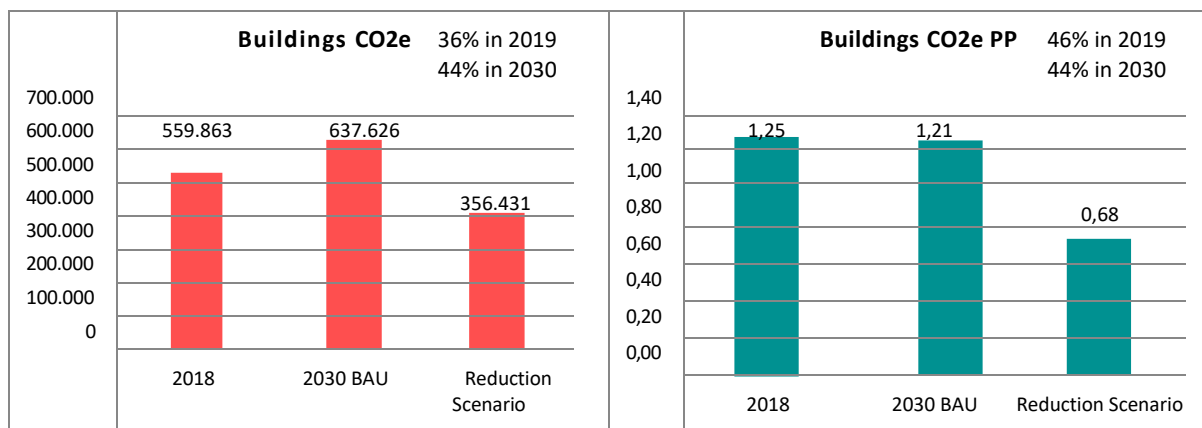


Figure 43: Greenhouse gas emissions of buildings per person and total 2019 and 2030 current situation and reduction scenario comparison

Through various measures to be taken in transportation, a reduction of 146 thousand tons CO₂e is estimated for by 2030 compared to the Current Situation Scenario.

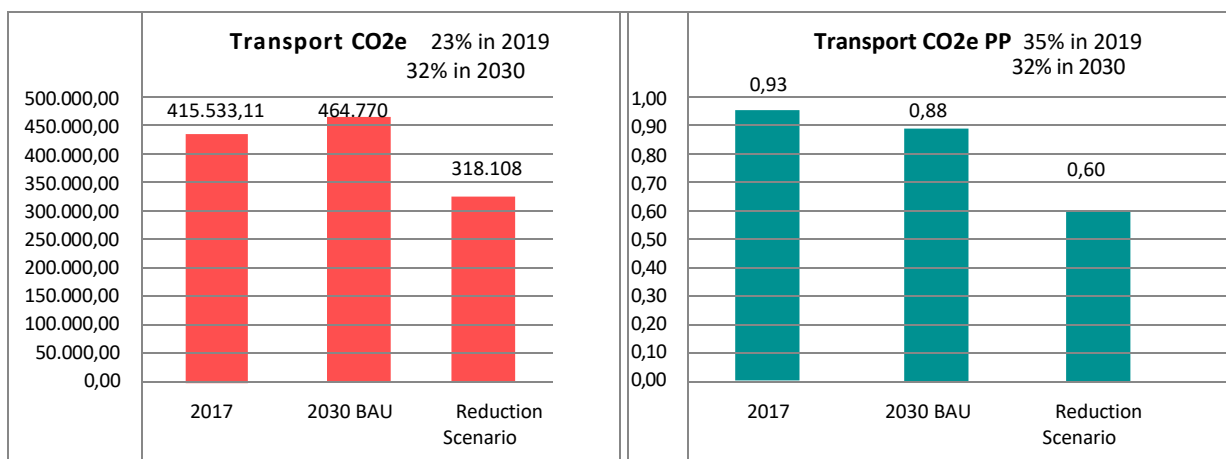


Figure 44: Greenhouse gas emissions in transportation per person and total 2019 and 2030 current situation and reduction scenario comparison

Adaptation

The climate adaptation strategy developed for Avclar aims at mitigating the felt the climate change effects and improve the urban quality of life. Considering the climate change effects on the city, the strategy suggests developing emergency plans and includes preparedness for increasing temperatures; management of water resources; and evaluations regarding weather events like storm and hail, and disasters like flood, landslide, and sea level rise. It is indeed important to create a sustainable and resilient city structure against the long-term and sudden effects of the climate change in cities. The Risk and Affectibility Assessment has been conducted with the purpose of identifying the risks the city will face with regard to climatic dangers, and areas and social groups that will be disproportionately affected by them. Climatic dangers such as hot and cold air waves, excessive precipitation, storms, drought, landslide, flood and sea level rise have been examined within the scope of this study and sector-specific risks have been identified. Climate adaptation activities have been identified taking these risks and affectibilities into consideration. It is important to carry out the climate adaptation activities integrally with the earthquake disaster management plans due to the fact that earthquake is a great risk that threatens the whole metropolitan area.

Climate adaptation activities have been developed based on the findings of studies conducted on the metropolitan scale, examinations regarding the relevant national reports, and information obtained at the stakeholder participation workshop and provided from the local government. Mentioned activities have been prioritized according to several environmental, social, economic and institutional criteria identified by the local government.

All findings discovered throughout the study point to the fact that the area of green spaces must be increased to achieve the goals like mitigating urban heat isle effect and improving the air quality. Accordingly, it is important to develop a green infrastructure strategy. Making connections with the green infrastructure in the improvement works carried out on existing water canals and protection bands, and creating green corridors across the city is suggested. The suggested strategy depends on creating an urban green belt, implementing nature-based solutions in areas where urban heat isle effects are felt most, and adopting development models prioritizing pedestrians, bicycles and public transport. The goals also include protecting the water resources and the biodiversity and carrying out awareness-raising operations about the climate change, supporting behavioral change within the scope of measures that will reduce the water consumption.

Integrating design approaches and tools such as “water-sensitive urban design”, “green infrastructure strategies” and “nature-based solutions”, that consider natural and cultural life forms in urban design applications for those who live in cities, with spatial planning is important. Avclar Climate Adaptation Strategy suggests that design principles should be created with this thought in mind and applications should observe these principles.

Adaptation activities must be regularly monitored based on the identified indicators and improved in accordance with the findings discovered through the monitoring process for their efficient implementation. It is suggested that Avclar Municipality prudentially continues to coordinate the targets, results and monitoring procedures of its various strategic plans. This supports the goal of adopting an integrated and holistic approach towards the sustainable management of resources, urban operations and services, in addition to presenting an opportunity for creating joint resource management and cooperation networks. Sharing the duties and responsibilities helps achieving a higher efficiency in the implementation of the relevant strategies. It is important to set up a commission that comprises of experts and decision makers to carry out the necessary operations in a coordinated manner. It must be taken into consideration that in addition to administrative organization, creating platforms for each collaboration process that allow cooperation and coordination among institutions especially in terms of sharing information and joint data input and supporting these platforms with ICT tools will become necessary.

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Appendixes

Appendix-A: Shareholder Workshop

Appendix-B: SECAP Activities and Priorities

Appendix-B1: Greenhouse Gas Reduction Workshop Results

● Low ●● Medium ●●● High

Buildings and Energy		
Activity	Priority Level	Applicability Level
Revising and updating the plans, regulations and guides related to zoning plan operations of the municipality and policies on the local level in accordance with the sustainability principles	●●●	●●●
Raising awareness among the citizens about energy efficient urban renewal and energy efficiency in industry	●●●	●●●
Heat insulation and energy transformation in existing residences	●●●	●●●
Use of energy efficient lighting systems in existing residences (LED lighting with cost saving)	●●●	●●●
Energy efficient renewals in existing tertiary buildings (heat insulation)	●●●	●●●
Energy efficient lighting in existing tertiary buildings	●●●	●●●
Use of efficient waterworks in new structures	●●●	●●●
Energy efficient urban renewal in residences	●●●	●●●
Heat pump usage	●●●	●●
Sanction options in energy efficient urban renewal and industry	●●●	●●
Creating sustainable design standards for new settlement areas	●●●	●●
25% energy efficiency in industry	●●●	●●
Renewal of residences with sustainable and low-emission technologies	●●●	●●●
Energy efficient and intelligent street lighting system	●●●	●●●
Developing medium- and long-term energy transformation strategies with infrastructure institutions	●●●	●●●
Renewable energy implementations in municipal buildings	●●●	●●
Substituting coal with low-carbon resources in residences	●●●	●
Transportation		
Activity	Priority Level	Applicability Level
Intelligent park applications	●●●	●●●
Conducting pedestrianization operations for increasing pedestrian transportation	●●●	●●●
Developing bicycle infrastructures, increasing their share in transportation through connection with E-5	●●●	●●●

“Park and continue” applications for reducing traffic	●●●	●●●
Using low-carbon options for municipal fleet and service vehicles	●●●	●●●
Developing and promoting applications for shared vehicle use	●●●	●●
Improving public transportation (network, infrastructure etc.)	●●●	●●
Optimization with intelligent signalization systems (for example, control center, traffic optimization arrangements with low investments etc.)	●●●	●●
Wastes and Wastewater		
Activity	Priority Level	Applicability Level
Making the separate collection of most important recyclable materials obligatory	●●●	●●●
Researching the potential of waste collection service in the food sector (restaurants, hotels etc.)	●●●	●●●
Encouraging local businesses to reduce the use of disposable plastic materials, banning them in the municipality	●●●	●●
Developing a financial rewarding system for waste sorting in Yeşilkent and Tahtakale neighborhoods	●●●	●●
Utilizing solar energy for waste management	●●●	●●
Promoting joint and at-home compost production (in parallel with public lands for sustainable food production)	●●●	●

Appendix-B2: Adaptation to Climate Change Workshop Results

● Low, ●● Medium ●●● High

Urban Heat Island (UHI) Effect and Green Space Management		
Activity	Priority Level	Applicability Level
Afforestation of river bed surroundings, integration of green and blue infrastructure	●●●	●●
Developing green infrastructure strategies according to future scenarios created within the framework of climate change adaptation	●●●	●●●
Creating green rings in neighborhoods to increase accessibility and connectivity of green spaces (e.g. designing bicycle roads and passive and active green spaces integrally)	●●●	●●●
Creating social projects/campaigns that promote civil society participation in the maintenance and innovation of green spaces	●●●	●●●
Taking tree inventory that includes assessments related to their effects on noise and air quality	●●●	●●●
Creating and commonizing PARKLETS – (certain areas have been identified, applications are in progress)	●●●	●●●
Light-colored materials and green roof applications in flooring, buildings and facilities, water use in public areas	●●	●●
Locating potential afforestation areas, afforestation and use of natural/local plant species consistent with the ecosystem	●●	●●●
Identifying criteria for urban renewal and spatial planning taking UHI effect into consideration, setting standards for the amount of green space area in new development areas	●●	●●●

Developing strategies to detect the opportunities with regard to increase the interconnection between the green spaces	●●	●●●
Planting plant species consistent with the ecosystem in unused areas	●●	●●●
Operations related to invasive species and their monitoring	●●	●●
Water Management		
Activity	Priority Level	Applicability Level
Reducing impermeable surfaces (e.g. Permavoid – hold, store and reuse water)	●●●	●●
Rainwater management storage system implementations: building level, underground, connected with green spaces	●●●	●●●
Organizing awareness-raising activities about drinking water and sea water management for businesses, industries and general public	●●●	●●●
Providing households with products for less water consumption (faucet caps) and making it obligatory with regulations	●●●	●●●
Raising awareness about reducing water and energy consumption	●●●	●●●
Revising current design and application standards to increase the efficiency of new infrastructure lines	●●	●●●
Integrating proper wastewater and rainwater management principles with the building and planing regulations.	●●	●●
Incorporating sustainable urban drainage principles into all current and planned public buildings	●●	●●
Reinforcing the discouraging/encouraging effects of punishment and reward systems for the pollution and protection of water resources	●●	●●●
Enhancing the current water management infrastructure, arranging and implementing maintenance programs	●	●●
Disaster Management		
Activity	Priority Level	Applicability Level
Identifying affectibility by weather events such as excessive temperature, excessive precipitation, storms and hurricanes and developing a disaster management plan	●●●	●●●
Identifying the extent to which urban infrastructure and building stock will be affected by potential hurricane, storm and excessive precipitation events	●●●	●●
Developing a “UHI Emergency Action Plan”, taking urban heat isle risk maps, identified infrastructure needs and affected groups into consideration	●●●	●●●
Identifying flood risks on all plan stage scales and drawing flood risk maps, (e.g. flood walls, ditch, diversion canal, detention dam etc.)	●●●	●●●
Identifying areas at landslide risk due to excessive precipitation and storm, identifying preventive and recovery measures for these areas	●●●	●●●
Creating concrete action plans for sudden climatic phenomena	●●●	●●●

Creating a Climate Adaptation Indicator Table (Green Indicator Table) that allows an efficient monitoring process and data sharing with decision makers, researchers and citizens	●●●	●●●
Developing monitoring methods and tools	●●●	●●●
Creating an efficient consultation committee with the city council and CSOs, ensuring integration and preparing guides in which the municipality is positioned as facilitator	●●●	●●●
Developing a shading strategy for green spaces	●●●	●●●
Creating warning systems for cold and hot air waves	●●●	●●
Identifying the areas where healthcare services will be provided in advance in case the number of people affected by the heat wave events exceeds the capacity of hospitals and healthcare centers for the purpose of preparing the infrastructure	●●	●●●
Completing necessary arrangements for transferring healthcare professionals from other healthcare centers to increase the healthcare service capacity in areas where UHI effects are felt more intensely during heat wave events are experienced	●●	●
Informing and educating those living in the areas covered by the UHI action plan about the negative effects of hot air waves on human health and related symptoms	●●	●●●
Conducting public awareness-raising activities to raise awareness about the activities in the action plan to be implemented by the government in case of a heat wave	●●	●●●
Declaring climate emergency in the city	●●	●●●
Identifying or developing integrated strategies that can be employed compatibly with climate adaptation strategies within the current strategies	●●	●●●
Integrating climate adaptation strategy to Disaster and Emergency Plans	●●	●●●

Appendix-C: Risk and Vulnerability Assessment Tables

Appendix-C1: Extreme Weather Events Risk and Vulnerability Assessment

AREAS OF INFLUENCE	DEFINITION	PARAMETER	Exposure	Possibility	Risk	Risk Level
Critical Infrastructure and Built Environment	Projected increases in temperature, wind speeds, cold temperatures and precipitation will place stress on the environment in particular. Critical infrastructure (such as energy and communication networks) and residential areas (especially the living areas of the most vulnerable population) appear as areas of influence.	Cold Wave	4	2	8	Moderate
		Heat Wave	2	4	8	Moderate
		Drought	5	4	20	High
		Excessive precipitation	5	3	15	High
		Strong winds	3	2	6	Low
Transport	Increases in wind speeds, cold weather and rainfall will put pressure on transportation networks, which may cause transportation services to disruption and financial damage during extreme events.	Cold Wave	4	2	8	Moderate
		Heat Wave	2	4	8	Moderate
		Drought	2	4	8	Moderate
		Excessive precipitation	5	3	15	High
		Strong winds	4	2	8	Moderate
Biodiversity	The increases in temperature, wind speeds, cold waves and precipitation will create more pressure on biological diversity by increasing the damage, loss of habitat and the prevalence of invasive species.	Cold Wave	4	2	8	Moderate
		Heat Wave	4	4	16	High
		Drought	5	4	20	High
		Excessive precipitation	4	3	12	Moderate
		Strong winds	3	2	6	Low
Waste Management	The increases in temperature, heat waves and droughts may increase the risk of fire in waste storage sites and at the same time increase the prevalence of pests and odor.	Cold Wave	4	2	8	Moderate
		Heat Wave	3	4	12	Moderate
		Drought	3	4	12	Moderate
		Excessive precipitation	3	3	9	Moderate
		Strong winds	2	2	4	Low
Water Resources	Temperature, cold air waves and increases in	Cold Wave	3	2	6	Low

	precipitation affect the flow and quality of water resources. Temperature increases and dry days cause water supply to reduce usability; Cold air waves can cause water services to deteriorate.	Heat Wave	5	4	20	High
		Drought	5	4	20	High
		Excessive precipitation	3	3	9	Moderate
		Strong winds	2	2	4	Low
Public Health	The negative impact of extreme weather events and the disasters related to natural resources, and environmental deteriorations also create negative effects on human health. Changes in air, soil and water quality have a direct impact on human health such as quality of life and food safety.	Cold Wave	3	2	6	Low
		Heat Wave	3	4	12	Moderate
		Drought	4	4	16	High
		Excessive precipitation	2	3	6	Low
		Strong winds	2	2	4	Low
Industry	Extreme weather events and the negative impact on the built environment and infrastructure of these disasters may adversely affect the industrial sector and employees.	Cold Wave	5	2	10	Moderate
		Heat Wave	3	4	12	Moderate
		Drought	3	4	12	Moderate
		Excessive precipitation	3	3	9	Moderate
		Strong winds	3	2	6	Low
Disaster Management	Extreme weather events and the increase in the financial damages caused by the disasters connected to them may adversely affect the intervention capacity of the institutions.	Cold Wave	3	2	6	Low
		Heat Wave	2	4	8	Moderate
		Drought	4	4	16	High
		Excessive precipitation	3	3	9	Moderate
		Strong winds	4	2	8	Moderate

Appendix-C2: Flood Risk Risk and Vulnerability Assessment

AREAS OF INFLUENCE	DEFINITION	PARAMETER	Exposure	Possibility	Risk	Risk Level
Critical Infrastructure and Built Environment	Coastal floods, river floods and excessive precipitation will bring additional stress and risk to the built environment. This additional risk, businesses, homes, critical infrastructure, etc. It will cause damage to areas.	Flash floods	5	4	20	High
		River floods	4	3	12	Moderate
		Groundwater flood	5	2	10	Moderate
		Permanent flood	4	2	8	Moderate
Transport	Increases in coastal floods, river floods and precipitation cause road damage and will cause interruptions in all transportation services.	Flash floods	5	4	20	High
		River floods	4	3	12	Moderate
		Groundwater flood	2	2	4	Low
		Permanent flood	5	2	10	Moderate
Water Resource	Increased flood events may damage the loss of habitats and ecosystems.	Flash floods	4	4	16	High
		River floods	5	3	15	High
		Groundwater flood	4	2	8	Moderate
		Permanent flood	3	2	6	Low
Waste Management	The overflow of landfills increases the risk of surface and ground water pollution.	Flash floods	4	4	16	High
		River floods	2	3	6	Low
		Groundwater flood	5	2	10	Moderate
		Permanent flood	3	2	6	Low
Water Resources	Increases in flood events are usually in a lower altitude and therefore with a higher risk of water raid, raising more pressure on water systems.	Flash floods	5	4	20	High
		River floods	4	3	12	Moderate
		Groundwater flood	4	2	8	Moderate
		Permanent flood	4	2	8	Moderate
Public Health	It poses a risk on human health such as increasing flash and groundwater floods due to water raids and the	Flash floods	4	4	16	High
		River floods	4	3	12	Moderate

AREAS OF INFLUENCE	DEFINITION	PARAMETER	Exposure	Possibility	Risk	Risk Level
	spread of water-induced infectious diseases.	Gro-undwater flood	4	2	8	Moderate
		Permanent flood	4	2	8	Moderate
Industry	Due to the damage of physical structures by floods, the inability of employees to work due to transportation problems, etc., logistics and communication activities may be disrupted due to damage to infrastructures.	Flash floods	5	4	20	High
		River floods	4	3	12	Moderate
		Gro-undwater flood	2	2	4	Low
		Permanent flood	3	2	6	Low
Disaster Management	Due to floods, there may be an increase in damages that may occur due to irregular buildings and infrastructure, and problems in the ability to respond quickly.	Flash floods	4	4	16	High
		River floods	5	3	15	High
		Gro-undwater flood	3	2	6	Low
		Permanent flood	5	2	10	Moderate