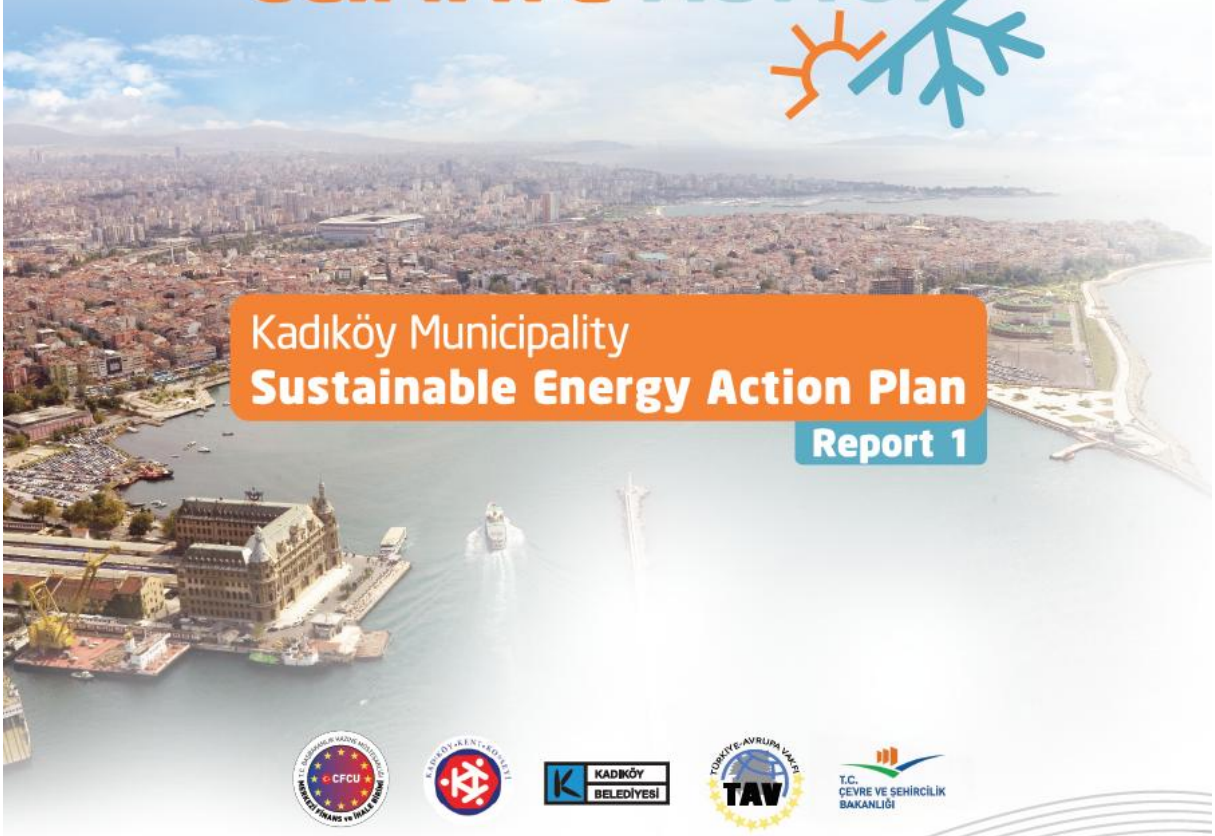
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Kadıköy Municipality Integrated and Participatory

CLIMATE ACTION



Kadıköy Municipality
Sustainable Energy Action Plan

Report 1

PREFACE

We are taking a critical step to do our best hand in hand, either on personal or corporate basis, for triggering a change and being a part of this change and for a sustainable environment. A major mental change is required for living in harmony with the world and being friendly with the environment.

Our world becoming warmer by only 1°C in 150,000 years due to natural factors since the existence of the world warmed by another 1°C in the last 150 years for adverse human effects. For this rapid change induced by human effect, available ecosystems and life of species in the world were put at risk where animals, plants and particularly endemic species faced the risk of extinction due to this change. With the intent to slow down this process having very severe socio-economic impacts and mitigate the resulting effects, 190 nations use efforts to produce joint solutions during this process that started with the Kyoto Climate Convention of 1997 and continued with Paris World Climate Summit of 2016.

We, local governors, need to develop climate action and adaptation plans and take initial actions to make the towns we govern safe and resistant against the adverse impacts of climate change, keep their technical infrastructures up-to-date and protect the residents of Kadıköy from the impacts of climate change on meteorological disasters, health and heat island.

To that end, we, as Kadıköy Municipality, aim to reduce emissions from activities under our jurisdiction and make our town resistant against the impacts of climate change as one of our strategic targets.

For the purposes of the EU Instrument for Pre-Accession Assistance, we developed "Kadıköy Municipality Sustainable Energy and Climate Adaptation Action Plan" to reduce our emissions by 40% by 2030 and make our town resistant against the impacts of climate change through innovative projects under the "Integrated and Participatory Climate Action for Kadıköy Municipality" that serves the purpose of strengthening our Municipality's efforts to mitigate climate change impacts in tandem with Turkey Europe Foundation and Kadıköy City Council with a wholistic approach dealing with global strategies and methods by ensuring the participation of our Municipal staff members, Kadıköy residents and subject-matter experts.

In addition, this valuable study that we carried out with great efforts and broad participation of urban stakeholders serves as a roadmap encompassing all related industries in our region and setting out our long-term goals. I believe that our study will be seminal for the future of our town, and have confidence that the residents of Kadıköy will be aware of the criticality of this subject and show the necessary support and sensitivity for all mitigation and adaptation projects starting from their own lifestyles. I extend my thanks to all our participants and our advisors and technical experts who supported us in preparing this valuable report and shared their opinion with us.

AYKURT NUHOĞLU

MAYOR OF KADIKÖY

COORDINATION AND INSPECTION

Uygur ÇAKMAK / Deputy Mayor / Kadıköy Municipality

Bahar YALÇIN / Deputy Mayor / Kadıköy Municipality

PROJECT EXECUTORS

A. Şule SÜMER / Director of Environmental Protection and Control / Kadıköy Municipality

Ali TULUMEN / Environmental Engineer / Kadıköy Municipality

Cansu TEKİN ALPASLAN / Environmental Engineer / Kadıköy Municipality

Doğan ÜNERİ / Geomorphologist / Kadıköy Municipality

Eren SAYGILI / Environmental Engineer / Kadıköy Municipality

Damla MUHCU / Forest Industry Engineer, M.Sc. / Kadıköy Municipality

İkbal POLAT / Secretary General / Kadıköy City Council

Hale AKAY / Turkey Europe Foundation

M. Emre GÜR / Secretary General / Turkey Europe Foundation

PROJECT COORDINATOR

Gökçe AHİ TUNCEL / Project Coordinator / Turkey Europe Foundation

ADVISORS AND TECHNICAL EXPERTS

Baha KUBAN, Ph.D. / Energy Policies Specialist / Senior Advisor

Caner DEMİR / Energy Director / Managing Advisor

Esra DEMİR / Operating Engineer, M.Sc. / Advisor

Kaan EMİR / Environmental Engineer / Advisor

Hilal TUNCER / Environmental Engineer / Advisor

Oya TABANOĞLU / Urban Planner / Advisor

ALL ATTENDEES OF ENERGY ACTION PLAN CONSULTATION MEETING

Prof. Mustafa ERDOĞDU, Ph.D. / Marmara University

Prof. Haluk GERÇEK / Istanbul Technical University

Prof. Zeynep ENLİL / Yıldız Technical University

Prof. Ayşegül ÖZBAKIR / Yıldız Technical University

Assoc. Prof. Barış Gençer BAYKAN / Yeditepe University

Assoc. Prof. Nihan YILDIRIM / Istanbul Technical University

Assoc. Prof. İrem Daloğlu ÇETİNKAYA / Boğaziçi University

Kıvanç KUTLUCA, Ph.D. / Kocaeli University

Özlem YAVUZ / Yıldız Technical University

Eylem Gül Cemal AKTAM / Urban Planner

Elif Morina YILMAZ / Provincial Directorate of Environment and Urbanization

Canan ASLAN / Maltepe Municipality

Eren YILDIZ / Maltepe Municipality

Fathiye EYÜBOĞLU / IETT

Şenay AKÇAN / IETT

Yasemin DERE / Nilüfer Municipality

Duygu KASABALI / Nilüfer Municipality

Esra YÖNEZ / Maltepe Municipality

Barış DOĞRU / EKOIQ

Burak ÖZTÜRK / Energon

Serdar SERHADLIOĞLU / Froniss İstanbul

Özkan ALDIKAÇTI / RKT Enegy

Cihat KILIÇER / RKT Energy

Doruk BECERAL / Bicycle-Transportation Platform

Özgür GÜRBÜZ / GREENPEACE

Duygu KUTLUAY / GREENPEACE

Ebru ÖZER / Earth Association

Muammer AKGÜN / Bacader

Oğuz KIRDANOĞLU / Danfoss Turkey

Hakan ERKA / GENSED

Hatice Ülkü ÖZER / Kadıköy Mun. Alderwoman, Head of Public Works Committee

Hasan AKYILDIZ / Kadıköy Mun. / Directorate of Housing and Urban Development

Halil ŞAHİN / Kadıköy Mun. / Directorate of Technical Works

Ahmet GÖRÜR / Kadıköy Mun. / Directorate of Housing and Urban Development

Damla TOPRAK / Kadıkköy Mun. Alderwoman, Head of Environmental Committee

Elif ÖZTÜRK / Kad. Mun / Directorate of Survey Project

Mehmet Ali AKTÜRK / Provincial Directorate of Environment and Urbanization

Akif Burak ATLAR / Chamber of Urban Planners

Nurullah GÜLEÇ / Chamber of Electrical Engineers

Tuba BİNGÖL ALTIOK / Turkish Chamber of Sanitary Engineers

Mehmet AKIN / TMMOB Chamber of Mechanical Engineers

Güneş YÜZÜGÜR / IZODER

Funda CİHAN / TMMOB Chamber of Environmental Engineers

Dilek YÜKSEL / TMMOB Chamber of Environmental Engineers

Alper YILDIRIM / TMMOB Chamber of Environmental Engineers

Asuman SÖNMEZ / TURSEF

Efe BAYSAL / Kadıköy Mun. / Academy Kadıköy

Esra KÖYMEN / Kadıköy Mun. / Directorate of Parks and Gardens

Ferdi SEYMEN / Kadıköy Mun. / Directorate of Housing and Urban Development

Kudret TOSUN / Kadıköy Mun. / Survey Project Mngr.

Mert YAMAN / Kadıköy Mun. / Directorate of Technical Works

Nazım AKKOYUN / Kadıköy Mun. / Plan Project Mngr.

Oya RAMOĞLU / Kadıköy Mun. / Directorate of Technical Works

Zerrin KARAMUKLUOĞLU / Kadıköy Mun. / Plan Project Mngr.

Esat TEMİMHAN / Kadıköy City Council

ALL ATTENDEES OF ADAPTATION PLAN CONSULTATION MEETING

Prof. Ayşegül ÖZBAKIR / Yıldız Technical University

Çağdaş KUŞÇU ŞİMŞEK, Ph.D. / Sivas Cumhuriyet Uni.

Gonca AKGÜL / Yıldız Technical University

Elif TEZCAN / ISKI R&D Branch Office

Elif ATLI / ISKI R&D Branch Office

Ayşegül DOKUMACI / IMM Directorate of Environmental Protection and Control

Sevnur YILDIRIM DOĞAN / Kadıköy Mun. / Directorate of Strategy Development

Ferdi SEYMEN / Kadıköy Mun. / Directorate of Housing and Urban Development

Leyla TERZİ / Kadıköy Mun. / Directorate of Survey Project

Nilgün CAN ATAR / Kadıköy Mun. / Directorate of Plan Project

Zerrin KARAMUKLUOĞLU / Kadıköy Mun. / Directorate of Plan Project

Nuri ÇAĞLAR / Kadıköy Mun. / Directorate of Healthcare Affairs

Özey KAYIRAN / Kadıköy Mun. / Directorate of Parks and Gardens

Remzi AKSOY / Kadıköy Mun. / Directorate of Parks and Gardens

Esra KÖYMEN / Kadıköy Mun. / Directorate of Parks and Gardens

Assoc. Prof. Ülkü DUMAN YÜKSEL / Gazi University

Koray VELİBEYOĞLU / Izmir High Technology Institute

Melike ÖZDEMİR / ISKI Kadıköy Branch Office

Assoc. Prof. Günay CAN / Cerrahpaşa Medical Faculty

Nüket CEYLAN/ Kadıköy Mun. / Directorate of Healthcare Affairs

Batuhan AKKAYA / Kadıköy Mun. / Directorate of Urban Design

Nazım AKKOYUN / Kadıköy Mun. / Directorate of Plan Project

Mert YAMAN / Kadıköy Mun. / Directorate of Technical Works

Seyfullah DENİZ / Kadıköy Mun. / Directorate of Environmental Protection and Control

Hakan ÖZDEMİR / Kadıköy Mun. / Directorate of Environmental Protection and Control

Duygu KAHRAMAN / Kadıköy Mun. / Directorate of Social Support Services

Benan AKSOY / Kadıköy Mun. / Directorate of Veterinary Affairs

Hacer KESKİN / Kadıköy Mun. / Kadıköy City Council

Nil UZUNKAYA / Kadıköy Mun. / Directorate of Survey Project

Ayşe Miray ŞEN / Advisor

We extend our thanks and respect to valued academicians, governmental bodies, non-governmental organizations and private sector representatives, volunteers and Kadıköy City Council members as well as Kadıköy Municipality Climate Ambassadors and our Neighborhood Headmen, who all contribute to our workshops with their attendance.

Our further thanks and respects go to Kadıköy Municipal Council members who contributed to the approval of "Kadıköy Municipality Sustainable Energy and Climate Adaptation Action Plan" by Kadıköy Municipal Council on 06.07.2018, which is one of the activities under the Integrated and Participatory Climate Action for Kadıköy Municipality.

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LIST OF ABBREVIATIONS

Abbreviation	Description
BAU	Business As Usual
IMM	Istanbul Metropolitan Municipality
KCAAP	Kadıköy Climate Action and Adaptation Plan
KSEAP	Kadıköy Sustainable Energy Action Plan
EMRA	Energy Market Regulatory Authority
ICLEI	International Council for Local Environmental Initiatives
ENVERDER	Energy Efficiency Association
MENR	Ministry of Energy and Natural Resources
IEAP	International Local Government GHG Emissions Analysis Protocol
IPCC	Intergovernmental Panel on Climate Change
IZODER	Association of Thermal Insulation Water Sound and Fire
GWP	Global Warming Potential
OIZ	Organized Industrial Zone
SECAP	Sustainable Energy and Climate Adaptation Action Plan
TOKI	Public Housing Development Administration
BEI	Baseline Emission Inventory
TSI	Turkish Statistical Institute
DGRE	Directorate General of Renewable Energy

EXECUTIVE SUMMARY

Regarding its level during the early 21st century, climatology can now definitely put forward that the global warming is taking place due to carbon dioxide and equivalent greenhouse gases emanating from human actions and particularly from fossil fuels used in energy generation. The use of fossil fuels, changes in land use, and agricultural activities are considered the most significant causes of the rise in greenhouse gas level. There are countless observations and researches demonstrating that air and ocean temperatures increase, masses of snow and glaciers widely melt and sea levels rise. The societies maintaining their existing production-consumption patterns and habits are understood to lead to severe consequences for climate change, resulting in considerable environmental damages and potential mass mortalities as well as associated humanitarian catastrophes. From the industrial revolution, carbon dioxide emissions caused by human actions particularly due to fossil fuel consumption are proven to rise much more rapidly than the amount which oceans and forestlands can absorb. This threat, which is very explicitly put forward by climatology, urged the world to take action.

However, the Intergovernmental negotiations on climate change has a very slow progress, remaining too incapable and slow-paced to take steps revealed by science. Local governments in closer contact with societies have started to get increasingly more involved in this issue which is of particular concern to human life quality and health. Local Governments for Sustainability (ICLEI) established in 1990's and other associations and coalitions set further goals exceeding those of their own governments from the early 2000's, demonstrating that they could start playing substantial roles in fight against climate change. Today, the coalitions developed by local governments have an increasingly important place in climatic negotiations.

For the purposes of the Covenant of Mayors, to which Kadıköy Municipality became a signatory in 2012 under the coordination of the Directorate of Environmental Protection and Control, the Municipality prepared "Kadıköy Municipality Sustainable Energy Action Plan" with the intent to reduce greenhouse gas emissions across the district by 20% by 2020 and uploaded it to the Covenant of Mayors system and obtained approval in 2015. Lastly, Kadıköy Municipality aimed to convert "Kadıköy Municipality Sustainable Energy Action Plan" into "Kadıköy Municipality Sustainable Energy and Climate Change Strategy and Action Plan" in line with the goal of improving the organizational capacity for fight against climate change and with new objectives of Paris Agreement on climate change. Kadıköy Municipality was entitled to the grant after filing an application for the "Grant Scheme for Capacity Building in the Field of Climate Change in Turkey". Kadıköy Municipality plans to enhance its objective of emission reduction by being involved in the new formation that aims to reduce emissions by 40% by 2030 in the Covenant of Mayors (CoM) platform within the scope of "Integrated and Participatory Climate Action for Kadıköy Municipality". With Kadıköy Sustainable Energy Action Plan prepared to that end, the intention was to reduce emissions within the jurisdiction of Kadıköy.

Kadıköy Greenhouse Gas Emission Inventory

The most commonly used international GHG Protocol [1] was used when developing the organizational inventory. The preparation of urban-scale greenhouse gas emission inventory was based on 2006 and 2013 IPCC Guidelines for National Greenhouse Gas Inventories developed by the

Intergovernmental Panel on Climate Change (IPCC) National Greenhouse Gas Inventories Working Group.

Urban-scale greenhouse gas emissions were prepared in line with general principles and philosophy applicable to each local government on an independent basis from the International Local Government GHG Emissions Analysis Protocol (IEAP) developed by the International Council for Local Environmental Initiatives (ICLEI).

The total Greenhouse Gas Inventory for Kadıköy District is **1,509,302 tons CO_2e** for 2016 which is selected as the reference year. Of this quantity, **95,874** tons (6.35%) are directly caused by the Municipality's organizational operations only. 64.5% of total greenhouse gas emissions across Kadıköy are composed of emissions, such as fuels used in residential buildings, commercial buildings and industrial plants and urban vehicle traffic, in Scope 1, 28.5% of electricity consumption in Scope 2 and the remaining 7% of mass transportation vehicles and wastewater treatment plant located within the jurisdiction of IMM. The categories of "Scope" in international greenhouse gas reporting standards are as given below[1]:

- **Scope 1 – direct greenhouse gas emissions:** These are emissions from all stationary and movable sources of emission that are owned or directly controlled by the organization. These sources include assets which are owned, leased, or acquired by leasing. The scope limit is all *controllable* sources of emission.
- **Scope 2 – electricity indirect greenhouse gas emissions:** These are emissions from the generation of purchased electricity for the organization's operations. This group should include the utilized mains electricity or other types of energy used for heating/cooling purposes.
- **Scope 3 – other indirect greenhouse gas emissions:** These are GHG emissions which are caused by the organization as result of its operations and remain under its own control, but are excluded from indirect emissions. These may result from activities beyond or behind the organization's core operations, employee travel or subcontractor's operations.

As seen in Figure 0-1 below, Scope 1 emissions from fuels used in buildings, transportation and industrial plants comprise the highest emission category with 64.5%. Urban electricity consumptions is the second highest category with 28.5%. Following these emissions, the other considerable source of emission is comprised of Scope 3 emissions that include municipal mass transportations vehicles.

[1] *International Local Government GHG Emissions Analysis Protocol (IEAP), ICLEI, 2009*

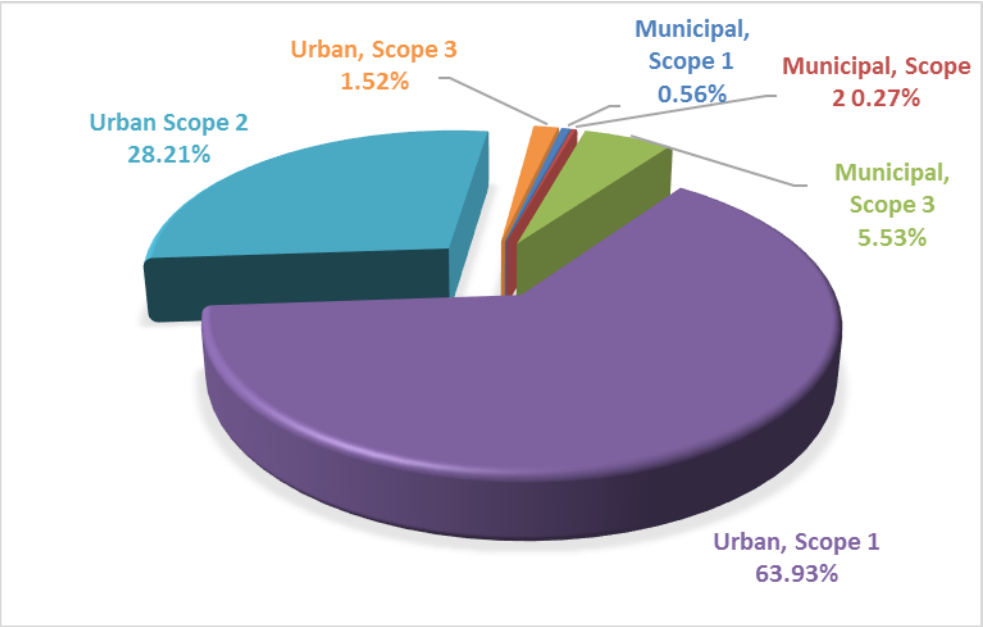


Figure 0-1: Kadıköy Urban Greenhouse Gas Emissions by Scopes, 2016

"Kadıköy Sustainable Energy Action Plan" is prepared based on these values, setting objectives and actions for emission reduction for 2016. The following table and figure include the summary of Kadıköy urban inventory.

Table 0-1: Kadıköy District Total Urban Greenhouse Gas Emission Inventory

Kadıköy	MWh	tCO_2e	%
Energy Consumption in Buildings, Equipment/Facilities and Industries (Residential, commercial and industrial consumptions)	3,542,800	974,446	64.6%
Energy Consumption in Transportation (Vehicles)	1,938,122	511,919	33.9%
Other Emissions (Wastewater and Fugitive Emissions)	-	22,937	1.5%
Total	**5,480,922**	**1,509,302**	**100%**
Consumption and Emissions per Capita	**12.12**	**3.34**	

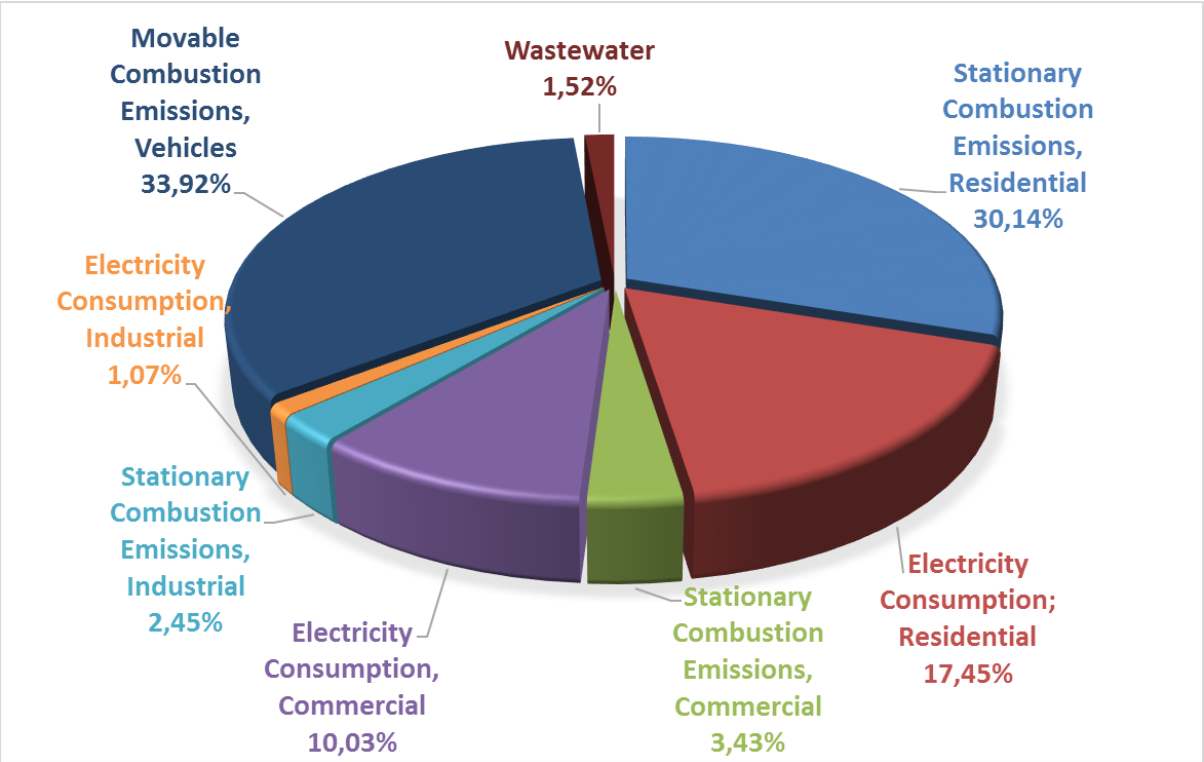


Figure 0-2: Distribution of Urban Greenhouse Gas Inventory for Kadıköy District, 2016, %

Kadıköy Sustainable Energy Action Plan (KSEAP)

Although the population in Kadıköy declined in recent years, this decline is known to result from the population leaving the district due to urban transformation. In the upcoming years, the population is expected to rise by about 60% with an increase far above the average of Turkey.

Kadıköy Sustainable Energy Action Plan is prepared in line with long-term plans developed under either transportation in Kadıköy or its physical development, and enhanced by projections and recommendations under these plans. Greenhouse gas emissions are expected to reach 2.2 million tons CO_2e with an increase of about 50% by 2030, if no action is taken. Since this rise remains below the expectation for population growth, the emissions per capita are expected to decline from 3.34 tons CO_2e to 3.18 tons.

For urban-scale greenhouse gas emissions comprising the pillar of this study, a variety of urban strategic plans were considered and projections were provided for energy consumption. The studies conducted by Kadıköy District in recent years came in very useful in this respect.

Based on projections of increase (in population, building stock, etc.) under urban strategic plans for the period following 2018, the year in which the report was prepared, energy consumption and greenhouse gas inventory growth trends were used for every year. The sub-topics shown in the following table identified the potential amounts of saving on a yearly basis as a result of reduction measures / actions based on actual projections. The reduction ratios submitted under the report are final reduction quantities achieved in 2030.

The following table outlines emission reductions in various categories with main topics. A variety of reduction measures or actions under these categories are studied in the report in details.

Table 0-2: Reduction Measures by Sectors, 2030

TOPICS OF REDUCTION MEASURES	Energy Saving (MWh)	tCO_2e Reduction
Urban Development - Built Environment	1,784,476	466,294
Transportation	418,715	111,834
Renewable Energy	149,229	73,808
Awareness Raising Campaigns	144,490	40,610
Other (wastewater + industry)	75,605	44,363
Natural energy efficiency*	383,665	105,651
TOTAL	**2,956,179**	**842,560**

*Emissions are assumed to "naturally" decline 7% through national policies and technological advancements for energy efficiency.

1 INTRODUCTION

The threat of climate change, which is very explicitly put forward by climatology, urged the world to take action. World countries joined together under the **United Nations Framework Convention on Climate Change** in 1992 in order to cope with inevitable issues introduced by climate change, decreasing the pace of global warming. As a result of negotiations initiated with the awareness about the inadequateness of emission reductions under the convention in 1995 following this formation, the **Kyoto Protocol** compelling the developed countries to legally reduce emissions was executed and signed in 1997. Having failed to yield the expected results due to resistance by and reluctance of nations and governments with the first liability period terminated in 2012, the duration of Kyoto Protocol was extended until 2020. At the convention held in December 2015 in Paris, the international community laid the foundations of a climate regime that would define the post-Kyoto era regarding the fight against global climate change and the adaptation to adverse impacts of climate change. The Paris Agreement of 2015 was signed by nations on their "declaration of will" submitted on an individual basis, and became effective on October 5, 2016 upon the achievement of the intended majority. A signatory to the Agreement, Turkey also were committed to achieve 21% reduction by 2030.

On the other hand, urban governments that are in closer contact with societies and are first affected by adverse impacts of climate change have started to get increasingly more involved in this issue which is of particular concern to human life quality and health.

One may remark that governments and decision-making mechanisms are increasingly getting localized in the modern world. The will of societies to have a say in decisions taken in particular regard to their own living spaces is growing stronger. Local governments and other associations and coalitions developed by such governments set further goals exceeding those of their own governments from the early 2000's, demonstrating that they could start playing substantial roles in fight against climate change. Today, the coalitions developed by local governments have an increasingly important place in climatic negotiations.

1.1 PURPOSE OF THE PROJECT

This study will primarily deal with climate change and threats posed by the said change and cities' interactions with such threats in many aspects, highlight issues resulting from climate change, and activities and operations leading to climate change, and describe local governments' initiatives for responding to these processes.

For the purposes of the Covenant of Mayors signed by Kadıköy Municipality in 2012, the Municipality prepared "Kadıköy Municipality Sustainable Energy Action Plan" with the intent to reduce greenhouse gas emissions across the district by 20% by 2020 and uploaded it to the Covenant of Mayors system and obtained approval in 2015. Lastly, Kadıköy Municipality aimed to convert "Kadıköy Municipality Sustainable Energy Action Plan" into "Kadıköy Municipality Sustainable Energy and Climate Change Strategy and Action Plan" in line with the goal of improving the organizational capacity for fight against climate change and with new objectives of Paris Agreement on climate change. To that end, Kadıköy Municipality was entitled to the grant in September 2017 after filing an application for the "Grant Scheme for Capacity Building in the Field of Climate Change in Turkey" initiated by the Prime Ministry Central Finance and Contracts Unit. Kadıköy Municipality plans to

enhance its objective of emission reduction by being involved in the new formation that aims to reduce emissions by 40% by 2030 in the Covenant of Mayors (CoM) platform within the scope of "Integrated and Participatory Climate Action for Kadıköy Municipality".

The **Sustainable Energy Action Plan (SEAP)**, which should be submitted by Kadıköy Municipality in line with its commitments under the Covenant of Mayors, will be the most pivotal output of this study. The Sustainable Energy Action Plan entails the identification of Kadıköy Municipality's organizational and urban-scale emissions. This report is intended to develop an *emission reduction plan* of Kadıköy Municipality and determine the instruments for implementation. Accordingly, a Baseline Emission Inventory (BEI) was developed, determining organizational and urban-scale emissions primarily in accordance with international standards. Additionally, this inventory will provide a useful basis for keeping a record of emissions and monitoring the reduction in line the objectives set.

Following the development of inventory, the reductions which are likely to be achieved by the Municipality with operations under its control will be determined. For service as a role model for future projects carried out to achieve reductions, the examples of successful implementations in agreed, initiated and/or accomplished energy action plans of cities, who are signatory to the Covenant of Mayors, were reviewed. This successful examples will be a source of inspiration in developing those projects which Kadıköy may adopt to reach the objective of emission reduction.

The Turkish statutory regulations on renewable energy and energy efficiency were compiled under this report to provide a basis for renewable-source energy practices and energy efficiency projects that are included in crucial elements of Sustainable Energy Action Plans.

Kadıköy Municipality's organizational and urban-scale emission inventories are presented under the report with calculation methods described and data sources indicated. This study also presents the proposition of feasible projects, which are suited to the results of these inventories, implementation practices in Turkey and the Municipality's priorities, and potential loan and funding supports for these projects.

1.2 STUDY METHODOLOGY

The methods and standards adopted by the association are used for the purposes of this study to prepare the Sustainable Energy and Climate Action Plan, which is the obligation of Kadıköy Municipality under the Covenant of Mayors.

As the first step, a training, informative and team building meeting was held where the attendance was held compulsory by the senior management. The half-day meeting held on January 12, 2018 built a *data production* group during a mini workshop designed to identify the concerned staff and distribute responsibilities following an effective introduction for enhancing and motivating the Municipality's human resources capacity, ensuring that the necessary data for Kadıköy Municipality's organizational inventory was obtained with an effective distribution of roles between functions. The topics of this meeting context are given below:

- Local Governments in Climate Negotiations,
- Project Introduction and Expectations,
- What Can Be Done at an Urban Scale? - Examples from World Cities,
- Introduction to Inventory Calculation,

- Why Cities Should Prepare a Greenhouse Gas Inventory?
- Methods of Greenhouse Gas Calculation in Cities,
- Benefits of Inventory,
- Examples from the World,
- Steps of Inventory Calculation,
- Scoping and Limit Determination in Inventory Preparation,
- Data Collection, Planning and Processing,
- Setting Reduction Objectives,
- Inventory Reporting, and

Meetings were held with the data production group on several dates to ensure that the data obtained was of quality entailed by the methodology used for calculations. During these meetings, the intention was to improve the team's motivation, communicating the importance of the work performed and what the data provided primarily referred to and why the said was required as well as discussing the problematic parts and omissions of data obtained. While some of the following data could be not attained, these were included in the list for consideration in calculations during the upcoming years.

Table 1-1: Data inquired for Kadıköy Municipality's organizational emission inventory.

Subject	Data Type	Assigned Function
Waste	Information such as packaging waste and other types of waste, sorting, processing, etc.	Directorate of Environmental Protection and Control
Building Energy Consumptions	Electricity, natural gas and other fuel consumptions broken down on a monthly basis, and subscription numbers.	IGDAS and EnerjiSA
Street and Marketplace Lighting	Electricity consumption data broken down on a monthly basis, and subscription numbers.	EnerjiSA
Building Stock	Ownership, business, headcount, quality, intended use, confined space, energy identity information.	Directorate of Housing and Urban Development
Fuel Consumptions	Type and quantity of fuel consumed for generators broken down on a monthly basis.	Directorate of Technical Works
Transportation	Vehicle fleet information (vehicle type, use frequency, intended use, consumption data, etc.) Personnel vehicle information on personnel transportation.	Directorate of Support Services, Directorate of Transportation Services and IMM
Central Air Conditioning Information	Consumption, refrigerant gas type, capacity, etc.	Directorate of Technical Works
Vehicle Consumptions	Consumption data on transportation works awarded to contractors	Directorate of Support Services
Split Air Conditioner Information	Air conditioner identity information (refrigerant gas type, capacity, quantity, intended use/ place/ frequency of use, etc.)	Directorate of Support Services
Projection and Strategic Objectives	2030 projection, 2016 renewable and efficiency objectives etc.	Directorate of Plan Project
Electricity Consumptions (Contractor)	Electricity consumptions broken down on a monthly basis. Subscription numbers.	EnerjiSA
Fuel Consumptions (Refuse Collection etc.)	Fuel consumptions broken down on a monthly basis. (This can be an estimation based on hourly consumption data by vehicle type, but the method should be described.)	Directorate of Environmental Protection and Control

The process of obtaining data from organizations other than the Municipality (e.g. electricity and natural gas distribution companies) was initiated with the support of senior management for organizational and urban-scale emission inventories. No reluctance was observed at organizational

level in these processes. In particular, however, there are problems with data quality and detail due to some key services remaining within the jurisdiction of the Metropolitan Municipality or the privatization of energy companies.

Following the completion and verification of data compilation, organizational and urban-scale baseline emission inventories were developed, which would provide a resource for the entire study and the subsequent roadmap. The intended data for collection to develop an organizational emission inventory was given in Table:1.1.

The most commonly used international Greenhouse Gas Protocol (GHG Protocol) was used for the development of organizational inventory. This standard is the emission inventory calculation standard introduced by the World Resources Institute (WRI) and the World Business Council of Sustainable Development (WBCSD).

The preparation of urban-scale GHG emission inventory was based on emission factors included in **2006 IPCC Guidelines for National Greenhouse Gas Inventories** developed by the Intergovernmental Panel on Climate Change (IPCC) National Greenhouse Gas Inventories Working Group and on Global Warming Potentials (GWP) updated by **IPCC in the Assessment Report No. 5 (2013)** in 2013. IPCC guidelines were prepared in five volumes;

- General Guidance and Reporting,
- Energy,
- Industrial Processes and Product Use,
- Agriculture, Forestry and Other Land Use,
- Waste

. The guidelines and other related documents were accessed via official website of National Greenhouse Gas Inventories Working Group (3).

The sources of emission required to be included in greenhouse gas inventories and the methodologies used to quantify these sources vary between organizations, institutions and sectors, while they are not variable among local governments. IEAP was compiled based on;

- IPCC 2006 methodologies,
- WRI/ WBCSD GHG Protocol,
- Series of ISO 14064 for GHG and
- Global Reporting Initiative (GRI) Appendix - Public Sector Organizations

When preparing the emission inventory under IPCC, the approaches called as Tier 1-2-3 should be decided depending on the details, breakdown, accuracy and reliability degree of available types of data. Tier 1 was selected regarding the assessment conducted for Kadıköy Municipality (methodology approaches with increasing complexity and accuracy rate based on IPCC Tier 1-2-3).

The options of reduction were assessed following the development of Municipal and urban emission inventory, and the general topics for emission reduction measures were determined to reduce GHG emissions in Kadıköy (emissions per capita) by 40% by 2030. The first workshop was carried out on 01.02.2018 with the City Council and the concerned sector leaders in Solar Energy. The study was finalized with the Workshop with Experts of March and subsequent Public Workshops for the purposes of "Integrated and Participatory Climate Action for Kadıköy Municipality".

[3] *http://iklim.csb.gov.tr*

Sustainable Energy Action Plan Workshop

In early 2018, the process in which the measures designed to reduce urban greenhouse gas emissions would be determined was initiated under Kadıköy Sustainable Energy and Climate Adaptation Action Plan (SECAP). On January 12, 2018, a meeting was held with functional managers and agents invited by the Directorate of Environmental Protection and Control that worked devotedly for the coordination of the study at Kadıköy Municipality. This meeting shared the draft inventory of Kadıköy district and exchanged ideas on potential measures for reducing greenhouse gas emissions.

The workshop that took place on **March 13, 2018** shared draft results of carbon footprint inventory and included all public bodies, non-governmental organizations, local government functions and all concerned individuals and groups on subjects which are of particular concern to the future of the city. A Group Work was conducted, dividing the attendants from various stakeholder groups into 6 main themes given below following the introductory presentations on the project.

1. Physical Urban Development - Built Environment,
2. Block-Based Heating Solutions (Regional Heating),
3. Renewable Energy,
4. Transportation,
5. Awareness - Finance, and
6. Corporate Organization.

Group works were carried out in 2 phases.

During the first phase, each group sought the answers of related questions defined in the topics given above, and focused on plans and scenarios for the proper urban development towards 2030.

During the second phase, each group was asked to propose suggestions regarding the project for assessment within action plans and to prioritize such suggestions Each theme group was asked to detail 5 strategic suggestions of top priority. The details of suggestions are; organization/entity in charge, financial need, risks, implementation steps and time schedule, and potential impacts on energy densities or greenhouse gas emissions. Following this four-hour work, each group proposed its own suggestions where group presentations were brought up for discussion.



March 13, 2018 Sustainable Energy Action Plan Workshop

2 GLOBAL CLIMATE CHANGE: INTERNATIONAL POLICY AND ACTION

The impacts of climate change vary regionally and locally, e.g. in terms of flooding and overflows, drought, hot waves, etc., and thus the measures applicable in anywhere will differ. Local governments play a crucial role not only in determining the instruments and methods of response, but also in investing in infrastructure. The organizations such as ICLEI[2], C40[3] and Covenant of Mayors[4], which join together local governments from various geographies of the world having a variable level of development, offer pivotal opportunities of cooperation and experience sharing to local governments that intend to take a step in this respect. However, determining methods suited to local conditions is not enough alone; local governments should also possess the financial capability and the power to take political decisions [5].

Given the impacts listed above, it is understood that cities are in need of active policies, actions and strategies in various areas from transportation to housing, from infrastructure to waste management and land use for fight against climate change. As is known, the urban climate policy is seated on two rivets. The first one is the mitigation of climate change, while the second one is the adaptation to adverse impacts and consequences of climate change.

2.1 TURKEY AND IMPACTS OF GLOBAL CLIMATE CHANGE

Regional climate projections were developed by the Turkish State Meteorological Service (TSMS) in accordance with global model outputs under CMIP5 project. The years between 1971-2000 was selected as the reference period of the study, while the years between 2016-2099 was selected for projection. TSMS primarily conducted parametrization testing and subsequently run the model by selecting 4 different periods. 4 periods used by TSMS for climate projections are the years between 1971-2000, 2016-2040, 2041-2070 and 2071-2099. Comparing the results from the regional climate model obtained in the reference period to the results from global models for the same period, it is seen that both sets of results are greatly consistent with each other particularly regarding summer and winter temperatures. For mean annual temperatures, the results from the regional model appears to be lower than the results from and observations under the global model. Based on the scenarios in question, it is projected that;

Period from 2016 to 2040:

• Increase in temperatures will generally be limited by 2°C,

• In the summer season, temperature will increase by 2-3°C in Marmara and the Western Black Sea Regions,

• An increase in precipitations will be expected in the winter months on Aegean coasts and in the Eastern Black Sea and Eastern Anatolia, and the Spring precipitations will decrease by about 20% in the considerable part of Turkey except for Aegean coasts and the Eastern Anatolia.

[2] ICLEI: Local Governments for Sustainability
[3] C_40: Network developed by 86 metropolitan governments in the world
[4] CoM: Covenant of Mayors; association to which the European Union members submit their commitment in climate and energy aspects
[5] Green Economy for Climate, Istanbul Sabancı University Policies Center, May 2017

Period from 2041 to 2070:

• Temperature increase will be approximately 2-3°C in the spring and autumn,

• There will be up to 4°C increase in temperatures in the summer months.

• Winter precipitations will decrease approximately by 20% in the Eastern and Southeastern Anatolia and Central and Eastern Mediterranean Regions,

• In the summer months, there will be approximately 30% decreases in the Eastern Anatolia where precipitations are crucial, and

• Autumn precipitations will decrease save for Aegean coasts and a small part of the Central Anatolia.

Period from 2071 to 2099:

• Increase in temperatures will be 2°C in the winter,

• Increase in temperatures will be 3°C in the spring and autumn,

• For summer temperatures, the Aegean coasts and the Southeastern Anatolia will witness temperature increase above 4°C,

• Precipitations will decrease approximately by 20% in the spring except for the Coastal Aegean, Central Black Sea and Northern Eastern Anatolia regions,

• The coastal line will have approximately 10% increased precipitations in the winter,

• Summer precipitations will decrease by up to 40% except for the Aegean, Marmara and Black Sea coasts, and

• Autumn precipitations will be decreased almost all over Turkey (MGM_c, 2014).

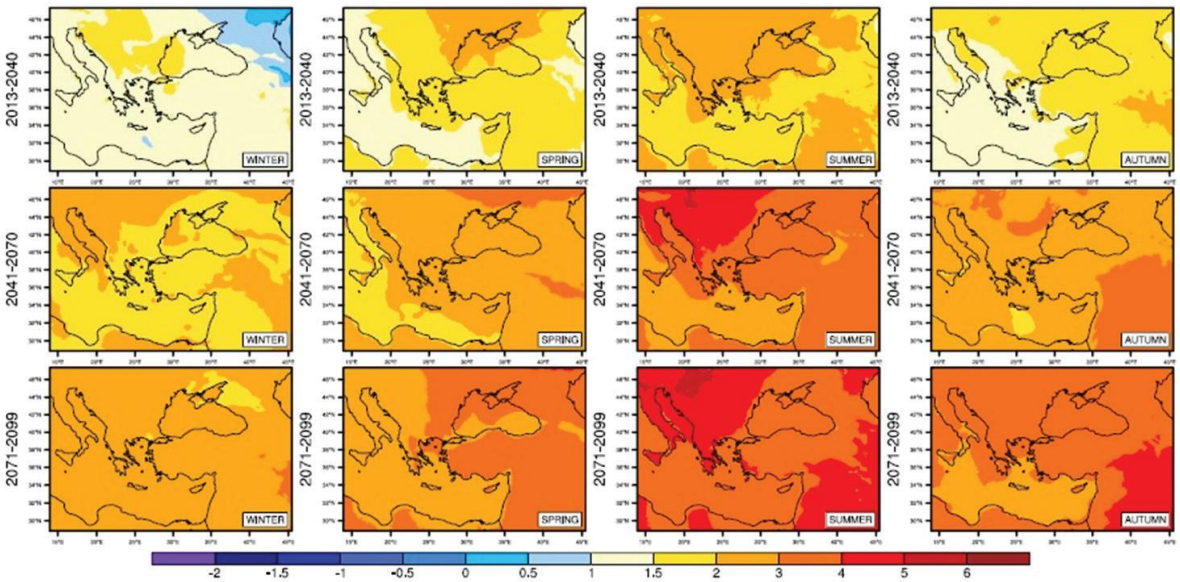


Figure 2-1: TSMS temperature projections based on MGM_ RCP4.5

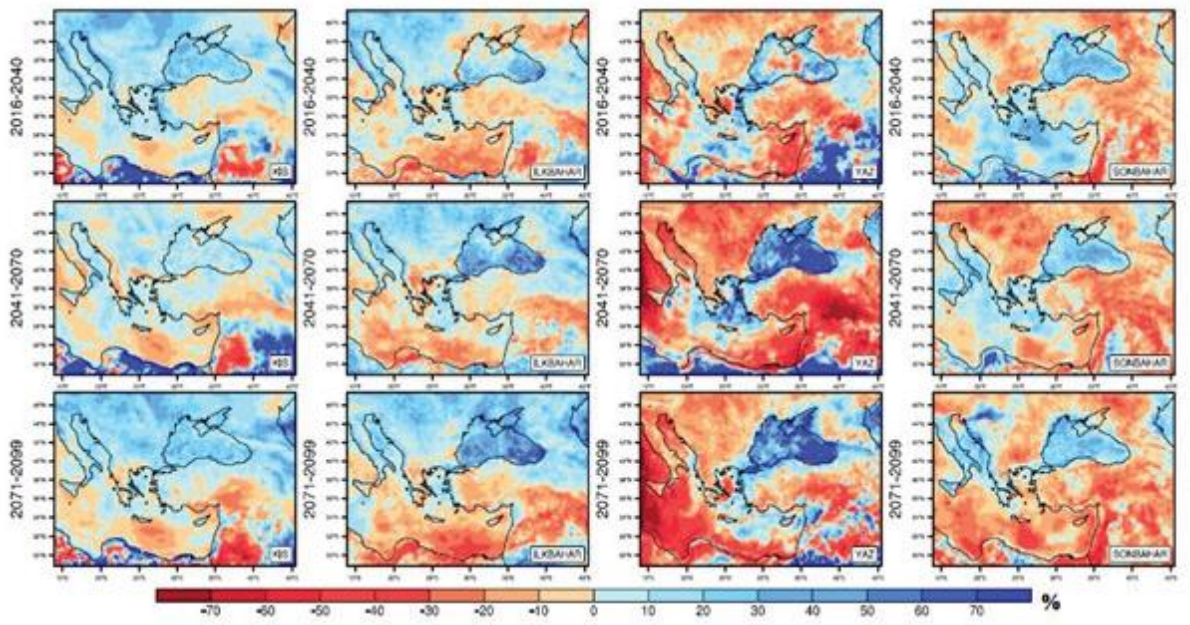


Figure 2-2: TSMS temperature projections based on RCP4.5

Source: 6th National Communication of Turkey on Climate Change pg. 161

Although variable results are obtained based on various scenarios, it is apparent that the region including Turkey will be considerably affected by changes in the global climate system in the upcoming century.

One of the subjects studied in relation to climate change is the observed increase or decrease in extreme values of climate parameters. In consequence of climate change, a number of changes are expected in the frequency of extreme values. Based on the reports included in chapter 1 of the Contribution of Working Group I to the IPCC Fifth Assessment Report, the conclusion was that there would be increase in hot or cold waves and in the severity and frequencies of wet and dry extreme weather events due to irregularities associated with average temperature increase and energy distribution.

2.2 Turkey and Planning Studies on Global Climate Change

The consequences of growing risks caused by climate change in terms of conventional development policies are still not taken into account as a net factor in investment decisions taken by governments or the private sector in Turkey. However, the climatic conditions incorporating variability and uncertainty entail the assessment of climatic risk factors inherent in investment risks and even the standardized method of dealing with climate change impacts during the feasibility phase of projects. This results in the need to conduct extensive "impact analyses" so that the impacts of climate change are clarified in Turkey. The conduct of climate change impact analyses is of importance for determining the impacts of climate change on various sectors and social groups in Turkey, calculating the benefits and costs of adaptation policies to climate change, providing consensus between stakeholders with different perspectives on climate change policies, reducing uncertainties and thus clarifying priorities.

The latest five-year development plan, which still remains in force, is the Tenth Five-Year Development Plan encompassing the period from 2014 to 2018. One of the primary principles of the

Tenth Development Plan is to bring our country to upper levels of international value chain hierarchy. Additionally, the Tenth Development Plan highlights that it is possible, through clean production and eco-efficiency in the field of production, to protect the environment and enhance competitiveness at the same time, stressing that a growth model driven by the concept of "green growth" becomes more important to reach the goals of sustainable development.

The foundation of Turkish policies on climate change was laid with the Eighth Five-Year Development Plan. In 2000, the Specialization Commission Report on Climate Change was published under the Eighth Five-Year Development Plan. The objectives designed to improve the process were incorporated with the Ninth and Tenth Five-Year Development Plans drawn up subsequently. The Eighth Five-Year Development Plan remarked that particular efforts would be used to become a signatory to UNFCCC and, furthermore, that a number of regulations would be introduced in energy efficiency for GHG emission reduction. As stipulated in the Ninth Five-Year Development Plan, a further step was taken in fight against climate change and the "National Action Plan on Climate Change" was prepared, which set out policies and measures for reducing greenhouse gas emissions in line with Turkey's own conditions. As the latest and still effective plan, the Tenth Five-Year Development Plan stresses that the concept of "green growth" is considered as the baseline to reach the goals of sustainable development.

The "Coordination Board on Climate Change (CBCC)", featuring representatives from public and private sectors and non-governmental organizations, was established in 2001 with the intent to coordinate studies being carried out between various functions regarding the fight against climate change. The Board was restructured on four occasions; in 2004, 2010, 2012 and 2013. For the purposes of the adjustment of 2013 - the final restructuring, the air management was incorporated into the scope of activity and the board was named " the Coordination Board on Climate Change and Air Management (CBCCAM)". The board consists of a total of twenty bodies and organizations; Ministry of Environment and Urbanization (coordinator), Ministry of European Union, Ministry of Science, Industry and Technology, Ministry of Foreign Affairs, Ministry of Economy, Ministry of Energy and Natural Resources, Ministry of Food, Agriculture and Livestock, Ministry of Interior, Ministry of Development, Ministry of Finance, Ministry of National Education, Ministry of Forestry and Water Affairs, Ministry of Health, Ministry of Transport, Maritime and Communications, Undersecretariat of Treasury, Turkish Union of Chambers and Commodity Exchanges, Turkish Industry and Business Association, Independent Industrialists and Businessmen's Association, Disaster and Emergency Management Presidency and Turkish Statistical Institute. Additionally, CBCCAM includes seven sub-working groups as well as advisors and secretariat. Besides, the board features functions or experts dealing with climate change in entities and organizations under the control of the board. These working groups are;

- Working Group on Reduction of GHG Emissions (Ministry of Environment and Urbanization - MEU)
- Working Group on Impacts of and Adaptation to Climate Change (MEU)
- Working Group on GHG Emission Inventories (Turkish Statistical Institute - TSI)
- Working Group on Financing (Ministry of Treasury - MT)
- Working Group on Technology Development and Transfer (Ministry of Science, Industry and Technology - MSIT)
- Working Group on Training, Awareness and Capacity Building (MEU)
- Working Group on Air Management (MEU)

The master document used for producing policies in climate change studies is the "**National Climate Change Strategy Document**" that covers the years between 2010-2020. The document was prepared through a well-attended study involving CBCC members, representatives from the concerned public and private sectors, universities and non-governmental organizations under the coordination of the Ministry of Environment and Urbanization (MEU), and approved by the Higher Planning Council on May 3, 2010. The document includes policies for reduction, adaptation, financing and technology which Turkey is capable of achieving through national and international resources, considering the principle of "common, but differentiated responsibilities" as its baseline.

As per the Ninth Development Plan and the National Climate Change Strategy Document, the **National Action Plan on Climate Change** was published in July 2011 in tandem with a large group including CBCC members and other concerned stakeholders under the coordination of the Ministry of Environment and Urbanization. In addition, the **National Adaptation Strategy and Action Plan on Climate Change** containing our nation's policies for adaptation to climate change, which aimed the years between 2011-2023, was prepared in 2012. The plans provide actions for controlling and adapting to GHG emissions in line with the objectives of National Action Plan on Climate Change and define those individuals or entities in charge and timing for bringing these actions to life. The Adaptation Strategy to Climate Change is detailed in Report 2 extensively.

3 KADIKÖY GREENHOUSE GAS EMISSION INVENTORY

3.1 SCOPE OF GREENHOUSE GAS INVENTORY

The analysis of urban-scale emissions should include all analyses of GHG emissions occurring within the geographical and administrative boundaries of a local government. Additionally, the urban-scale inventory should describe the consequences of activities and decisions taken within the region regardless of where emissions occur in geographical aspects.

Each field of activity falling under the scope of a local government's jurisdiction entail the development of specific GHG management schemes. GHG emission inventories of local governments consist of two parts:

1. Emissions associated with the local government's own operations, and
2. Emissions associated with the community in the administrative district for which the local government is responsible.

The emissions from a local government's operations are similar to those from a private organization with a complex structure. Therefore, the calculations do not greatly vary from the emission inventory requirements in the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard developed by the World Resources Institute and the World Business Council for Sustainable Development.

For calculating **urban-scale emissions**, one should adopt an approach and follow a method distinct from those used when calculating national greenhouse gas emission inventories. One of the major causes of this is the challenge of determining the local level of activities and operations resulting in greenhouse gas emissions.

Organizational boundaries

Kadıköy Municipality is located along the coastal line stretching from Haydarpaşa to Bostancı, which consists of 21 neighborhoods.

Operational boundaries

The GHG Protocol sorted emission categories out as follows:

- **Scope 1 – direct greenhouse gas emissions:** These are emissions from all stationary and movable sources of emission that are owned or directly controlled by the organization. These sources include assets which are owned, leased, or acquired by leasing. The scope limit is all *controllable* sources of emission. This scope should include refrigerant gases of air conditioning systems used for operations.
- **Scope 2 – electricity indirect greenhouse gas emissions:** These are emissions from the generation of purchased electricity for the organization's operations. This group should include the utilized mains electricity or other types of energy used for heating/cooling purposes.
- **Scope 3 – other indirect greenhouse gas emissions:** These are GHG emissions which are caused by the organization as result of its operations and remain under its own control, but are excluded from indirect emissions. These may result from activities beyond or behind the organization's core operations, employee travel or subcontractor's operations. The decision-making parameter in this scope should be the level and quality of available data.

3.2 2016 INVENTORY

The total Greenhouse Gas Inventory for Kadıköy district is 1,509,302 tons CO_2e for 2016. Of this quantity, 95,875 tons (6.35%) are directly caused by the Municipality's organizational operations. Figure 3-1 gives the distribution of greenhouse gas emission inventory in Kadıköy by scopes. 28.5% of the total inventory represents greenhouse gas emissions associated with electrity consumptions. While Scope 1 emissions, accounting for 64.5% of the total inventory, represent fuel consumptions in all buildings and industrial facilities as well as during urban transportation, Scope 3 represents greenhouse gas emissions from wastewater and mass transportation facilities remaining within the jurisdiction of the Metropolitan Municipality.

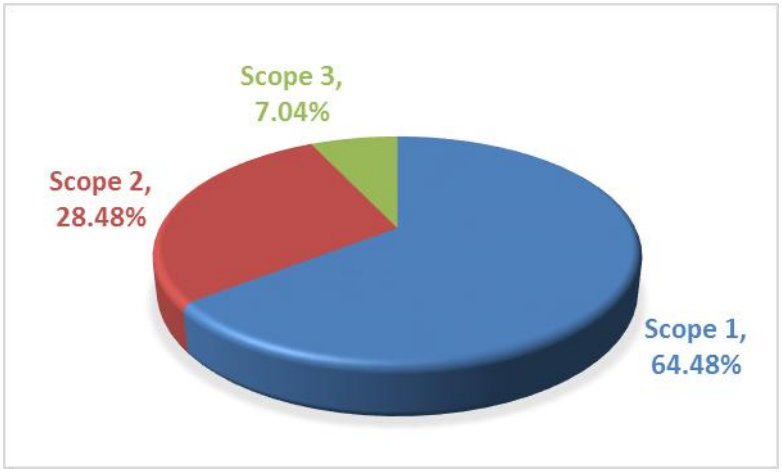


Figure 3-1: Distribution of Kadıköy District Greenhouse Gas Emission by Scopes, 2016, %

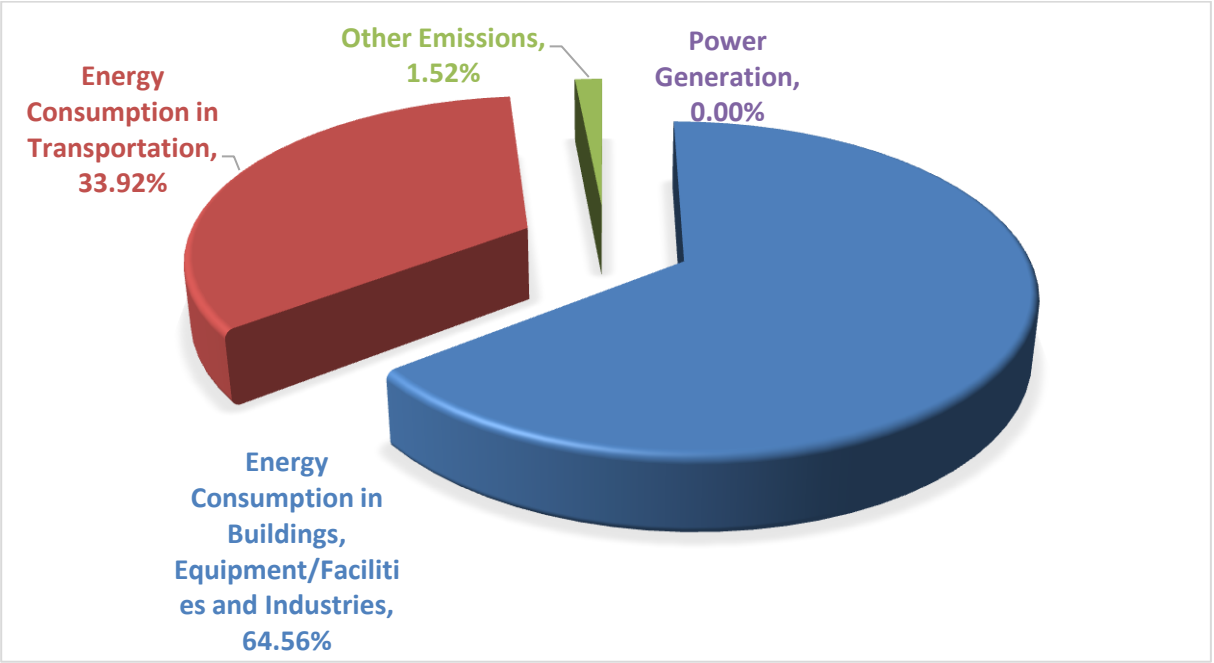


Figure 3-2: Distribution of Kadıköy District Greenhouse Gas Emission by Transportation, Buildings - Industry and Other, 2016, %

Source: Urban Greenhouse Gas Inventory Calculations for Kadıköy Municipality

Table 3-1: Corporate Greenhouse Gas Inventory for Kadıköy Municipality, 2016

Municipal				
Category	CO_2	CH_4	N_2O	Total
	tons CO_2e			
Buildings and Facilities				**5,115**
Scope 1 Stationary Combustion Emissions	1,039.9	2.7	0.5	1,043.1
Scope 2 Electricity Consumption	4,047.1	8.2	16.4	4,071.7
Street Lighting & Traffic Lights				**1,068**
Scope 2 Electricity Consumption	-	-	-	-
Scope 3 Electricity Consumption	1,062.0	2.1	4.3	1,068.4
Vehicle Fleet				**7,290**
Scope 1 Movable Combustion Emissions	7,177.4	11.2	101.5	7,290.2
Scope 2 Electricity Consumptions by Electric Vehicles	-	-	-	-
Mass Transportation				**82,350**
Scope 3 Mass Transportation Metro Electricity Consumption	3,262.2	6.6	13.2	3,282.0
Scope 3 Mass Transportation Vehicles Municipal Buses	77,842.6	118.5	1,096.4	79,057.5
Scope 3 Employee Commutation	10.1	0.0	0.1	10.2
Fugitive Emissions				**51**
Scope 1 Air Conditioner Gases	51.3	0.0	0.0	51.3
Other Scope 3 Emissions				**-**
Scope 3 Flights	-	-	-	-
TOTAL	94,492.5	149.4	1,232.4	95,874.3

Greenhouse gas emissions are divided into sub-sectors, as is in Tables: 3-1 and 3-2, and broken down under different topics as per international notations so that reduction strategies can be identified.

The results of calculations show that GHG emissions in Kadıköy are approximately 1.5 million tons CO_2e. As expected with urban emissions, this total quantity is mainly caused by energy consumptions in residential building, transportation and industry/commercial categories.

Table 3-2: Greenhouse Gas Inventory at Kadıköy District Scale, 2016

Urban + Municipal						%
Category		CO_2	CH_4	N_2O	Total	
		tons CO_2e				
Residential					**718,215**	**47.6 %**
Scope 1	Stationary Combustion Emissions	453,430	1,170	239	454,839	30%
Scope 2	Electricity Consumption	261,786	530	1,060	263,376	17%
Commercial					**203,059**	**13.5 %**
Scope 1	Stationary Combustion Emissions	51,564	133	27	51,724	3%
Scope 2	Electricity Consumption	150,421	304	609	151,335	10%
Industrial					**53,173**	**3.5%**
Scope 1	Stationary Combustion Emissions	36,924	95	19	37,038	2%
Scope 2	Electricity Consumption	16,037	32	65	16,135	1%
Vehicles					**511,919**	**33.9 %**
Scope 1	Movable Combustion Emissions	419,129	3,285	7,165	429,579	28%
Scope 3	Mass Transportation - movable combustion	77,843	119	1,096	79,057	5%
Scope 3	Mass Transportation - electric	3,262	7	13	3,282	0%
Solid Waste					**-**	**0%**
Scope 3	Methane Emissions	-	-	-	-	0%
Wastewater and Fugitive Emissions					**22,937**	**1.5%**
Scope 3	CH_4 and N_2O Emissions	51	13,183	9,703	22,937	2%
Agriculture & Land Use					**-**	**0%**
Scope 1	Enteric Fermentation	-	-	-	-	0%
Scope 1	Emissions from Agricultural Lands	-	-	-	-	0%
TOTAL					**1,509,302**	**100%**

Source: Organizational and Urban Greenhouse Gas Inventory Report for Kadıköy Municipality

Table 3-3: Distribution of Greenhouse Gas Inventory for Kadıköy District

Distribution of Greenhouse Gas Inventory for Kadıköy District	tons CO2e	%
Residential, Electricity + Fuel	718,215	47.6
Municipal Functions, Commercial & Public, Electricity + Fuel	203,059	13.5
Industrial, Electricity + Fuel	53,173	3.5
Transportation Vehicles & Mass Transportation	511,919	33.9
Wastewater Treatment	22,937	1.5
Total	**1,509,302**	**100.0**

The emission data summarized in the Table above is illustrated schematically in Figure 3-3 below.

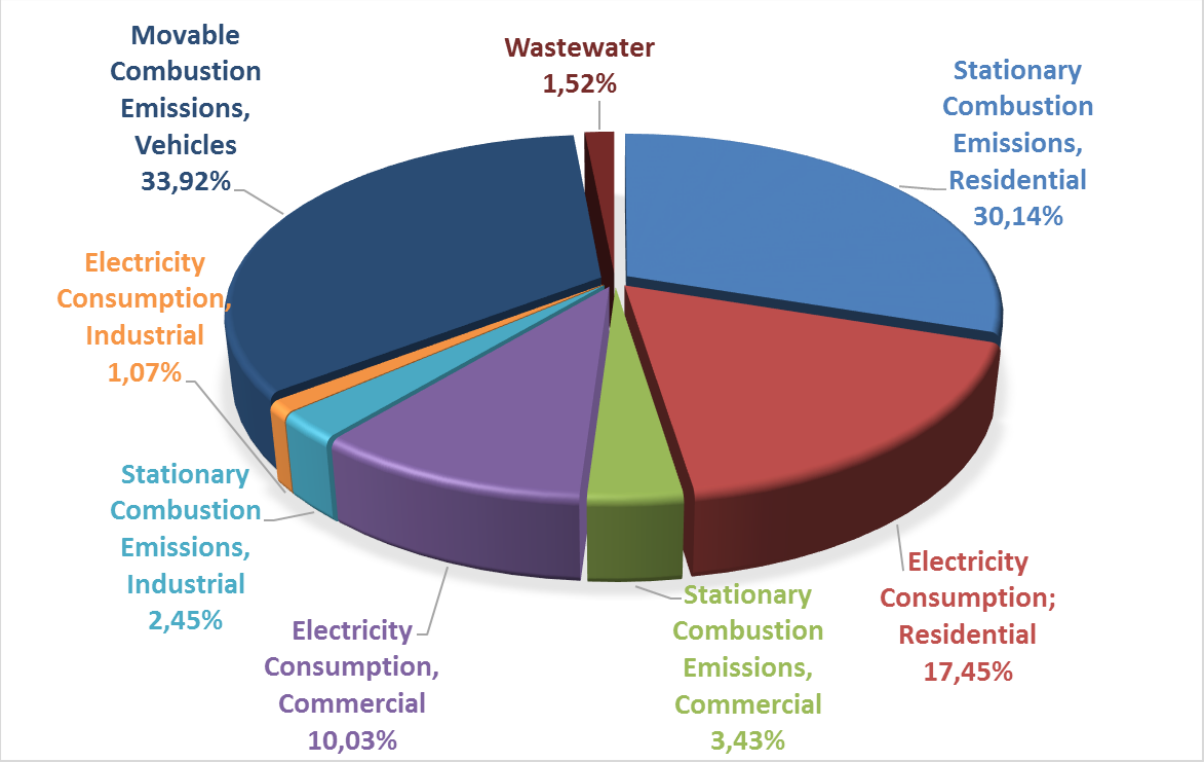


Figure 3-3: Distribution of Urban Greenhouse Gas Inventory for Kadıköy District, 2016, %

Based on the GHG Emission Inventory, the emissions from transportation within the boundaries of Kadıköy District comprise the highest value with 34%. The number of vehicles crossing the district grows greater due to the position of Kadıköy district as a hub of passageway between the European and Anatolian continents and the concentration of business centers in this region of the Anatolian side. Following transportation, the second highest source of emission is from the heating-purpose consumptions in residential buildings (30%). The subsequent highest emissions are electricity consumption in residential buildings (17.5%) and commercial entities (10%).

3.3 DEVELOPMENT OF VARIOUS GREENHOUSE GAS SOURCES IN RECENT YEARS

Although 2016 was selected as the baseline year, the data pertaining to 2010 and 2016 were benchmarked in comparison to the Action Plan prepared by Kadıköy Municipality for 2010. Based on statistics published by TSI and EMRA regarding the city, the data considered during calculations are as listed below:

- Urban Electricity Consumption (by sectors)
- Natural Gas Consumption (by sectors)
- Diesel
- Gasoline
- LPG (tube, bulk, autogas)

Any other data updated by Kadıköy Municipality regarding the city at the time of calculations was listed below.

- Mass Transportation Data (diesel, electricity, IDO (Istanbul Sea Buses) consumptions)

3.3.1 STATIONARY ENERGY FUEL CONSUMPTIONS

Kadıköy district measures the rates of GHG emissions from fuels used in the sectors under IEAP.

- Municipal Buildings and Facilities
- Residential Building
- Commercial
- Industry

The emissions from these sectors may originate from fuels that are directly consumed for local governmental operations (Scope 1), from indirect electricity consumption (Scope 2) or from fuel and electricity consumed under the jurisdiction of the Metropolitan Municipality (Scope 3).

Direct Emissions from Fuel Consumption within the Boundaries of a Local Government

If a central distribution network or other fuels (e.g. natural gas) is/are used within municipal boundaries, this source of emission is classified as **Scope 1**. It is important to monitor and report, on an individual basis, all of the fuel consumed for electricity or central heating/cooling element (e.g. steam) production.

Natural Gas Consumption

The available data is the information on natural gas consumed in 21 neighborhoods located within the boundaries of Kadıköy Municipality.

Table 3-4: Natural Gas Consumption within the Boundaries of Kadıköy Municipality

Natural gas consumption (million m^3)	2010	2016	2016 MWh
Residential Buildings	233,668,458	233,280,553	**2,334,828**
Municipal Buildings and Facilities	716,657	536,578	**5,140**
Public Bodies	31,110,211	7,323,750	**70,171**
Commercial		18,745,725	**179,584**
Industry	3,016,280	19,052,370	**182,522**
Total	**268,511,605**	**278,938,976**	**2,772,245**

Source: IGDAS

For 2010, the topics "Public Bodies" and "Commercial" were reviewed together due to the lack of separate data. The use of natural gas appears to rise in all categories other than this category. Natural gas consumptions had the tendency to decline in sectors other than the industry. The decrease in population caused by the Urban Transformation in Fikirtepe Neighborhood from 2010 to 2016 may be cited as the example of the reason for this decline. Considering on a subscriber basis, natural gas consumptions were observed to increase. The rise in consumption across the industry can be explained by the increased number of concrete plants due to urban transformation.

Coal Consumption

The data on coal consumption in Kadıköy District was taken from the Kadıköy Governorship Social Assistance and Solidarity Foundation. The coal data obtained only covers any coal provided for relief purposes. The quantity data on coal purchased by public members individually was inaccessible. No coal was used in buildings and facilities other than residential buildings.

Table 3-5: Coal Consumption in Kadıköy District

Coal Quantity (ton)	2010 (ton)	2016 (ton)	2016 MWh
Residential	**1,496**	**900**	**3,663**

Source: Kadıköy District Governorship – Social Assistance and Solidarity Foundation

As understood from the table, the use of coal tends to gradually decline in reverse proportion to the increase in natural gas penetration.

3.3.2 ELECTRIC ENERGY CONSUMPTIONS

If electricity or central heating/cooling elements (e.g. steam) supplied by the mains or other power plants is/are used within the boundaries of a local government, this source of emission is classified as Scope 2.

As seen in the following table, every sector appears to have an decreased level of electricity consumption save for industrial and municipal consumptions. The key reason for this decrease is the actual decline in population of Kadıköy.

Table 3-6: Electricity Consumptions in Kadıköy District

Electricity Consumption in Kadıköy District (kWh)	2010	2016	2016%
Residential	643,125,802	529,931,368	61%
Municipal Buildings and Facilities	5,642,159	8,192,523	1%
Street Lighting	18,749,049	2,149,742	0%
Commercial	473,212,703	294,154,369	34%
Industry	5,127,576	32,463,853	4%
Total	**1,145,857,289**	**866,891,855**	**100%**

Source: EnerjiSA Kadıköy Consumption Data

3.3.3 TRANSPORTATION

The quantities of emissions resulting from the combustion of fuels used in the following vehicles should be measured.

- Road vehicles and off-road vehicles,
- Railway, marine and air vehicles (Kadıköy urban GHG inventory includes no air transportation.)

Any emissions from these sources may occur either directly by the use of fuel in vehicles or indirectly by the use of generated electric energy in vehicles.

Vehicles within Urban Boundaries (Scope 1)

The fuels used by road vehicles within the boundaries of Kadıköy district are classified as Scope 1. The provincial fuel oil consumption data is accessible through annual reports of the Energy Market Regulatory Authority. The value of consumption calculated for bus terminals and the consumption associated with transportation in the Municipal inventory (Municipal vehicle fleet, mass transportation vehicles, personnel transportation, and consumption by contractors providing services to the Municipality, if available) should be deducted from the values of fuel consumption within urban boundaries.

Table 3-7: Fuel Oil Consumptions in Kadıköy District

Fuel Type	2010	2016	Energy Consumption 2016 (MWh)
Gasoline (L)	70,269,370	55,603,422	493,758
Diesel (L)	75,049,500	87,035,587	855,560
LPG (kg)	25,764,500	20,841,071	264,056
Total			**1,613,375**

Source: EMRA, Oil and LPG Reports prepared in 2010 and 2016

Of mass transportation vehicles operating within the boundaries of Kadıköy Municipality, buses, metrobuses, M4 Kadıköy-Tavşantepe metro line and T3 Moda Tramline remain within the jurisdiction of IETT (Istanbul Electric Tramway and Tunnel Establishments) and ferry lines remain within the jurisdiction of IDO (Istanbul Sea Buses) and therefore the emissions from these vehicles within Municipal boundaries are considered Scope 3. The emissions from fuel consumed by minibus and shared taxi lines within the district are taken into consideration as Scope 1. The following table compared mass transportation-transportation consumptions pertaining to 2010 and 2016.

Table 3-8: Mass Transportation Vehicles Fuel and Electricity Consumptions

Mass Transportation Motor Vehicles	2010	2016	Energy Consumption 2016 (MWh)
Municipal Buses (L)	14,741,191	12,611,817	123,974
Minibus (L)	4,154,290	4,740,395	46,598
Shared Taxi (L)	952,536	1,179,055	11,590
City Line (L)	6,227,025	10,009,643	98,395
Metrobus (L)		1,090,821	10,723
M4 Kadıköy-Tavşantepe metro line (kWh)		6,410,989	6,411
T3 Moda Tram Line (kWh)	203,402	192,586	193
TOTAL			**297,884**

Source: IETT, IDO

Given Table 3.9, one can see which sector in Kadıköy district has changed rates of emissions to what extent by making a comparison between 2010 and 2016 emissions. Although there are not great variances between inventory rates, the most noticeable aspect of this table is the observed decline in emissions from 2010 to 2016. CO_2e emissions per capita appear to have a tendency to rise, while there is an observed decline in total emissions. This can be attributed to growing industrial consumptions in connection with construction works within the province and to declining population in return.

Table 3-9: 2010 and 2016 Comparison for Kadıköy District Greenhouse Gas Inventory

Urban + Municipal					
Category		2010	2016	2010	2016
		tons CO_2e			
Residential Building		805,478	718,215	47%	48%
Scope 1	Stationary Combustion Emissions	509,640	454,839	30%	30%
Scope 2	Electricity Consumption	295,838	263,376	17%	17%
Tertiary buildings		298,414	203,059	17%	13%
Scope 1	Stationary Combustion Emissions	69,112	51,724	4%	3%
Scope 2	Electricity Consumption	229,302	151,335	13%	10%
Industrial		8,909	53,173	1%	4%
Scope 1	Stationary Combustion Emissions	6,550	37,038	0%	2%
Scope 2	Electricity Consumption	2,359	16,135	0%	1%
Transportation		603,814	511,918	35%	34%
Scope 1	Stationary Combustion Emissions	528,849	429,579	31%	28%
Scope 3	Mass Transportation	71,886	79,057	4%	5%
Scope 3	Mass Transportation - Metro	3,079	3,282	0%	0%
Wastewater and Fugitive Emissions		-	22,937	0%	2%
Scope 3	CH_4 and N_2O Emissions	-	22,937	0%	2%
TOTAL		**1,716,615**	**1,509,302**	**100%**	
Per Capita		**3.22**	**3.34**		

The sectors included in GHG inventory changed in comparison to 2010. Changes were compared for 2016, the baseline year, and 2010, the year in which the action plan was prepared earlier.

- The share of category “Residential Buildings” in urban GHG inventory was observed to increase from 47% to 48%.
- The share of category “Commercial & Public” in GHG inventory decreased from 17% to 13%.
- The share of category “Transportation” in GHG inventory decreased from 35% to 34%.
- While the percentage of sectors in overall inventory changed comparing 2010 to 2016, the rate of emissions in all sectors, but the industrial sector, was observed to decrease compared to 2010. The main reason for this is considered to be the decrease in population of Fikirtepe Neighborhood resulting from the actual urban transformation. Similarly, the 7-time increase in industrial emissions is considered to be caused by the establishment of new provisional concrete plants in the vicinity of construction sites. Comparing total inventories; the rate of emissions seems to decline compared to 2010, while CO_2e emissions per capita appear to rise due the reduction of population.
- Another issue to be noted is the non-inclusion of methane (CH_4) and nitrous oxide (N_2O) emissions in GHG inventory when calculating 2010 GHG emissions. This should be considered during comparison. The share of CH_4 and N_2O in 2016 GHG emissions is below 1%.

4 KADIKÖY SUSTAINABLE ENERGY ACTION PLAN

The distribution of Kadıköy urban GHG emissions is consistent with the nature of urban development emerging with Turkey's post-1980's overall economic drivers. The causes, such as migration, urban rent, rapid automobilization and encouragement of loan-based consumption economy, create a considerable pressure over the city. Existing urban dynamics and issues of Kadıköy were raised with countless reports, congresses and meetings carried out by the city's stakeholders, in particular by the local government.

Modern urban governments should plan energy flows and urban development jointly in world cities that are exposed to the threat of climate change, resource shortage, adverse and sudden climate events. Climate Change or Sustainable Energy Action Plans are indispensable planning and governance instruments primarily for keeping a record of, monitoring, and reducing in the long-term urban energy and GHG concentrations. Their integration with a long-term urban planning on Zoning and Transportation allows the urban vision to be voiced in different sub-fields, enhancing stakeholder engagement. The probability of widespread use of renewable energy resources with rapidly decreasing costs, particularly of solar energy, and the existence of urban stakeholders owning the city's future create a great synergy for a sustainable urban development. 'Climate Change Action Plans' offer a crucial tool of assessment to local governments, setting out and prioritizing all sources, and potentials and practices likely to be used.

As seen in Table 3-1, the inventory continued to include the sectors within the jurisdiction of Kadıköy Municipality, which the latter could intervene in and/or drive, and the sectors that could make recommendations to the Metropolitan Municipality under its own actions plans despite being within the jurisdiction of the Metropolitan Municipality. Kadıköy Municipality committed itself to reduce emissions per capita by 40% minimum when signing the Covenant of Mayors (CoM). As is with the industry category, the emissions associated with economic sectors under the direct influence of national policies are generally excluded from urban inventories. Though not under the control of Kadıköy Municipality, most of the industrial plants in Kadıköy are concrete plants that are established on a provisional basis due to urban transformation. One may indicate that concrete plants will stop their production upon the completion of urban transformation and therefore a natural process of reduction will take place.

It is deemed appropriate to incorporate the measures for residential buildings, tertiary buildings (including public buildings), transportation and wastewater, for which the local government may aim reduction through education, guidance or direct strategies open to municipal intervention, into the inventory in accordance with the principles of Covenant of Mayors.

Table 4-1: Energy Consumptions Projected to Be Reduced under Kadıköy SEAP, 2016

Kadıköy		5,480,922	1,509,302	%
		MWh	tCO_2e	
Energy Consumption in Buildings, Equipment/Facilities and Industries	**COM**	**3,542,800**	**974,446**	**64.6%**
Municipal Buildings & Facilities	Yes	13,332.940	5,115	0.3%
Other Buildings & Facilities Other Than Municipal Buildings	Yes	543,909.520	196,876	13.0%
Residential Buildings	Yes	2,768,422	718,214	47.6%
Municipal Street Lighting	Yes	2,150	1,068	0.1%
Industry	Yes	214,986	53,172	3.5%
Energy Consumption in Transportation		**1,938,122**	**511,919**	**33.9%**
Municipal Vehicle Fleet	Yes	26,864	7,290	0.5%
Mass Transportation Municipal Buses	Yes	291,280	79,057	5.2%
Mass Transportation Metro	Yes	6,604	3,282	0.2%
Urban Vehicles	Yes	1,613,375	422,289	28.0%
Business Flights	Yes	-	-	0.0%
Transit - Bus Terminal	Yes	-	-	0.0%
Other Emissions		**-**	**22,937**	**1.5%**
Solid Waste Disposal	Yes	-	-	0.0%
Wastewater Treatment				0.0%
Wastewater Treatment Process CH_4	Yes	-	13,183	0.9%
Wastewater Treatment Process Nit./Denit. N_2O	Yes	-	-	0.0%
Wastewater Treatment Discharge N_2O	Yes	-	9,598	0.6%
Fugitive Emissions	Yes	-	51	0.0%

4.1 CURRENT STATE AND PROBABLE FUTURES

Kadıköy Municipality projections of population demonstrate that the population of Kadıköy district will reach about 706 thousand by 2030 with 56% increase. The cause of this high level of increase is considered to be the return of population, leaving Fikirtepe region due to urban transformation, to the region along with more groups of people as well as the steady increase in district population because of its nature of being a district receiving immigrants. Urban GHG emissions in Kadıköy are projected to follow a trend as shown in Figure 4-1, if existing trends persist.

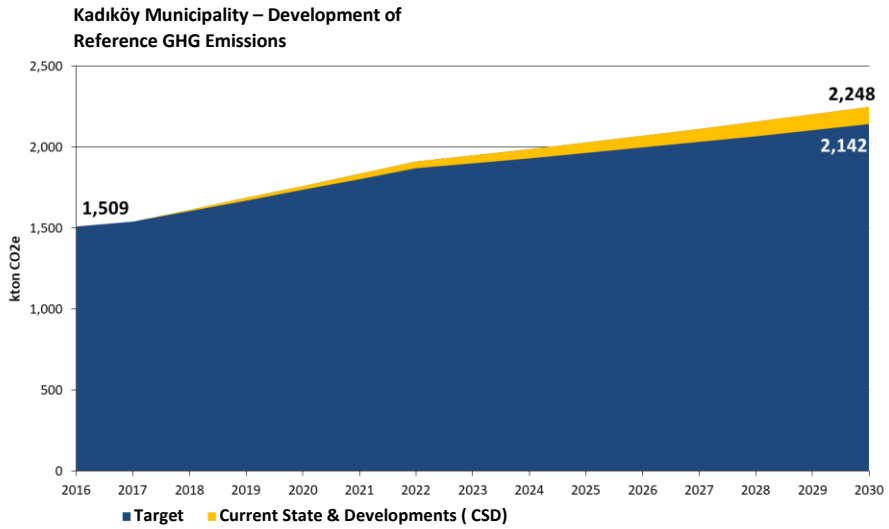


Figure 4-1: Kadıköy Greenhouse Gas Emission Projections, 2016 - 2030

Future projections are estimated based on population, sectoral trends, urban transformation and in-situ transformation data obtained from Kadıköy Municipality reports and studies. Furthermore, Turkey also has a 'natural' trend of increase in energy efficiency enforced by technological advancements, regulations and financial dynamics. For example, the state's official "Energy Efficiency Strategy Document 2010-2013" aims to reduce energy concentration by 15% for industrial and service sectors, 15-30% for building stock on average, and in accordance with EU norms for house appliances and transportation vehicles (emission reduction of 3-4% per year for cars, 30% energy saving for house appliances by 2020). Public bodies were instructed to save energy by 20% by 2023. In the light of the state public bodies' projections and the recent developments in energy efficiency of Turkey, an average of 7% energy efficiency recovery is agreed as a reliable value by 2030 in comparison to 2016 in terms of KSEAP study. This 'natural' decrease in energy consumptions brings urban emissions in Kadıköy to the level of **2.142.049 tons CO_2e as of 2030** based on the projection of 2016 in which measures will be initiated.

For urban-scale greenhouse gas emissions comprising the pillar of this study, a variety of urban strategic plans were considered and future assumptions were provided for energy consumption. The studies conducted by Kadıköy in recent years came in very useful in this respect.

Based on projections of increase (in population, building stock, etc.) under urban strategic plans for the period following 2018, the year in which the report was prepared, energy consumptions and greenhouse gas inventory were projected for every year. The sub-topics shown in the following table identified the potential amounts of saving on a yearly basis as a result of reduction measures / actions based on actual projections. The reduction ratios submitted under the report are final reduction quantities achieved in 2030. The potentials for probable reduction in various sectors, the "overall" approaches recognized by international literature and the outputs of studies particularly on energy efficiency in Turkey were used. For example, the total effect of actions taken to enhance energy efficiency on the Turkish building stock will undoubtedly vary from, e.g., that of Germany due to the variances at initial points. The cost and duration of actions will vary from one country to another. Additionally, the average effects of several improvements in urban transportation on emissions from transportation were calculated using the values utilized in several reports that were prepared in this respect. For example, there is a continued debate over the inapplicability of any recognitions allowed to those cities of "developed" countries to the cities of "developing" countries, although calculation methods employed for urban GHG emissions have become increasingly similar to each other in recent years. In "developing" countries where the pace of renewing and expanding urban infrastructures fails to keep up with the population rise, it is reported that the increase in unit services (e.g. unit increases in railway mass transportation distances) should be based on various parametric recognitions. The growing number of Turkish studies in this field will also enhance the accuracy of estimations on reductions as well as that off urban emissions inventories prepared to eliminate variances and uncertainties in calculation methods.

The rate of emission increased to % values given in the related chapters in 2030, increasing emissions at specific rates by years with a great portion of reduction measures initiated in 2018. Taking the sum total of all of these reduction results, a reduction above 40% was achieved in emissions per capita while no absolute considerable reduction could be achieved compared to 2016. The inference is that 37% reduction can be achieved in 2030 in line with the "Business as Usual" (BAU) scenario.

4.2 SCOPE OF SUSTAINABLE ENERGY ACTION PLAN AND GREENHOUSE GAS REDUCTION MEASURES

Kadıköy Sustainable Energy Action Plan consists of 5 main topics. These are; sustainable urban texture, urban mobility, renewable energy, participatory social awareness, and other reduction efforts that are of minor importance for Kadıköy district, such as wastewater and industry.

First, the current state was put forward regarding the topics given and then the strategies designed to reduce the identified sources of GHG emissions were developed. Particular care was exerted to make the identified strategies consistent with other plans performed at either local or national scale.

Under the topic of Sustainable Urban Texture, the measures with a high level of feasibility recognized in the international arena, which are designed to reduce energy consumptions in residential buildings, Municipality and other commercial buildings located in the city, were identified and the attainable targets were determined in consideration of national strategic plans and those decisions taken during the workshop.

Under the topic of Urban Mobility, the studies, planned within the scope of the Transportation Master Plan for Istanbul as well as Kadıköy District Strategic Plan, were reviewed to the great extent.

Considering Renewable Energy, Kadıköy is known to have a potential above that of Germany which, for example, commonly uses solar-powered electricity production. Specifically, building roofs feature appropriate spaces for applications.

The public will be informed of energy efficiency and renewable energy through guiding and exemplary awareness raising campaigns that can be organized by Kadıköy Municipality in tandem with the concerned organizations, and through potential information points.

4.2.1 IMPROVEMENT OF SUSTAINABLE URBAN TEXTURE

Based on 2015 National Greenhouse Gas Inventory; 72% of national CO_2 emission (475.1 million tons CO_2e) result from energy consumption. Based on Current State (BAU - 'Business as Usual') Scenario; the energy consumption by the buildings sector totaling 28.3 million TOE (tons of oil equivalent) is estimated to reach 47.5 million TEP by 2030, demonstrating that CO_2 emission will double. On the other hand, the buildings sector offers crucial opportunities for cost-effective emission and energy saving potential. With the First National Communication submitted pursuant to UNFCCC (the United Nations Framework Convention on Climate Change), the Government reported that investing in energy efficiency is more cost-effective than the use of renewable energy for the reduction of emissions[6].

The population increase and the rapid urbanization intensify the need for residential buildings particularly in metropolitans. Based on TSI's building count data for 2000, the number of buildings grew from 4.3 million in 1984 to 7.8 million in 2000 with 78% increase, while the number of residential buildings reached 16.2 million with 129% increase as per the data of the same year. Based on the building count of 2000, the area covered by residential, commercial and public buildings corresponds to 913 million m^2, 400 m^2 million of which is estimated to be provided with heating.

The building stock provided in our country before 2000 consumes at least two times as much as the value in the current legislation even when compared by applicable construction standards only. The

[6] Project for Turkish Climate Change Action Plan Improvement Evaluation of Current Situation of Buildings Sector Report, Tülin Keskin, August 2010

Directorate General of Renewable Energy (formerly Electric Power Resources Survey and Development Administration – ERSDA) announced the energy efficiency potential of buildings as 35%, estimating that 2400 Gwh electric energy could be saved with heat insulation and cooling applied to 10 million residential buildings as well as 2.3 million TOE fuel capable of being saved for heating.

The 3rd Strategic Area of Kadıköy Strategic Plan is "Urban Development and Construction". Below are listed the objectives associated with the strategic target (strategic target 6) of producing permanent solutions for infrastructure and superstructure issues to create a city in line with the principle of a "Habitable", "Robust", "Free-of-Obstacles" and "Sustainable Kadıköy" identified under this strategic area; and of designing urban aesthetics by carrying out plans and projects that would protect culture-cultural texture[7].

- Strategic Target 1: Carry out planning activities and urban design projects in Urban Transformation and Urban Renewal Areas and in regions with buildings to be renewed remaining out of such areas, perform risk assessment activities and inspections for buildings, issue demolition and building licenses by ensuring the compliance of projects with the public zoning legislation, and make buildings consistent with licensed designs.
- Strategic Target 3: Carry out participatory and innovative design activities to enhance the spatial and living quality of Kadıköy.
- Strategic Target 4: Coordinate participatory, innovative and ecological activities to create open public spaces (parks, squares, parking lots, etc.) and closed public facilities (culture centers, sports halls, etc.).

- Strategic Target 5: Engage in activities to develop new axes by adopting a holistic approach towards existing pedestrian, bicycle and vehicle access roads across Kadıköy.
- Strategic Target 10: Perform maintenance, repair and reconstruction works for any and all public buildings and service functions remaining within the Municipal borders.

The National Energy Efficiency Action Plan published in the early 2018 served as a guide for identifying reduction measures intended to be adopted under Kadıköy Sustainable Energy Action Plan. Below are the intended actions to be taken by the public sector for the following buildings. The issues that are of particular concern to local governments are detailed.

- *Identification and Sharing of Best Practices for Materials and Technology Used in the Construction Sector*
- Development of Database Including Energy Consumption Data for Buildings
- Definition of Energy Saving Targets for Public Buildings
- Enhancement of Energy Efficiency in Municipal Services
    - Actions shall be taken to improve the efficiency of financing mechanism provided by the Bank of Provinces for municipalities and incorporate international finance institutions into this mechanism.
    - Actions shall be taken to conduct energy efficiency surveys and adopt measures at municipalities with the help of financing provided.
    - Municipalities shall encouraged to be certified by ISO 50001 Energy Management System.
    - Municipalities shall be caused to develop an energy efficiency function as a part of their organization.

[7] Kadıköy 2015 – 2019 Strategic Plan

- *Rehabilitation of Existing Buildings and Improvement of Energy Efficiency*
- *Encouragement of Using Central and Regional Heating/Cooling Systems*
  - In line with action outputs "Determination of Cogeneration and District Heating-Cooling Systems Potential and Preparation of Roadmap", the terms of obligations imposed on new buildings and settlements shall be investigated with the incentive schemes searched for existing buildings.
  - The amendment to the applicable legislation shall mandate the performance of economic feasibility analyses for renewable energy-assisted cogeneration systems and heating/cooling systems regarding new community buildings to be constructed.
  - Direct or indirect incentives shall be defined for existing community buildings and large settlements that are identified to have a high potential.
  - The maximum use of regional geothermal potential and power generation facility-induced waste heat shall be provided for district heating systems, if available.
- *Increasing the Rate of Ownership of Energy Performance Certificates for Existing Buildings*
  - For the execution of energy performance certificates for existing buildings, the capacity of legal entities having a licensed engineer or architect certified as an Independent Consulting Engineer by the concerned professional chambers will be improved so that such entities have the capability to execute energy performance certificates.
  - Sampling studies shall be conducted every year so that the authenticity of any energy performance certificates can be verified.
  - The necessary regulations shall be introduced for imposing sanctions against buying and selling and leasing of any buildings without energy performance certificates.
  - The imposition of sanctions against inefficient buildings shall be considered in the long term after all buildings are provided with an energy performance certificate.
- *Encouragement of Certification for Sustainable Green Buildings and Settlements*
  - Actions shall be taken to prepare baseline assessment guidelines regarding the "Regulation on Certification for Sustainable Green Buildings and Sustainable Settlements" that is enacted by the Ministry of Environment and Urbanization, but not yet put into effect, and to develop the necessary infrastructure for the National Green Building Information System.
  - The measures shall be in place to certify and encourage buildings and settlements with a green certificate.
  - Public buildings shall be certified such that they set an example to the private sector.
  - The Ministry of Environment and Urbanization shall conduct an annual field research to verify the results indicated by certification.
  - The targeted years associated with the obligation imposed on new public and private buildings to be "nearly zero energy building" shall be defined.
  - A monitoring mechanism shall be in place for enhancing the number of sustainable buildings.
- *Encouragement of Energy Efficiency for New Buildings*
  - A number of macro-economic analyses shall be carried out for the encouragement of energy efficiency for new buildings, identifying the scope and an appropriate method.
  - The minimum energy performance criteria and the minimum practices, such as the use of renewable energy resources, cogeneration and heat pumps, shall be identified for incorporation into the new community building model.
  - TS 825 shall be updated such that it includes the requirement for energy used in other areas but for heating purposes and the guidelines on implementation.

- The implementation shall be reviewed every year to optimize it and assess the effect of measure.
- Any future improvements to the buildings constructed within the scope of urban transformation and to community buildings shall be assessed in this scope.
- The compulsory ownership of Class B EPCs (Energy Performance Certificates) for new buildings shall be taken into account.

- *Improvement of Energy Performance for Existing Public Buildings*
  - A legislative arrangement shall be adopted, which allows for the execution of long-term contracts for public buildings.
  - Type EPC templates shall be created.
  - The technical and financial capacity of energy efficiency consulting firms shall be enhanced.
  - A control and verification mechanism shall be developed. Outputs and Indicators: Legislative arrangement, development of type EPC templates as well as a control and verification mechanism, rate of saving achieved
- *Making Widespread the Use of Renewable Energy and Cogeneration Systems in Buildings*
  - The barriers to using renewable energy resources in buildings shall be mitigated with administrative procedures rendered more easy and rapid.
  - The applicable legislation shall define minimum limits in accordance with economic feasibility studies on the use of renewable energy resources in new buildings of a given size.
  - The settlement (netting) of buildings using photovoltaic solar panels with network operators shall be facilitated.
  - Indirect or direct support models shall be defined for the widespread use of cogeneration systems, heat pumps and renewable energy resources in existing buildings.
  - The necessary regulations shall be introduced for the sales of on-site generated electric and thermal energy with the condition of minimum self-consumption in place.
- *Energy Efficiency Survey Schemes for Buildings Having the Status of a SME, and Resource Allocation for Surveys*

Based on 2016 TSI data, the population of Kadıköy District is 452,302. It ranks 11th as the most densely populated district of Istanbul.

Table 4-2: Population Projection for Kadıköy District

	2016	2018	2020	2030
Population	452,302	495,733	569,337	705,926

The process of reconstructing those buildings in old settlement areas of Kadıköy, which are not consistent with the earthquake legislation, was expedited following the enactment of applicable laws and regulations. The projection is that 37% (10,659) of 28,885 buildings in Kadıköy will be demolished and reconstructed by 2020. The experts from the Municipality are of the opinion that 90% of the community building stock will undergo transformation in the upcoming 25 years in particular. The process of demolishing and reconstructing approximately 6,000 buildings located in Fikirtepe Urban Transformation Area, which is the poor city block of district, as well as hazardous buildings in other regions is executed under the surveillance of the Ministry of Environment and Urbanization, not the

Municipality. Although sustainability criteria were not imposed during the construction phase of such buildings, one may remark that they are designed with a more energy efficient pattern compared to older buildings in accordance with the applicable regulations.

The studies conducted in consideration of the district-wide projection data for 2020 and 2030 furnished by the directorate of plan project assume that the population of Kadıköy will increase by over 250 thousand between 2016-2030.

As is in the earlier study, Kadıköy Climate Action and Adaptation Plan (KCAAP) primarily focuses on reduction measures that will essentially enhance energy efficiency of and renewable energy use in the existing building stock, developing suggestions for the new building stock in the 'habitable' area projected by urban plans.

Target 1: Improvement of Sustainable Urban Texture

Target 1.1: Energy-efficient restorations for existing residential buildings;

Reduce energy consumptions in existing buildings of Kadıköy district through energy efficiency practices, avoid heat loss of residential buildings in the winter season and heat gain in the summer season, reduce fuel consumption and mitigate GHG emissions

Stakeholders: *Landlords and tenants, insulation material manufacturers, application contractors, Ministry of Energy and Natural Resources (MENR), finance institutions, professional organizations,* Association of Thermal Insulation Water Sound and Fire (IZODER), and Energy Efficiency Association (ENVERDER)

Target 1.1: Energy-efficient restorations for existing residential buildings
Action 1.1.1: Heat insulation for existing residential buildings
Action 1.1.2: Renewable energy applications for existing residential buildings
Action 1.1.3: Use of energy-efficient lighting systems (economical LED lighting) in existing residential buildings

Action 1.1.1	Heat insulation for existing residential buildings
Current State	Residential energy consumptions account for 51% of consumptions throughout Kadıköy and 48% of emissions (2,768,422 MWh and 718,214 tCO_2e, respectively). Like other buildings, residential buildings must obtain an Energy Performance Certificate by 2020 under the Energy Efficiency Law and the Buildings Energy Performance Regulation, enacted in 2008. Based on researches conducted by the Ministry of Public Works and IZODER, the number of heat-insulated buildings in Turkey, including those consistent with TS 825 built after 2000, is less than 20% across the country. It is agreeable that the same rate also applies to Kadıköy. For encouragement in this respect, the public awareness should be raised and several financial facilities should be provided. The distribution of related funding received from foreign parties is initiated.

Actions / Steps	56% of existing urban buildings shall be transformed via in-situ transformation and constructed in accordance with the applicable regulations by 2030. 14% of existing buildings (other than 56%) are projected to complete exterior, roof and weather insulation applications by 2030. As a result of these actions, it is projected that the related residential buildings will achieve **10% electricity saving and 40% energy saving from heating fuels**. Additionally, the projection is that **residential buildings will have 30% percent reduced coal consumption** and switch to natural gas and other fuels (e.g. biomass). The attendants of those meetings held by Kadıköy Municipality Climate Ambassadors also highlighted energy efficiency applications for residential buildings. In this context, the primary actions discussed during these meetings included detection of heat leakages, performance of necessary insulations, discussion of some practices such as tax incentives, etc.
Time Schedule	2018 - 2030
Cost	A total cost of approximately TRY 138 million with TRY 3,500 cost per building is projected, assuming that the exterior area of an average residential building is 50 m^2 and the cost is about TRY 70/m^2. For an average 100 m^2-flat, the payback period is about 6-7 years.
Rate of Saving	It is projected that a total of **608,497 MWh** energy will be saved with **33,756 MWh** electricity, **569,418 MWh** natural gas and **5,323 MWh** coal saved and consequently **a total of 134,210 tCO_2e** emission from **16,695 tons** electricity, **115,307 tons** natural gas and **2,207 tons** coal will be reduced.
Investor	Building owners and/or landlords
Stakeholders	Finance institutions, insulation material manufacturers, application contractors, Kadıköy Municipality Directorate of Plan Project, Metropolitan Municipality
Municipal Contribution	The Municipality cannot be expected to be an investor in enhancing energy efficiency of residential buildings. However, the Municipality can act as a guide, joining the concerned stakeholders together. Finance institutions can be caused to offer affordable financial facilities to the public with common financial solutions developed in tandem with various material manufacturers. If the Municipality manages to allocate adequate human resources, it may support finance institutions in inspecting future projects developed and ensuring that such projects are implemented for the intended use.

Action 1.1.2: Renewable energy applications for existing residential buildings

One of the most important distributed renewable energy applications is photovoltaic (PV) and heat pump applications that are specifically suitable for Kadıköy. After a short span of stagnation, the PV technology market grows very rapidly with decreasing pricing. As indicated earlier, a number of legislative omissions were eliminated to a great extent, but the projection is that the adaptation of

recently privatized distribution companies to photovoltaic applications will take some time. Nevertheless, it is estimated that the costs of PV applications will be reduced for residential buildings with reasonable payback periods as from 2018 due to the decreasing price of technology and increasing electricity prices in Turkey. An estimation study on roof applications for Kadıköy is described in Action 3.1.2 under "Development of Locality-Specific Innovative Solutions for Energy Production" that discusses projects for Renewable Energy emission reduction.

Action 1.1.3	**Use of energy-efficient lighting systems in existing residential buildings**
Current State	Several studies conducted in Turkey demonstrate that domestic lighting-purpose electricity consumptions is about 10-20% percent of all electricity consumptions. Based on the number of residential electricity subscribers in Kadıköy district, it is projected that all of the buildings switching to energy-efficient lighting systems will be capable of decreasing lighting-purpose energy consumptions by about 50-80%, resulting in total electricity consumptions declining by 15%. (It is agreed that 70% incandescent lamp and 30% compact fluorescent lamp is used for lighting in accordance with the reference residential building parameters defined in the Buildings Energy Performance Regulation.)
Actions / Steps	It is projected that **15%** saving will be achieved for electricity consumptions after primary replacement of those lamps that are most commonly used in residential buildings and then of all lamps with LED lamps. The switchover to motion-sensitive LED lighting system is one of the most pivotal issues in energy efficiency raised during the meetings held by Kadıköy Municipality Climate Ambassadors.
Time Schedule	2018 - 2030
Cost	The replacement of 12 lighting systems per building costs approximately TRY 240, totaling TRY 63 million. Based on an average household electricity consumption, the payback period for lighting systems replacement can be indicated as about one year. Given the declining price, and lifetime of new technologies, LED lighting systems are observed to (last approximately three times longer) be more economically advantageous.
Rate of Saving	The aim is to achieve **91,058 MWh** reduction in electricity consumption and **45,037 tCO_2e** reduction in emission.
Investor	Landlords and tenants
Municipal Contribution	Acting as an informative and guiding party

Target 1.2: Development of energy systems at block scale;

Reduce fuel consumptions and mitigate GHG emissions by increasing the number of block-based energy systems across the city

Stakeholders: *Landlords and tenants, insulation material manufacturers, application contractors, Ministry of Energy and Natural Resources (MENR), finance institutions, professional organizations,* Association of Thermal Insulation Water Sound and Fire (IZODER), and Energy Efficiency Association (ENVERDER)

Target 1.2: Development of energy systems at block scale
Action 1.2.1: Heating of minimum 25% of residential buildings through alternative-fuel and district heating systems

Action 1.2.1:	**Heating of minimum 25% of residential buildings through alternative-fuel and district heating systems**
Current State	Another subject increasingly growing in importance is that individual building heating is improper application in terms of energy efficiency. The Buildings Energy Performance Regulation stipulated the compulsory use of a central heating system, if the total area of use in newly constructed buildings is greater than 2,000 m², and changing the buildings with a central heating system to an individual system was rendered more difficult under Article 42 of the Property Law. The **district heating system** is a large-scale heating system by which heating and hot water needs are met with the transfer of heat produced in one or more energy resources through pre-insulated piping systems to heat users (industrial facilities, community buildings, neighborhoods, cities, etc.). There are many global applications for district heating systems using biomass fuels as an alternative type of fuel. **Alternative-fuel systems:** The use of efficient systems using alternative patterns of fuels, such as biomass, geothermal, heat pump, etc., either a district heating system or a central and individual system, is rapidly growing.
Actions / Steps	Feasibility studies should be carried out first so that residential buildings are heated by alternative-fuel systems and district heating systems. The inclusion of district heating systems in the central government's agenda will expedite the steps to be taken in this respect. TUBITAK (Scientific and Technological Research Council of Turkey) completed a study that analyzed the potential of thermal power plants to utilize waste heat throughout Turkey. The projection was that 25% of the residential buildings located in Kadıköy would be heated through the monocentric heating of several buildings and the potential switchover to renewable resources with the elimination of cost and supply issues associated with applicable technologies. During consultation meetings, the opinion from public members stressed the inefficiency of individual systems and remarked that studies had to be carried out to make the practices, such as switchover to central systems, shared meter etc., widespread.
Time Schedule	2024 - 2030

Cost	No cost is projected since the technology will vary depending on the fuel selected.
Rate of Saving	The aim is to achieve **640,017 MWh** reduction in energy consumption caused by heating and hot water and **129,603 tons CO_2e** reduction in emission.
Investor	District heating systems remain within the jurisdiction of the Metropolitan Municipality. Investors are residential site managements, building contractors, funding institutions, heat pump applicators, individual users and other investors.
Municipal Contribution	While the liability for district heating infrastructure was vested in district municipalities earlier, the Metropolitan Municipality became liable for the said infrastructure from the local elections, also known as the Metropolitan Law. Therefore, Kadıköy Municipality will not be a direct investor in this respect. The Metropolitan Municipality is obliged to distribute any waste heat, either purchased and/or generated.
Risks	High level of initial investment cost, and Logistics issues in the supply of necessary waste for biogas generation.

Target 1.3: Energy-efficient planning of urban transformation and in-situ transformation areas;

Achieve low-carbon urban development and 40% less energy consuming residential buildings through the integration of energy efficiency and renewable energy resources with projects at the time reconstruction (design) of those buildings inconsistent with the earthquake legislation.

Stakeholders: *Kadıköy Municipality, Metropolitan Municipality, Public Housing Development Administration (TOKI), Urban and Regional Planners, Chamber of Architects, MENR, Professional Organizations, IZODER, ENVERDER, Construction Companies, Finance Institutions, Various Fund Sources, and Development Agencies.*

Target 1.3: Energy-efficient planning of urban transformation and in-situ transformation areas
Action 1.3.1: Energy-efficient urban development for residential buildings

Action 1.3.1:	**Energy-efficient urban development for residential buildings**
Current State	One of the focus points of Kadıköy Municipality Directorate of Plan Project and Directorate of Zoning and Urban Development is the planning and implementation of urban development. Strategic Target 6 of the Strategic Area (SA 3) for Urban Development and Construction in Kadıköy Municipality 2015-2019 Strategic Plan includes carrying out planning activities and urban design projects in Urban Transformation and Urban Renewal Areas and in regions with buildings to be renewed, performing risk assessment activities and inspections for buildings, issuing demolition and building licenses by ensuring the compliance of projects with the public zoning legislation, and making buildings consistent with licensed designs. The urban development of Fikirtepe Region is currently in progress. The areas available for urban or mass transformation, remaining out of this region, are also identified.
Activities /	As a result of the currently ongoing urban development in Fikirtepe

Steps	Neighborhood, further in-situ transformations were planned for neighborhoods including old settlement locations, such as Hasanpaşa, Caferağa, etc. The consideration is that 90% of the district's building stock (with 25% equivalence increase) will be renewed as a result of in-situ transformations in the upcoming 25 years. The consultation meetings, involving Kadıköy Municipality Climate Ambassadors, discussed the organization of thematic meetings for keeping Climate Ambassadors more informed of zoning and construction issues across the district, and the provision of information about the places visited by building contractors and groups having building and reconstruction permits, licenses, etc. and the follow-up of housing processes. The Ambassadors communicated their demand for boosting the awareness raising activities about the subject matter with the Urban Design Guidance.
Time Schedule	The intention is to complete all planning works by 2019. It is projected that the urban development will continue gradually from 2019 to 2030.
Cost	The projection is that the design and construction of energy-efficient buildings in regions currently designated for urban transformation will increase cost per building 10%. The approximate cost per building is about TRY 10,000.
Rate of Saving	The aim is to achieve a total of **182,896 MWh** energy saving with **24,966 MWh** electricity and **157,930 MWh** natural gas saved and a total of **44,329 tCO_2e** emission reduction with **31,981 tCO_2e** electric emission and **12,348 tCO_2e** natural gas emission reduced.
Investor	Building owners, and construction companies
Stakeholders	Municipality, Ministry of Environment and Urbanization, building contractors, finance institutions, related professional chambers, and auditing firms
Municipal Contribution	Acting as a planning, guiding and uniting party. Adjustments can be made to zoning plan notes in areas over which the Municipality has jurisdiction.
Risks	High cost, lack of information

Target 1.4: Energy-efficient restorations for existing tertiary buildings (public, commercial);

Avoid heat loss of tertiary buildings in the winter season and heat gain in the summer season, reduce fuel consumption and mitigate GHG emissions.

***Stakeholders:** Commercial building users, insulation material manufacturers, applicators, Istanbul Chamber of Commerce (ICC), MENR, finance institutions, professional organizations, IZODER, ENVERDER, and ministries to which all public buildings are affiliated.*

Target 1.4: Energy-efficient restorations for existing tertiary buildings
Action 1.4.1: Energy-efficient restorations for existing tertiary buildings (heat insulation)

Action 1.4.2: Energy-efficient lighting for existing tertiary buildings

Action 1.4.1:	**Energy-efficient restorations for existing tertiary buildings (heat insulation)**
Current State / Objective	Considering the data pertaining to 2016, it is seen that about 5% of total energy consumptions and about 3% of emissions are from commercial and public buildings. Commercial buildings have a higher level of energy consumption and energy cost compared to residential buildings. Therefore, it is projected that heat insulation measures will be taken for minimum 70% of commercial buildings and energy consumptions will be lowered by at least 40% by 2030 since insulation and other energy efficiency applications will be more cost-effective for these buildings.
Actions / Steps	- Raise awareness among commercial building owners of the subject matter - Provide assistance in finding easy financial facilities - Demonstrate financial gain via simplified feasibility studies
Time Schedule	2018 - 2030
Cost	It is very hard to make an estimation, because the sizes of tertiary buildings vary greatly.
Rate of Saving	**190,619 MWh** energy saving, **78,229 tCO_2e** reduction
Investor	Commercial building owners, public bodies
Stakeholders	Building owners, applicators, material manufacturers, IZODER, and ENVERDER
Municipal Contribution	Acting as an informant and coordinator
Risks	In particular, the building owners leasing their property may be reluctant to make investment since they will be uninterested in consumption reduction.

Action 1.4.2:	**Energy-efficient lighting for existing tertiary buildings**
Current State / Objective	The electricity consumption in tertiary buildings accounts for 5% of consumptions and 10% of emissions across the entire city. A great portion of this energy consumption results from lighting. The relatively higher price of energy and the high level of consumption make any future subject investments cost-effective. The earlier similar studies have demonstrated that the transformation to energy-efficient systems in lighting is amortized in a span less than one year. 15% energy saving is projected to be achieved for all of the tertiary buildings.
Actions / Steps	It is estimated that the higher level of transformation will most likely be achieved with the pressure from the central government and concerned Ministries.
Time	2018 - 2030

Schedule	
Cost	It is hard to calculate a total budget, because the number of lighting systems is unknown. (A budget estimation is possible for residential buildings, but it is very difficult to make such an estimation for tertiary buildings)
Rate of Saving	The projection is **62,068 MWh** reduction in electricity consumption and **30,699 tCO_2e** reduction in emission.
Investor	Commercial entities, and public bodies
Stakeholders	Energy-efficient lighting system manufacturers, and recycling facilities
Municipal Contribution	Acting as an informant and guide
Risks	There is no commercial or technical risk

Target 1.5: Energy-efficient applications for Municipal buildings;

Reduce energy consumptions in public buildings of Kadıköy district, particularly in the Municipal building, through energy efficiency practices, avoid heat loss of Municipal buildings in the winter season and heat gain in the summer season, reduce fuel consumption, mitigate GHG emissions and raise awareness among the public with good practices

Stakeholders: *Municipality, Metropolitan Municipality, insulation material manufacturers, electromechanical applicators, MENR, finance institutions, professional organizations, IZODER, various fund sources, development agencies, and ENVERDER*

Target 1.5: Energy-efficient applications for Municipal buildings
Action 1.5.1: Energy-efficient restorations for existing Municipal buildings (heat insulation + lighting)

Action 1.5.1:	**Energy-efficient restorations for existing municipal buildings (heat insulation + lighting)**
Current State / Objective	While Kadıköy Municipality buildings and facilities have a considerably low share in energy consumption, they are important for serving as an role model to raise awareness among public members and build awareness of energy efficiency. The National Energy Efficiency Plan (2017-2030) includes an action topic dealing with the enhancement of energy efficiency in municipal services. Based on this action topic, municipalities were recommended to be certified by ISO 50001 Energy Management System and develop energy efficiency functions as a part of their organization. Natural gas consumption can be reduced through insulation applications

	intended for municipal buildings. There will be further reduction in lighting costs that account for the considerable part of electricity consumption.
Actions / Steps	The intention is to provide 40% energy efficiency with energy efficiency applications (heat insulation, thermostatic valve use, energy management system, etc.) applicable to 50% of municipal buildings.
Time Schedule	2018 - 2030
Cost	As indicated earlier, the variances between applications for tertiary buildings make it hard to estimate costs. Operations should be carried out on an individual basis. Exterior insulation and lighting operations were carried out for the service building of the Mayor's Office of Kadıköy, which is one of the largest buildings by m^2. Based on the estimations made using current prices, the cost of insulation for 35 of the buildings (cultural centers, art centers, kindergartens, healthcare centers, study centers, libraries, and homes of volunteers) with an average exterior wall area of 350 m^2 equal to TRY 857,500. The payback period for exterior insulation is expected to range from 7 to 8 years in winter conditions of Istanbul.
Rate of Saving	With the projection of energy reduction in all Municipal buildings with lighting systems renewed, the target is **2,899 MWh** reduction in electricity consumption and **1,434 tCO_2e** reduction in emission in total. The aim is to achieve a total of **7,243 MWh** and **3,160 tCO_2e** reduction with **1,446 MWh** natural gas and **2,899 MWh** electricity (cooling) saving and **293 tCO_2e** natural gas and **1,434 tCO_2e** electricity emission reduction with the help of heat insulation applications.
Investor	Kadıköy Municipality
Stakeholders	Lighting companies, finance institutions, applicators
Municipal Contribution	Acting as an implementer
Risks	High initial cost

Target 1.6: Energy-efficient street lighting systems;

Provide energy saving through energy-efficient street lighting systems

Stakeholders: *Municipality, Istanbul Metropolitan Municipality, energy-efficient lighting system manufacturers, finance institutions, MENR, various fund sources, and development agencies*

Target 1.6: Energy-efficient street lighting systems
Action 1.6.1: Energy-efficient street lighting system

Action 1.6.2: PV integration with street lighting systems

Action 1.6.1:	**Energy-efficient street lighting system**
Current State / Objective	Although there is no accurate information on the number of fixtures and lamps, these items correspond to 0.4% of all electricity consumptions and 0.7% of all emissions across the city. The plan is to replace street lighting systems within the jurisdiction of Kadıköy Municipality (in parks and gardens) and the Metropolitan Municipality with LED lighting systems. The several parts of the city are observed to have initial LED lighting applications. LED lighting systems are known to last for a longer time compared to other lighting systems. Replacing lighting systems with energy-efficient systems, the aim is to achieve; • Reduction in energy losses and inefficiency, • Reduction in energy, repair and maintenance costs, • Protection of energy and natural resources, and • Waste reduction. Additionally, it is important to make public the work of replacement with energy-efficient systems to be conducted as a crucial part of visibility and awareness raising studies.
Actions / Steps	All lighting systems across the city are projected to be replaced with LED lighting systems by 2030. Replacing all street lighting systems with LED systems will provide 60% saving. Based on the subject information from those functions under the control of the Directorate of Parks and Gardens, 95% of fixtures under the responsibility of the Directorate were transformed as of March 2018 in accordance with regulations and 99% of fixtures would reportedly be replaced by the end of 2018. However, it is apparent that the district has still potential of reduction considering the lighting systems remaining within the jurisdiction of other bodies and organizations such as Istanbul Metropolitan Municipality and Directorate General of Highways.  
Time Schedule	2018 - 2030

Cost	The unit price of LED street lamps is approximately TRY 1,500. Based on the information from Kadıköy Municipality, Directorate of Parks and Gardens, there are 100 fixtures left unreplaced under the Municipality's responsibility. The further replacement of these fixtures is planned for 2018. The total cost will be TRY 150,000. However, the level of reduction target is kept high considering those street lighting systems under the responsibility of the Metropolitan Municipality and the Directorate General of Highways.
Rate of Saving	The aim is to achieve **2,077 MWh** energy consumption reduction and **1,027 tCO_2e** emission reduction, if all lighting systems across the city are replaced with LED lighting systems.
Investor	Kadıköy Municipality, Metropolitan Municipality, and other public bodies
Stakeholders	Ministry of Energy and Natural Resources, finance institutions, and manufacturers
Risks	Lack of financial resources available to the Municipality, and shortage of human resources capable of conducting feasibility studies

Action 1.6.2:	**PV integration with street lighting systems**
Current State / Objective	It is possible to reduce consumptions, which are already reduced 80% with the integration of street lighting systems - featuring energy-efficiency lighting installations - with photovoltaic (PV) power systems, to 0 (zero) level. Solar energy integration can be achieved for 20% of street lighting systems switching to LED lighting system.
Actions / Steps	The utility poles replaced with LED lighting systems deliver high level of energy efficiency (60-80%). Given the future saving achieved, the cost of subsequent PV integration becomes infeasible in terms of cost. However, Kadıköy intends to bring to life PV applications in a number of parks with the responsibility for developing model practices for the public.
Time Schedule	2018 - 2030
Cost	The consumptions from lighting are greatly decreased for energy efficiency practices. Because the payback period for PV investment will be very long, the limited number of applications will be carried out only for setting an example.
Rate of Saving	No reduction goal could be set due to the limited number of future applications.
Investor	Metropolitan Municipality, and Kadıköy Municipality
Stakeholders	Finance institutions, fund sources, and lighting system manufacturers
Municipal Contribution	Acting as an implementer and guide
Risks	High cost

4.2.2 IMPROVEMENT OF SUSTAINABLE URBAN MOBILITY

The issue of transportation is considered to be one of the key components of quality of life. The European Union policies and schemes address the relation between quality of life and transportation particularly in terms of sustainability and social integration. The determinants of transportation policy development are the sustainability of natural resources and energy resources and the prevention of environmental pollution. Furthermore, making transportation effective in daily life is reported to be important for enhancing the quality of life and the well-being of individuals.

The Transportation Master Plan for Istanbul published in May 2011 remarks, "The metropolitan area mass transit system considers existing transportation facilities, land use decisions, attraction centers, macro-micro scale transportation investments and transportation systems integration to allow passengers to reach their destination more rapidly and easily and to let transit passengers switch from one system to another effortlessly. Therefore, transfer center zones are planned, which will provide integration between different types of transportation such as rail system (metro, light metro, tramline, funicular, etc.), road system (rubber-tired mass transit, metrobuses, private cars and taxis, etc.) seaway system and bicycle and pedestrian transportation systems." A large part of the rail system intended since the preparation of this plan was brought to life. The transfer center for Marmaray and Kadıköy-Tavşantepe (8 stations located in Kadıköy) metro line was put into service in Ayrılık Çeşmesi and the people of Kadıköy started to use this metro line intensely.

In addition, Kadıköy Municipality 2015-2019 Strategic Plan includes the strategic target "Engage in activities to develop new axes by adopting a holistic approach towards existing pedestrian, bicycle and vehicle access roads across Kadıköy."

The National Energy Efficiency Action Plan listed the future measures taken for the transportation sector. While district municipalities do not have great authority over mass transportation in particular, the following measures intended to be taken under the National Energy Efficiency Action Plan served as a guidance in major subjects where Kadıköy Municipality may carry out operations or give recommendations for transportation. The issues that are of particular concern to local governments are detailed below.

- *Encouragement for Energy-Efficient Vehicles*
  - The Special Consumption Tax includes tax reductions applicable to electric and hybrid vehicles, and specific analyses shall be carried out for the adoption of additional tax reductions, assessing the introduction of a new regulation based on analysis results.
  - The infrastructure shall be improved in line with the differentiated taxation practice aligned with fuel consumption and emission (CO_2/km) values. Tax advantages shall be offered for low-emission vehicles with the improved version of current Motor Vehicle Tax system. This system shall incorporate the practice of higher tax collection from older vehicles in consideration of the balance between environmental impact and purchasing power.
  - The database, storing CO_2 emission data pertaining to all vehicles placed on the market, shall be built. The taxation system shall be assisted by this database.
  - The standards on the installation of charging stations for electric and hybrid vehicles shall be regulated and the related infrastructure shall be built.

- The awareness of electric and hybrid vehicles shall be enhanced, making the low-emission vehicle culture established. Vehicle manufacturers shall be caused to play an active role in promoting and popularizing electric and hybrid vehicles among the public.

- *Development of a Comparative Study on Alternative Fuels and New Technologies*
  - A comparative study shall be developed, analyzing cost, energy consumption and environmental impacts of alternative fueled and/or new technology vehicles based on comparative indicators.
  - Alternative fueled and/or new technology vehicles shall be analyzed for their cost per ton-km or passenger-km, energy resources used by them and consumption of such resources, and hazardous emissions released to the atmosphere throughout their lifecycle, and a comparative study shall be conducted.
  - The requirements for training and physical infrastructure shall be assessed regarding repair and maintenance services for new technology vehicles.
  - A comparative study shall be carried out on conventional and alternative fueled vehicles and energy efficiency policies shall be set in line with the results from this study.

- *Development and Improvement of Bicycle and Pedestrian Transportation*
  - The infrastructure of bicycle and pedestrian paths (bicycle and pedestrian ways, bicycle parking zones, smart bicycle / bicycle stations) shall be built and developed in cities.
  - Bicycle and pedestrian paths/areas closed to motor vehicle use shall be developed in city centers.
  - Urban planning approaches that make traveling on foot or by bicycle appealing shall be adopted. The integration of pedestrian and bicycle paths with other patterns of rubber-tired, rail and sea access shall be provided without any restrictions.
  - The applicable legislative arrangements shall be improved for making zero-emission transportation widespread.

- *Reduction in Urban Traffic Congestion: Reduction in Car Driving*
  - A number of measures shall be taken, which discourage the access of cars to city centers.
  - The capacity of parking lots in attraction centers causing traffic congestion shall be designed properly, no building applications shall be allowed without a parking lot, and the utilization of parking lot fees, collected by municipalities, for the construction of new parking lots shall be coordinated effectively.
  - Actions shall be taken to avoid vehicle occupation of footpaths and sidewalks and to plan on-the-road parking on intense arterial roads. Pick-up and drop-off zones for vehicles such as taxis, buses and shared taxis shall be arranged physically.
  - Some arrangements shall be introduced where the parking fee is costly in areas with heavy urban traffic and relatively inexpensive in places with easy traffic, and mass transportation systems shall be organized on an intermodal basis. The practice "Park and Ride" shall be made widespread.
  - At peak traffic times, the travel of vehicles, such as refuse collection/earth-moving trucks, heavy-duty vehicles, etc., in traffic shall be inspected and restricted. Actions shall be taken to ensure that heavy-duty vehicles have access to the city only at specific times of day within the scope of inner-city logistics.
  - Low-carbon emission zones shall be developed within cities, and the access of heavy-tonnage vehicles to such zones shall be restrained.

- The transportation management functions within Metropolitan Municipalities shall be supported with smart transportation systems, resulting in the effective handling of traffic congestion.
- Courier companies shall be encouraged to carry our inner-city courier deliveries at times with less traffic congestion.
- In and out times applicable to public bodies, private entities and schools shall be arranged on a cascaded basis more effectively.
- A guide shall be prepared for municipalities, compiling the best practices for mitigating urban traffic congestion.
- Activities shall be carried out to raise awareness among the public of the annual cost of vehicle driving.

- *Popularization of Mass Transportation*
  - National and international financial aids shall be utilized to augment and strengthen the mass transportation service network.
  - Mass transportation shall be rendered widespread through awareness raising and information activities. A one-week "mobility week" that aims to alter transportation behaviors for raising transportation awareness among the public shall be organized, holding various activities across the country. Carpooling, widespread new technologies, rapid (allocated) line and alternative transportation methods shall be encouraged.
  - The widespread use of eco-friendly vehicles that are light in weight, electric or hybrid, hydrogen-powered or natural gas-powered, etc. shall be encouraged, providing unrestricted integration of transportation modes with one another.
  - The intermodal transportation shall fundamentally be adjusted regarding the routes and stop/station zones of mass transportation vehicles.
  - In collaboration with local goverments, companies shall encourage their employees to use mass transportation vehicles.
  - The service quality shall be improved to steer passengers towards using mass transportation vehicles.
  - Some arrangements shall be provided to keep appropriate spaces and apparatuses available in mass transportation vehicles so that passengers can carry their bicycles with them.
  - Drivers shall be provided with safe driving technique and communication training to enhance safety and energy efficiency of mass transportation vehicles.

- *Improvement and Implementation of Organizational Restructuring for Urban Transportation*

In addition to national plans, the residents of Kadıköy take every opportunity to raise various demands about sustainable transportation. The attendants of Integrated and Participatory Climate Action for Kadıköy Municipality - World Cafe workshops held between April 13-14, 2018 exchanged a great deal of ideas particularly about the continuity of bicycle and pedestrian paths (as well as the expansion of green areas), the requirement for enhancing the share of maritime transportation (horizontal lines etc.) and preparing for vehicles consuming alternative fuels (charging stations etc.), the integration of mass transportation modes with bicycles (bicycle rental, parking zones etc.), the operation of parking lots in the vicinity of mass transporation stations within the district boundaries, and the restriction of vehicle access to the inner parts of the city, etc. As a local government, Kadıköy Municipality will undoubtledly play a crucial role in referring the public demand to higher authorities,

although a large part of such requests are under the authority of Istanbul Metropolitan Municipality and even the Ministry of Transportation.

Target 2: Improvement of Sustainable Urban Mobility

Target 2.1: Improvement of low carbon emission transportation network;

With mass transportation becoming widespread, the aim is to reduce transportation by motor vehicles used in traffic. *7.5% reduction is targeted regarding transportation emissions.*

Stakeholders: Kadıköy Municipality, Istanbul Metropolitan Municipality, IETT, Provincial Traffic Department, Ministry of Transportation, finance institutions, and TCDD (Turkish State Railways)

Target 2.1: Improvement of low carbon emission transportation network
Action 2.1.1: Enhance the use ratio of mass transportation vehicles
Action 2.1.2: Start up the commuter train again
Action 2.1.3: Replace mass transportation vehicles with energy-efficient vehicles
Action 2.1.4: Encourage the use of electric vehicles across the city
Action 2.1.5: Set an example, replacing 80% of the municipal vehicle fleet with electric vehicles to encourage the use of electric vehicles

Action 2.1.1	Enhance the use ratio of mass transportation vehicles
Action 2.1.2	Start up the commuter train again
Current/State /Objective	The use ratio of mass transportation vehicles shall be enhanced with various practices, decreasing the use of private vehicles. The removal of a vehicle from traffic results in approximately 2 tons CO_2e emission reduction per year. Haydarpaşa-Gebze commuter train line, which was in service in the previous years, was suspended for use due to maintenance and adaptation to switchover to high-speed train system. The estimation is that the use of private vehicles will be reduced to a great extent with the commuter line expected to re-operate in 2018. In addition, maritime transportation mode appears to be used to the extent far below its potential. The requirement for additional investments in road transportation vehicles can be eliminated, steering a portion of passengers using road transportation vehicles towards maritime transportation.
Actions / Steps	• Reduce passenger wait times at stops/stations, • Carry out line optimization for rubber-tired mass transportation vehicles, • Increase the frequency of metro, marmaray and tramline services, and • Increase the number of and improve the infrastructure of mass transportation transfer stations. 7.5% energy saving is targeted with such measures. • Replace those vehicles used in minibus and shared taxi lines with energy-

	efficient fueled vehicles, • Improve rail system network and increase the number of feeder lines, and • Support maritime transportation by horizontal lines and increase its share in urban transportation. All of the potential actions listed above correspond to the measures indicated during Kadıköy Municipality Climate Ambassador meetings. The Ambassadors listed their demand for the integration of mass transportation systems, prioritization of rail systems, increased comfort offered by mass transportation vehicles, occasional free-of-charge transportation services and increased share of maritime transportation in urban transportation etc. Kadıköy Municipality is urged to indicate the existence of such a pressure from its residents since the majority of these demands are governed by the authority of IMM.
Time Schedule	2018 - 2030
Cost	Additional buses, metrobuses and railcars should be purchased to shorten passenger wait times. The number of city line ferries should also be increased. These actions are under the authority of Istanbul Metropolitan Municipality where Kadıköy Municipality is not required to make a considerable investment. Bostancı – Dudullu Metro Line, for which a tender was called, will cost € 558,800,000. The cost of the part remaining within the boundaries of Kadıköy will amount to € 172 million. Kadıköy Municipality is neither the decision-maker for investment nor the investor. The cost of a 1-km double-track railway with electrical signaling system is equal to $ 1.4 million on a flat terrain (based on 2012 prices). Given rugged terrains, the Haydarpaşa extension of the high-speed train line to Pendik can be said to cost minimum $ 52 million. Kadıköy Municipality is neither the decision-maker for investment nor the investor.
Rate of Saving	The aim is to achieve **68,086 MWh** energy reduction and **17,821 tCO_2e** emission reduction.
Investor	Istanbul Metropolitan Municipality, IETT, Istanbul Ulaşım A.Ş., and TCDD
Stakeholders	Kadıköy Municipality, Istanbul Metropolitan Municipality, various fund sources, Bank of Provinces, mass transit vehicle manufacturers, Provincial Traffic Department, and Ministry of Transportation
Municipal Contribution	The Municipality may present an opinion in contact with TCDD and the Ministry of Transportation. It may cooperate with IETT, a subsidiary of the Metropolitan Municipality. It may deliver an opinion for the optimization of various road, crossroad and signalization arrangements.
Risks	Failure to alter passengers' stereotyped behaviors, and challenges faced by TCDD, Ministry of Transportation and Metropolitian Municipality in fund raising

Action 2.1.3	Replace mass transportation vehicles with energy-efficient vehicles
Current State / Objective	It is found out, during inventory calculations, that mass transportation vehicles have about 5% share in urban energy consumption. While IETT started renewing those buses owned by the Municipality, the average age of vehicles ranges from 7 to 8 years. The subject measures stipulated by the Transportation Master Plan are as given below. Necessary measures: - Execute operation with modern and high capacity buses, and - Consider alternative fuel use in consideration of positive contributions of the following steps under KSEAP, although not included in the Transportation Master Plan.
Actions / Steps	- Offer suggestions for the replacement of old vehicles owned by IETT with new and low fuel consumption vehicles, - Replace minibuses and shared taxis with low fuel consuption and energy efficient vehicles in a similar way, - Replace a part of vehicles with CNG vehicles during the renewal process, and - Replace vehicles with electric and biofuel-powered vehicles on a gradual basis.
Time Schedule	2018 - 2030
Cost	One CNG charging stations costs € 200-250 thousand, and the transformation of vehicles totals € 2,500 per vehicle. The prices are expected to decline further in a couple of years with technology becoming widespread and less costly. The cost of an EV charging station is approximately TRY 40,000.
Rate of Saving	The aim is to achieve 80% energy saving upon the replacement of all mass transportation vehicles. The target is **104,637 MWh** energy saving and **28,400 tCO_2e** emission reduction.
Investor	IETT, owners of private public buses, and Municipality
Stakeholders	Fund sources, Bank of Provinces, and public members
Municipal Contribution	Acting as a guide and implementer
Risks	High level of initial investment costs

Action 2.1.4:	Encourage the use of electric vehicles across the city
Current State / Objective	Because electricity generation is still carried out through fossil fuels and inefficient facilities, particular attention should be paid to support the stimulation of electric vehicle use with solar energy. Intensive efforts of technology development for electric vehicles technologies and particulary for

	storage systems and batteries where almost every vehicle manufacturer appears to prepare for this development. This is an issue closely related to national policies.
Actions / Steps	• Stimulate passenger vehicle owners to use electric vehicles • Replace 18,000 vehicles with electric/hybrid vehicles
Time Schedule	2023 - 2030
Cost	An EV rapid charging station entails an investment amount of TRY 40,000, while the sum of TRY 175,500 is required for a 50-kWp photovoltaic power panel (source: negotations with private companies).
Rate of Saving	The vehicle owners replacing their vehicles with electric or hybrid ones will cause **123,858 MWh** energy saving and **33,617 tCO2e** emission reduction.
Investor	Private vehicle owners
Stakeholders	Various fund sources, Bank of Provinces, vehicle manufacturers, vehicle servicing companies, and public members
Municipal Contribution	Infrastructure investments, priviliged road and garden applications
Risks	Ongoing limitation of model practices, and costs

Action 2.1.5	**Set an example, replacing 50% of the municipal vehicle fleet with electric vehicles to encourage the use of electric vehicles**
Current State / Objective	As described in Action 2.1.4, the use of electric vehicles should be encouraged and fossil fuel consumptions should be reduced. Therefore, one of the most important factors that will encourage public members to use electric vehicles is the replacement of the Municipality's own vehicle fleet with electric vehicles. The consumptions by the Municipal vehicle fleet account for 0.5% of total consumption as of 2016. Upon switching to electric vehicles, the emissions from the Municipal vehicle fleet are expected to be reduced substantially.
Actions / Steps	Replace 50% of the Municipal vehicle fleet with electric vehicles by 2030. Review lease options as well as the purchase of electric vehicles.
Time Schedule	2018 - 2030
Cost	The lease cost of electric vehicles is very approximate to that of fossil-fueled vehicles. Consequently, no additional cost is projected.
Rate of Saving	The **replacement** of 80% of the Municipal vehicle fleet with electric and hybrid vehicles will result in **2,982 MWh** energy saving and **809 tCO_2e** emission reduction.

Investor	Kadıköy Municipality
Stakeholders	Various fund sources, Bank of Provinces, vehicle manufacturers, and vehicle servicing companies
Municipal Contribution	Acting as an implementer
Risks	Ongoing limitation of model practices, and costs

Target 2.2: Development of green transportation infrastructure;

The intention is to achieve reduction in the use of motor vehicles such as private cars and taxis etc. with increased rate of bicycle use, increase the current rate of bicycle use from 0.5% to 2.5% and pedestrian access from 42% to 47% and above.

***Stakeholders:** Kadıköy Municipality, Istanbul Metropolitan Municipality, Directorate General of Highways, public members, large building managements, and universities and schools*

Target 2.2: Development of green transportation infrastructure
Action 2.2.1: Achieve 2% increase in the share of bicycle use in transportation
Action 2.2.2: Achieve 5% increase in the share of pedestrians in transportation

Action 2.2.1	**Achieve 2% increase in the share of bicycle use in transportation**
Current State/Objective	Basically, the enhancement of bicycle use is an infrastructure-related issue. As demonstrated by the European experience, the separation of extremely cost-effective bicycle paths and the provision of safety are essentially a matter of planning. Today, bicycle transportation is used at a very low level compared to other types of transportation in Kadıköy. This rate should still be increased based on patterns of use (residence, work, school, shopping, leisure time, etc.), although there are bicycle paths in a large part of topographically flat areas in the region due to the nature of urban settlement.
Actions / Steps	Potential steps taken for increasing the rate of bicycle use **Short- and medium-term measures;** - Improve the access to rail system stations, - Enhance the opportunities of using mass transportation vehicles together with bicycles, and - Structure the inner-city bicycle transportation network. **Long-term measures:** - Complement the study on bicycle transportation with a bicycle-sharing system, and - Complete road signs and signboards. The plan is to increase the rate of bicycle use 2% for the entire urban

	transportation. Additionally, the public members attending consultation meetings reported that they did not lean towards bicycle transportation due to the unsafe nature of roads. Thus, they raised their demand for the increased number of safe bicycle paths and bicycle station points.
Time Schedule	2018 - 2030
Cost	The cost per km of a bicycle path varies depending on the material used and the topographic structure. In line with the research by the Municipal Directorate of Environmental Protection, an average of 1-km bicycle path is projected to cost TRY 52,300. Presuming that the bicycle paths projected under Climate Adaptation and Energy Action plans will be approximately 20 km long by 2030, the total cost is assumed to be TRY 1,050,000.
Rate of Saving	The aim is to achieve **34,043 MWh** energy reduction and **8,911 tCO_2e** emission reduction.
Investor	Kadıköy Municipality, and IMM
Stakeholders	Various fund sources, Bank of Provinces, and public members
Municipal Contribution	The Municipality may act as a stimulant and guide. A bicycle path may designed and built on routes for which the Municipality may take action.
Risks	Need for financial sources, and difficulty in altering passenger habits

Action 2.2.2	**Achieve 5% increase in the share of pedestrians in transportation**
Current State/Objective	Specifically, there is a high rate of pedestrian travels in the city center, central parts of intensive shopping areas, individual directions having a high volume (e.g. schools, sports areas), and location with a substantial number of mass transportation connections. The potential measures designed to enhance pedestrian access under the Transportation Master Plan are listed as follows. **Short-term measures** - Improve the conditions of crossing in places with a high level of need for crossing, and - Provide unrestricted access to mass transportation stops/stations. **Long-term measures** - Expand pedestrian zones in city and district centers, and - Accomplish the application of road signs and traffic signboards.
Actions / Steps	- Expand pedestrian paths, - Develop zones closed to vehicle traffic, and - Provide training on healthy living.
Time Schedule	2018 - 2030

Cost	A 1-km long pedestrian path with a width of 3 m costs approximately TRY 300,000. If an area 2 km in length is pedestrianized by 2030 throughout Kadıköy, the total cost will be TRY 600,000.
Rate of Saving	The aim is to achieve **85,108 MWh** energy saving and **22,276 tCO_2e** emission reduction, providing 5% energy saving with 5% increased rate of pedestrian access.
Investor	Kadıköy Municipality, and Istanbul Metropolitan Municipality
Stakeholders	Local Health Authority, various fund sources, Bank of Provinces, and public members
Municipal Contribution	The local government is responsible for making the roads within its jurisdiction pedestrian friendly, and rendering them safe for and appealing to pedestrians and bicycle users closing specific routes to vehicle traffic.
Risks	Alteration of the habits of city residents

Target 2.3: Conduct of transportation technique training programs;

Reduction in fuel consumption through advanced and ecological driving techniques

Stakeholders: *Kadıköy Municipality, IMM, IETT, and public members*

Target 2.3: Conduct of transportation technique training programs
Action 2.3.1: Training on eco-driving techniques (specifically intended for drivers operating taxis, mass transportation vehicles and waste collection vehicles)

Action 2.3.1:	**Training on eco-driving techniques (specifically intended for drivers operating taxis, mass transportation vehicles and waste collection vehicles)**
Current State / Objective	Providing training on eco-driving techniques for taxi drivers, followed by all commercial vehicle and private vehicle owners, and for mass transportation vehicle operators in particular will allow the drivers in urban traffic to reduce fuel consumption. Several studies demonstrate that eco-driving training programs result in the reduction up to 10% in vehicle fuel consumption.
Actions / Steps	The subject training programs can be expanded through municipal training centers. The support of the Istanbul Metropolitan Municipality may be sought.
Time Schedule	2020 - 2030
Cost	The training cost of eco-driving techniques is approximately TRY 200 per capita across Turkey.
Rate of Saving	No projection was provided for the rate of saving.
Investor	Drivers operating private mass transportation vehicles (IETT, private public bus, minibus, shared taxi and taxi operators), Kadıköy Municipality, IETT, and IMM
Stakeholders	A variety of agreements and cooperations may be executed with training

	providers.
Municipal Contribution	Acting as an implementer and guide
Risks	Social admission, and incapability to allocate time for training programs

4.2.3 DEVELOPMENT OF LOCALITY-SPECIFIC INNOVATIVE SOLUTIONS FOR ENERGY PRODUCTION

While the increased efficiency of energy utilization along with the widespread use of renewable energy resources is a significant element of emission reduction in Kadıköy district, the potential of renewable energies cannot be used effectively. The district appears to have an intermediate potential of solar energy. Because the impacts of climate change are expected to be more severe as from 2030, it is critical to enhance energy efficiency and develop energy production systems that use the potential of regional renewable energy resources.

In addition to national plans, the residents of Kadıköy take every opportunity to raise various demands about locality-specific energy production. Additionally, the attendants of Integrated and Participatory Climate Action for Kadıköy Municipality - World Cafe workshops held between April 13-14, 2018 communicated their demand particularly for the encouragement of solar energy applications in buildings and the insertion of remarks to zoning plan notes regarding the compulsory adoption of solar energy practices. One may also encounter the related petitions led by various NGOs. It is no doubt that a great majority of these demands cause a substantial pressure for national policies to deal with the subject in a more holistic and bureaucracy-facilitating manner.

The half-day workshop organized with the city council and solar energy industry leaders under the guidance of Kadıköy Municipality on 01.02.2018 (*Focus Meeting on the Potential of-Opportunities for Using Solar Energy in Buildings during the Urban Transformation Process) discussed the capability of expanding solar energy across Kadıköy district.* The workshop assessed the policies pursued by other countries in the subject matter and their consequences as well as a variety incentives and measures. The factors assessed were annually declining prices, driving power of energy cooperatives, and a variety of further incentives. As a result of annual improvements in the legislation, it is projected that individual solar energy investments will become widespread in Turkey in the short term, if not immediately. It is even now possible to benefit from a range of funds associated with the subject matter.

The potentials of renewable energy development are listed as follows.

Target 3: Development of Locality-Specific Innovative Solutions for Energy Production

Target 3.1: Renewable energy applications;

Reduce the need for energy supplied from fossil fuels with widespread renewable energy applications in Kadıköy

Stakeholders: *Municipality, MENR, DGRE, warehouses, renewable energy investors, finance institutions, building/home owners, and commercial entities*

Target 3.1: Renewable energy applications
Action 3.1.1: Renewable energy applications for Municipal and associate buildings
Action 3.1.2: PV applications for building roofs

Action 3.1.1	**Renewable energy applications for Municipal and associate buildings**
Current State / Objective	Currently, Kadıköy Municipality has no considerable invesment in renewable energy. While the renewable energy integration is harder to achieve in existing buildings, the performance of unlicensed photovoltaic (PV) power system applications is projected to reduce energy consumptions and lower the amount of electricity bills payable by the Municipality.  Renewable energy practices adopted by public bodies are already supported by Development Agencies. Given the different types of financing coming into play over in the course of time, Kadıköy Municipality has the capability to install a considerable number of unlicensed PV systems in very different structures such as warehouses, machine shops, facilities, parking lots, etc. The current legislation allows for the performance of unlicensed applications up to 1 MW installed power and this value is reported to rise to 2.5 MW soon. It is projected that Kadıköy Municipality can install a PV system having a total of 1 MW power by 2030 through either roof systems or appropriate land applications. The electricity consumed by the Municipality totaled 8.2 million kWs in 2016. The said quantity corresponds to 0.02% of energy consumptions throughout the city. Although the measures to be taken has no considerable impact on the reduction in urban energy consumption, they can serve both as a model to public members and a guide with experiences gained.
Actions / Steps	It is projected that the Municipality can install a PV system having a total of 1 MW power by 2030 through either roof systems or appropriate land applications. The Municipality and/or its affiliates should carry pre-survey and feasibility studies in areas available for FV system installation.
Time Schedule	2018 - 2030
Cost	An approximate cost of TRY 4.7 million is projected for a 1-MW PV system to be installed. The payback period for this type of investment is about 8 years based on current prices. Considering, however, electricity prices increasing every year

	and PV technology getting less costly, the payback periods will shorten further in the upcoming 13-year period.
Rate of Saving	**1,400 MWh** renewable energy production **per year** and **692 tCO_2e** saving
Investor	Kadıköy Municipality and other public bodies
Stakeholders	Local and international development agencies, finance institutions, PV manufacturers, and applicators
Municipal Contribution	The Municipality is the direct implementer. First, the Municipality should conduct feasibility studies on any projects to be developed.
Risks	High level of initial cost

Action 3.1.2	**PV applications for building roofs**
Current State / Objective	One of the most important distributed renewable energy applications is photovoltaic and heat pump applications that are specifically suitable for Kadıköy. After a short span of stagnation, the PV technology market grows very rapidly with decreasing pricing. As indicated earlier, a number of legislative omissions were eliminated to a great extent, but the projection is that the adaptation of recently privatized distribution companies to photovoltaic applications will take some time. Nevertheless, it is estimated that the costs of PV applications will be reduced for residential buildings with reasonable payback periods due to the decreasing price of technology and increasing electricity prices in Turkey.
Actions / Steps	The plan is to fulfill 15% of the electricity, consumed by buildings, through renewable energy and consequently to install PV systems having a total of 105 MW installed power. The meetings with "Kadıköy Municipality Climate Ambassadors", held during and after consultation meetings, frequently put forward that solar energy could not be utilized adequately. There is a strong demand for the simplification of legislation in this respect and the establishment of an environment that will pave the way for solar investments in single family homes. Although this is an issue not under the sole control of Kadıköy Municipality, the Municipality is considerably determined to make more widespread use of rooftop solar energy systems. The further workshop of February 01, 2018 held on solar energy discussed this issue.
Time Schedule	2021 - 2030
Cost	The cost of photovoltaic systems rapidly declines with price drops ranging from 8 to 12% as a result of the doubled market growth taking place every 2.5 years. This figure is calculated on average with the estimation that the average charges of installed systems will drop below EUR 1 per Watt-peak by 2020. The total invesment cost will amount to **TRY 500 million**. While there is a substantial

	uncertainty in the PV system installation market, it is also likely that these prices can be far below those values calculated in this report due to drastic price drops. The current payback period is slightly longer than 8 years.
Rate of Saving	The aim is to achieve **147,829 MWh** renewable energy production **per year** and **73,116 tCO_2e** emission reduction.
Investor	Landlords/building owners
Stakeholders	Various international fund sources, organizations providing green financial facilities, and PV system manufacturers and applicators
Contribution from Kadıköy Municipality	The Municipality may act as an guide to public members in this respect, providing guidance on network connection and communication with manufacturers.
Risks	Complicated statutory legislation, lack of information, and difficulty in altering behaviors

4.2.4 PARTICIPATORY SOCIAL AWARENESS PROCESSES AND BEHAVIORAL CHANGE STUDIES

Target 4: Participatory Social Awareness Processes and Behavioral Change Studies

During the studies conducted under the Integrated and Participatory Climate Action for Kadıköy Municipality, many ideas were exchanged at "Climate Ambassadors Consultation Meetings" held with the participation of Kadıköy residents for awareness raising purposes. The voluntary Climate Ambassadors, who were already trained on climate change, its impacts and ways of protection upon attending to these meetings, started to organize meetings at Kadıköy City Council as the "Climate Ambassadors Working Group". The ideas suggested during these workshops will be considered by the Climate Ambassadors Working Group and Kadıköy Municipality over a period of time, and used to raise awareness among the public and provide energy efficiency, even if through behavioral alterations. The sub-action of *demand-side management* (Action 4.1.3) specifically included the notes on this workshop.

Target 4.1: Energy efficiency campaigns;

The aim is to raise awareness of saving in connection with energy saving, encourage and stimulate the purchase of low energy-consuming electrical devices and the use of innovative systems in lighting, provide technical support in terms of investment, and achieve fuel saving with eco-driving methods and the use of mass transportation.

Stakeholders: *Kadıköy Municipality, public members, vehicle owners, consumer associations, finance institutions, leading manufacturers, universities (academic knowledge sharing), and various press organs*

Target 4.1: Energy efficiency campaigns
Action 4.1.1: Saving in residential buildings with awareness raising campaigns
Action 4.1.2: Saving in commercial entities with awareness raising campaigns
Action 4.1.3: Demand-side management

Action 4.1.1	Saving in residential buildings with awareness raising campaigns
Current State / Objective	The aim is to raise awareness of saving in connection with energy saving, encourage the purchase of low energy-consuming electrical devices, provide technical support in terms of investment, and achieve fuel saving with eco-driving methods and the use of mass transportation. The nature of electricity consumed by residential buildings in our country greatly vary from a building to another depending on the income level of household and installation infrastructure, but 85% of domestic electricity used is consumed by electrical and electronic appliances with refrigerators having the largest share in domestic electricity consumption with 32% based on the data from the White Goods Industrialists Association of Turkey. The energy consumptions by products were improved by up to 60% with the help of technologies developed in our country in the last decade. Today, the Turkish manufacturers are capable of manufacturing products with the lowest energy consumption either in terms of technology or capacity or know-how. Our national white goods manufacturers are the second largest manufacturers in Europe, leading the European household appliances market. Our country is in compliance with the EU's "Council Directive 92/75/EEC of 22 September 1992 on the Indication by Labeling and Standard Product Information of the Consumption of Energy and Other Resources by Household Appliance" and with all applicable regulations. 20% of the energy consumed by residential buildings in Turkey is used for lighting purposes, although varying by income groups. It is possible to achieve energy saving up to 80% using efficient lamps for lighting. Compared to ordinary incandescent lamps, fluorescent lamps are 5 to 10 times and compact fluorescent lamps are 4 to 5 times more efficient. Comparing an ordinary incandescent lamp in terms of luminous flux; a 100-watt power lamp produces 14 lm/watt, while 70 lm/watt can be produced from a compact fluorescent lamp. Our country uses incandescent lamps very commonly for lighting purposes. This is a lighting method with poor energy efficiency. Similarly, the lighting for offices and commercial buildings can reach up to high values such as 30 - 40% of total electricity consumption.
Actions / Steps	The plan is to establish a number of information centers where the population living and working in Kadıköy may obtain information about subjects, such as energy consumption, energy saving, new technologies and applicators, and to operationalize specific centers which have the capability to give information and distribute leaflets to public members at service buildings and/or on visible spots. The patterns of consumption have an impact on energy saving to the extent above estimated. The reflection of minor changes in consumers' daily habits on energy consumptions can go beyond the expected level. For example, the electrical devices left in standby mode account for 10 - 20% of total consumption. In other words, a device left in standby mode for a duration of 10 hours consumes power as much as consumed during 1-hour operation in the best scenario. When developing a scenario, the change in energy consumption

	habits is estimated to affect energy consumptions and GHG emissions by up to 5%. The public members should be furnished with opportunities to benefit from these information points, incorporating the topics, such as energy-saving lighting systems, energy-efficient electronic devices, insulation, use of mass transportation vehicles, etc., as well as renewable energy technologies into the subjects about which information will be provided using the experiences from different cities that currently offer similar services to the masses. The cooperation with district Municipalities is possible in this respect. Those consultants to serve at information points should have a defined job definition and be trained. The coordinated execution of all activities requires the establishment of an organization to which consultants report and the development of an implementation plan. Consultants must; • Help the people in need find the best technology in energy and environmental performance aspects, and adapt that technology to the specifications of their homes or the buildings of application, • Seek the support of chambers and associations within Kadıköy working on this issue, and cooperate with them, if possible, • Give information about convenient financial incentives, • Provide assistance about legal procedures governing the installation of energy technologies, if required, and • Help with the selection of heating and cooling systems that are effective in terms of air quality and energy efficiency.
Time Schedule	2018 - 2030
Cost	The projected cost to be covered by the Municipal budget is TRY 250,000 in total (based on 2018 prices); personnel cost amounting to TRY 100,000 per year, if a team of 3 people is assigned to work on this subject matter; the sum of TRY 100,000 per year, if leaflets are printed in several subjects as projected; and the sum of TRY 50,000 per year to build booths for various events and festivals, if required.
Rate of Saving	**The projection is 118,960 MWh reduction in electricity consumption and 30,886 tCO_2e reduction in emission.**
Investor	Kadıköy Municipality
Stakeholders	Public members, several manufacturers and applicators, and finance institutions
Municipal Contribution	Acting as an implementer (various organizations, charges associated with information points, and awareness raising and promotional activities), guide and facilitator
Risks	Failure to alter stereotyped behaviors of public members

Action 4.1.2	Saving in commercial entities with awareness raising campaigns
Current State / Objective	The aim is to raise awareness of saving in connection with energy saving and encourage the purchase of low energy-consuming electrical devices.
Actions / Steps	The 2nd week of every January is the "Energy Efficiency Week" throughout Turkey. The aim should be raising awareness to make energy efficiency awareness established with trade fairs organized and booths built in a variety of locations (shopping malls etc.) specifically in this period. Any potential campaigns (rebate campaigns, cheap credit campaigns) coordinated jointly with leading electrical device manufacturers, insulation companies-associations and lighting device manufacturers can be organized such that they support the awareness raising campaign. A considerable portion of electric energy consumed by residential buildings is known to result from the use of devices categorized as white goods such as refrigerators, washing machines and dishwashers. The replacement of any electronic household devices consuming active energy with those having a high energy efficiency class (A, A+, A++) provides energy efficiency ranging from 40% to 70%.
Time Schedule	2018 - 2030
Cost	Further actions were projected to be taken for commercial buildings within the scope of the cost projected by the Municipality regarding the recruitment of 3 people mentioned in section 'residential buildings' and the distribution of awareness raising materials. Therefore, this cost amounting to TRY 250,000 can be divided into 2 categories.
Rate of Saving	**It is projected to achieve 25,529 MWh energy reduction and 9,744 tCO_2e emission reduction.**
Investor	Kadıköy Municipality
Stakeholders	Consumer associations, leading manufacturers, and vehicle owners
Municipal Contribution	Acting as an implementer (various organizations, charges associated with information points, and awareness raising and promotional activities), guide and facilitator
Risks	Failure to alter stereotyped behaviors of public members

Action 4.1.3	Demand-side management
Current State / Objective	No matter how below the energy consumption per capita is when compared to many European cities, the energy consumption in Kadıköy district densely populated by mid- and mid-upper classes is above the average of Turkey. Behavioral alterations achieved by awareness raising may be greatly influential in energy efficiency. It is known that about 5% energy saving could be achieved even with the initial monitoring of energy consumptions, which is a significant gain.

Actions / Steps	Having started operating under the umbrella of Kadıköy City Council, the working group "Kadıköy Municipality Climate Ambassadors" is the most crucial instrument available in the hand of the Municipality for raising awareness. The actions to be taken in this respect will also affect the outcomes of Actions 4.1.1 and 4.1.2. The featured opinions on this are: • Give regular information to make sure that Social Media tools are used effectively and energy saving is fulfilled, • Carry out awareness raising activities together with headmen, • Plan awareness raising activities at homes of volunteers, and • Organize more frequent activities held during the World Environment Week, such as Kadıköy Municipality Environment Festival.
Time Schedule	2019 - 2030
Cost	The costs vary depending on the contents of actions and were projected to be about TRY 100,000 with hardcopy visual materials and personnel cost included.
Rate of Saving	The rate of saving is assessed under action 4.1.1 and 4.1.2.
Investor	Kadıköy Municipality
Stakeholders	Public members, universities (academic knowledge sharing), and various press organs
Municipal Contribution	Acting as an implementer (various organizations, charges associated with information points, and awareness raising and promotional activities), guide and facilitator
Risks	Failure to alter stereotyped behaviors of public members

4.2.5 OTHER STUDIES ON REDUCTION

Target 5: Other Actions for Reduction

Wastewater:

Kadıköy wastewater pre-treatment and sea discharge plant located within the boundaries of Kadıköy Municipality processes wastewater that directly flows through Üsküdar, Ümraniye, Kadıköy and Maltepe districts to the sea and has an adverse impact on the local environment and social life, discharging it through a 2,308-meter long discharge line to the Black Sea undercurrent at 51.5-meter depth from the Strait of Istanbul. The plant collects here wastewater received from settlements located in area of 11,353 hectares in total; the entire area of Kadıköy, a 1,561-hectare area of Ümraniye and a 1,454-hectare area of Üsküdar.

The inventory calculation for the wastewater treatment plant is based on Kadıköy, because the further wastewater from districts other than Kadıköy is known to be received. The measures to take to reduce emissions from the wastewater treatment plant will be improving the conditions of the plant.

Target 5.1: Reduction in GHG emissions from wastewater treatment plants;

Stakeholders: *Istanbul Metropolitan Municipality, and ISKI*

Target 5.1: ***Reduction in GHG emissions from wastewater treatment plants;***
Action 5.1.1: Improve operating conditions of all wastewater treatment plants

Greenhouse gas emissions may be reduced by improving operating conditions of all wastewater treatment plants located within the boundaries of Kadıköy and producing biogas and bioenergy from sewage sludge. Based on a piece of information in 2017 Annual Report of ISKI, an affiliate of the Metropolitan Municipality, indicating that there are some tender formalities in progress associated with a biological wastewater treatment plant in Kadıköy, it is projected that GHG emissions from wastewater from Kadıköy district will decrease and **25,718 tons CO_2e** emission reduction will be achieved in 2030. GHG emission is projected to increase from its current level of **22,886 tons CO_2e** to **35,719 tons CO_2e** in 2030 with the increasing population.

Industry: The greenhouses gases emanating as a result of industrial operations can be analyzed under two topics; production-induced and energy-induced. The industry has an approximately 37% share in the final energy consumption of Turkey. The level of energy-induced GHG emissions from the industrial sector depends on the quantity of CO_2 emitted for electricity production purposes and the distribution of fuel types used across the industry.

Turkey is described by several national and international organizations as country having a high potential of energy efficiency. Based on the International Energy Agency data, its energy density is 0.38 doubling the average of OECD countries. The industrial sector carries out a range of activities to enhance energy efficiency and thus to reduce GHG emissions resulting in climate change. The results of energy surveying and scanning indicate that the industry has minimum 20% potential of energy saving.

The majority of industrial facilities built in Kadıköy district are comprised of concrete plants constructed for urban transformation in Fikirtepe Neighborhood. The assumption is based on the rate of reduction across the industry, assuming that the number of concrete plants will be reduced throughout the urban transformation process, although they do not remain within the jurisdiction of Kadıköy Municipality.

Target 5.2: Energy efficiency of the industry;

Stakeholders: *Kadıköy Municipality, and industrial establishments*

Target 5.2: ***Energy efficiency of the industry;***
Action 5.2.1: 25% energy efficiency across the industry

The aim is to achieve a total of **75,605 MWh** energy saving with **11,417 MWh** electricity and **64,189 MWh** natural gas saved and a total of **18,645 tCO_2e** emission reduction with **12,998 tCO_2e** natural gas emission reduced.

4.3 SUSTAINABLE ENERGY ACTION PLAN SUMMARY

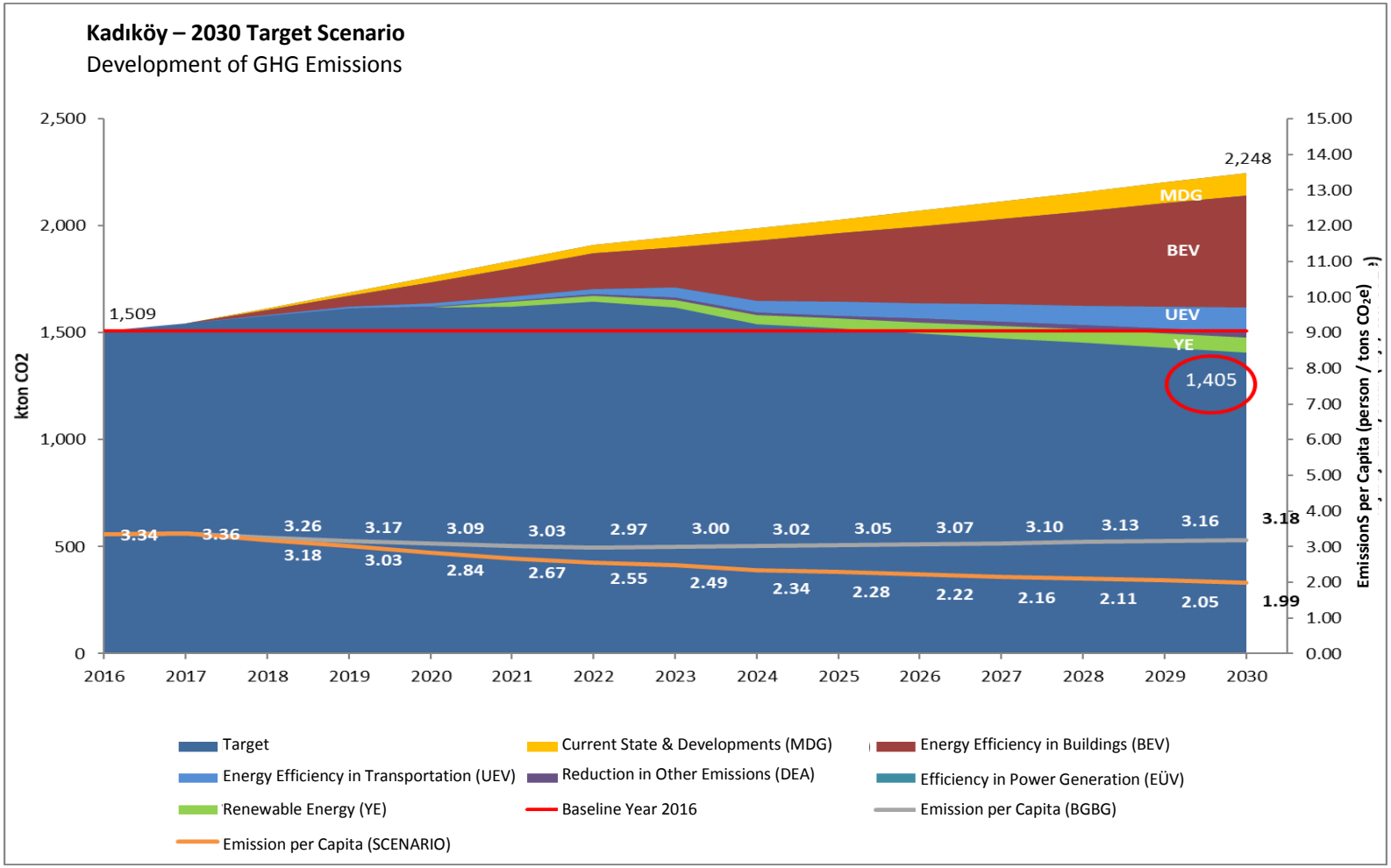


Figure 4-2: 2030 GHG Emissions Target Scenario for Kadıköy

	URBAN DEVELOPMENT - BUILT ENVIRONMENT				
	Target 1.1: Energy-efficient restorations for existing residential buildings	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
RESIDENTIAL	**Action 1.1.1: Heat insulation for existing residential buildings**	2018 - 2030	Kadıköy Municipality, landlords, IMM, MEU, MENR, IZODER, ENVERDER, building contractors, finance institutions, Urban and Regional Planning Function, Chamber of Architects, applicators, insulation material, and lighting system and PV manufacturers	**608,497**	**134,210**
	Action 1.1.2: Renewable energy applications for existing residential buildings	2017 - 2030			
	Action 1.1.3: Use of energy-efficient lighting systems (economical LED lighting) in existing residential buildings	2018 - 2030		**91,058**	**45,037**
	Target 1.2: Development of energy systems at block scale	**Time Schedule**		**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
	Action 1.2.1 Replacement of minimum 25% of existing fossil fuel-based heating systems with those using alternative fuels	2024 - 2030		**640,017**	**129,603**
	Target 1.3: Energy-efficient planning of new settlements	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
	Action 1.3.1: Urban development for residential buildings	2018 - 2030	Kadıköy Municipality, landlords, insulation material manufacturers, applicators, IZODER, ENVERDER, professional organizations, finance institutions and MENR	**182,896**	**44,329**
	Target 1.4: Energy-efficient restorations for existing commercial buildings (including public buildings)	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
COMMERCIAL	**Action 1.4.1: Energy-efficient restorations for existing Commercial buildings (heat insulation)**	2018 - 2030	Kadıköy Municipality, Commercial-Public building users, ICC, MENR, Governorship, Special Provincial Administration, insulation material manufacturers, applicators, and finance institutions	**190,619**	**78,229**
	Action 1.4.2: Energy-efficient lighting for existing Commercial buildings	2018 - 2030		**62,068**	**30,699**
	Target 1.5: Energy-efficient applications for Municipal buildings	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
MUNICIPIAL BUILDING	**Action 1.5.1: Energy-efficient restorations for existing Municipal buildings (heat insulation + lighting)**	2018 - 2030	Kadıköy Municipality, IMM, ENVERDER, IZODER, MENR, finance institutions, various fund sources, and development agencies	**7,243**	**3,160**
	Target 1.6: Energy-efficient street lighting systems	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**

LIGHTING	**Action 1.6.1: Energy-efficient street lighting system**	2018 - 2030	Kadıköy Municipality, IMM, Special Provincial Administration, energy-efficient lighting system manufacturers, finance institutions, MENR, various fund sources, and development agencies	**2,077**	**1,027**
	TOTAL			**1,784,476**	**466,294**

	TRANSPORTATION				
TRANSPORTATION	**Target 2.1: Improvement of low carbon emission transportation network**	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
	Action 2.1.1: Enhancement of the use ratio of mass transportation vehicles	2018 - 2030	Kadıköy Municipality, IMM, TCDD, IETT, Ministry of Transportation, and finance institutions	**68,086**	**17,821**
	Action 2.1.2 Re-operational condition of the commuter train				
	Action 2.1.3 Replacement of mass transportation vehicles with energy-efficient vehicles	2018 - 2030	Kadıköy Municipality, IMM, Ministry of Transportation, IETT, and public members	**104,637**	**28,400**
	Action 2.1.4 Encouragement of using electric vehicles across the city	2023 - 2030		**123,858**	**33,617**
	Action 2.1.5 Functioning as a model, replacing 80% of the municipal vehicle fleet with electric vehicles to encourage the use of electric vehicles	2018 - 2030	Kadıköy Municipality, electric vehicle manufacturers, charging station installers, and public members	**2,982**	**809**
	Target 2.2: Integration of pedestrians and bicycle use with mass transportation system	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
	Action 2.2.1 Achievement of 2% increase in the share of bicycle use in transportation	2018 - 2030	Kadıköy Municipality, IMM, Directorate General of Highways, universities, schools, MNE, and commercial buildings	**34,043**	**8,911**
	Action 2.2.2 Achievement of 5% increase in the share of pedestrians in transportation	2018 - 2030		**85,108**	**22,276**

	Objective 2.3: Training on eco-driving techniques (specifically intended for drivers operating taxis, mass transportation vehicles and waste collection vehicles)	Time Schedule	Related Organizations	Reduction in Energy Consumption (MWh)	CO_2e Reduction for 2030 (tons)
	Target 2.3.1: Training on eco-driving techniques (specifically intended for drivers operating taxis, mass transportation vehicles and waste collection vehicles)	2020 - 2030	Drivers operating private mass transportation vehicles (IETT, private public bus, minibus, shared taxi and taxi operators), Kadıköy Municipality, IETT, and IMM		
	TOTAL			**418,715**	**111,834**

RENEWABLE ENERGY					
	Target 3.1: Renewable energy applications	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
	Action 3.1.1: Renewable energy applications for the Municipality and its affiliates	2018 - 2030	Kadıköy Municipality, IMM, MENR, DGRE, industrial establishments, commercial entities with a large organizational umbrella, renewable energy investors, and finance institutions	**1,400**	**692**
	Action 3.1.2: PV applications for building roofs	2021 - 2030		**147,829**	**73,116**
	TOTAL			**149,229**	**73,808**

AWARENESS RAISING					
	Target 4.1: Energy efficiency campaigns	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
	Action 4.1.1: Saving in residential buildings with awareness raising campaigns	2018 - 2030	Kadıköy Municipality, IMM, public members, applicators, electronic device manufacturers, finance institutions, and consumer associations	**118,960**	**30,866**
	Action 4.1.2: Saving in commercial entities with awareness raising campaigns	2018 - 2030		**25,529**	**9,744**
	Action 4.1.3: Demand-side management	2019 - 2030	Public members, universities, and various press organs		
	TOTAL			**144,490**	**40,610**

OTHER				
Target 5.1: Wastewater treatment plants	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
Action 5.1.1: Improvement of operating conditions of all wastewater treatment plants	2017 - 2030	IMM, ISKI	0	**25,718**
Target 5.2: Energy efficiency of the industry	**Time Schedule**	**Related Organizations**	**Reduction in Energy Consumption (MWh)**	**CO_2e Reduction for 2030 (tons)**
Action 5.2.1: 25% energy efficiency in the industry	2018 - 2030		75,605	**18,645**
TOTAL			**75,605**	**44,363**

TOTAL	**2,956,179**	**842,560**

*The total reduction figure included the natural energy consumption (383,665 MWh) and GHG emissions (105.651 tons CO_2e) expected to take place as a result of energy efficiency and technological advancements.

5 REDUCTION MEASURES - CONCLUSION AND ASSESSMENT

The "Sustainable Energy Actions" on GHG reduction, which is the first part of Kadıköy Municipality Climate Change and Adaptation Plan, set out a roadmap which is designated by the participation of urban stakeholders and designed to reduce emissions from energy consumption across different sectors. This plan originates from the urban-scale GHG inventory, and is based on the future visions of urban stakeholders and the reports that have been so far prepared or caused to be prepared either by Kadıköy Municipality or several organizations regarding the future of the city.

The Covenant of Mayors (CoM) enables non-intervention in local governments and/or the freedom to exclude any sectors not within a local government's jurisdiction. Kadıköy Municipality has no sanctions imposed on industrial establishments. However, it is agreed to continue including this category in the inventory for its very low share in total emissions. The quantity of urban GHG emissions across Kadıköy is approximately **1,509,302 tons CO_2e** (excluding solid waste) for 2016 which is selected as the reference year. Of this quantity, **95,874** tons (6.35%) are directly caused by the Municipality's organizational operations. 65% of total GHG emissions across Kadıköy are comprised of Scope 1 emissions from residential and commercial buildings, industry and urban vehicle traffic in Scope 1, 28% of Scope 2 emissions from electricity consumptions and 7% of other emissions such as fugitive emissions and wastewater.

The emissions from fuel and electricity consumed by residential buildings have the largest share in Kadıköy's urban-scale emission inventory with 48%. They are followed by emissions from transportation sector (34% in total), tertiary buildings (14%), industrial sector (4%), and wastewater and fugitive emissions (1.5%), respectively.

KCAAP presented BAU (Business as Usual) scenario for Kadıköy, using the projections of population and sectoral growth furnished by several organizations, and calculated 2030 emissions to be approximately **2,247,700 tons CO_2e.** The largest component of 2030 emissions is residential buildings (48%) as is in the reference year. The categories of transportation sector and non-residential buildings are expected to be 35% and 13%, respectively.

In qualitative and quantitative aspects, the urban growth rate of Turkey is similar to that of cities in developing countries rather than the cities in developed/industrialized countries. As it is impossible to refer to absolute emissions reductions in connection with this rate of growth, it will be a proper act to describe emission reduction targets as emissions per capita. Based on BAU scenario, the emissions per capita is reduced from 3.34 tons CO_2e to 3.18 (5% decrease).

As shown in KCAAP, the emissions per capita across Kadıköy can be reduced by approximately 40% in 2030 compared to 2016 with the reduction measures indicated for every sector.

The following charts show total emissions across Kadıköy in 2016 - the reference year, emissions in 2030 based on BAU (Business as Usual) scenario, and emission reductions achievable by 2030 in line with several measures recommended to sectors of several origins by the Sustainable Energy Action Plan prepared.

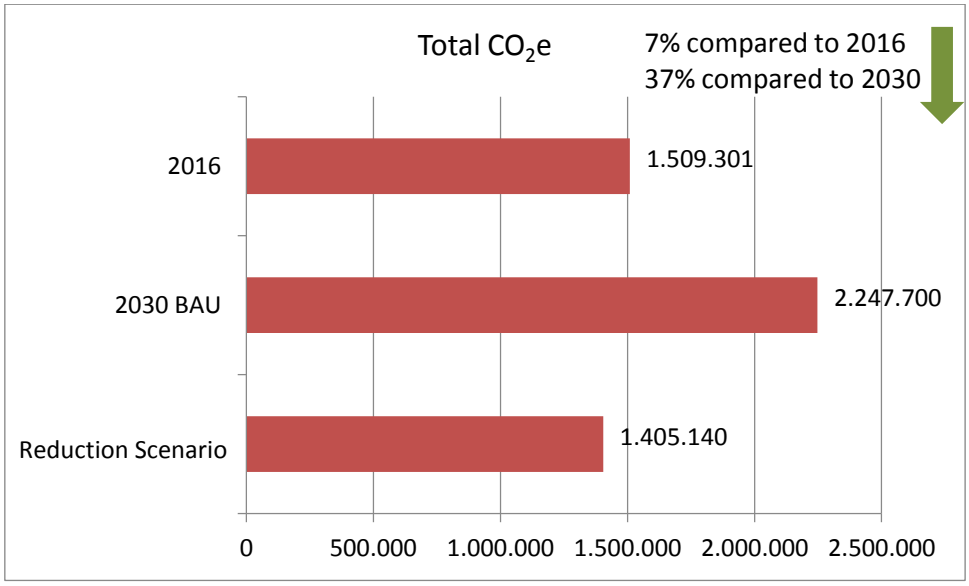


Figure 5-1: Total GHG Emission Inventory 2016, 2030 BAU and Reduction Scenario Comparison

As can be seen in the figure, absolute emissions can hardly be reduced by 8% compared to the baseline year 2016 due to high population increase despite all the ambitious measures proposed. As a result of energy efficiency measures and renewable energy investments across several sectors, the potential emissions for 2016 are calculated to be reduced by **approximately 842 thousand tons CO_2e**. GHG emissions per capita can be reduced to a considerable extent by the same reduction scenario, and it is possible to achieve 37% reduction based on BAU scenario and 40% reduction based on the reference year 2016.

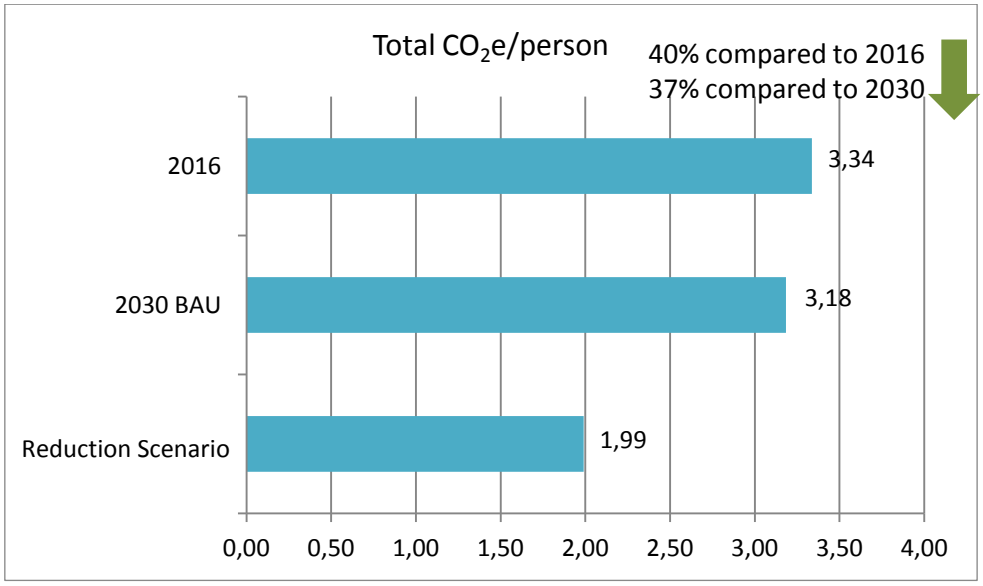


Figure 5-2: Total GHG Emission Inventory 2016 (per capita), 2030 BAU and Reduction Scenario Comparison

The reduction scenario demonstrates that Kadıköy can grow with declining emissions despite high rates of growth, which should be recognized as a substantial accomplishment. Comparing between

BAU and Reduction Scenarios by "Buildings" and "Transportation" sectors, one encounter the following results.

Building stock energy and carbon concentrations are the largest components of Kadıköy greenhouse gas inventory. The growing population with changing consumption habits should be steered towards low carbon routes in terms of either structural characteristics or consumption habits, energy efficiency of building stock should be improved, and new buildings should be constructed in a pattern that requires much lower energy. The two figures below show the emissions from the buildings in Kadıköy and reduction scenarios by absolute and per capita values. With a range of measures to take, it is projected that the emissions from buildings can be reduced by **approximately 581 thousand tons CO_2e** based on BAU scenario.

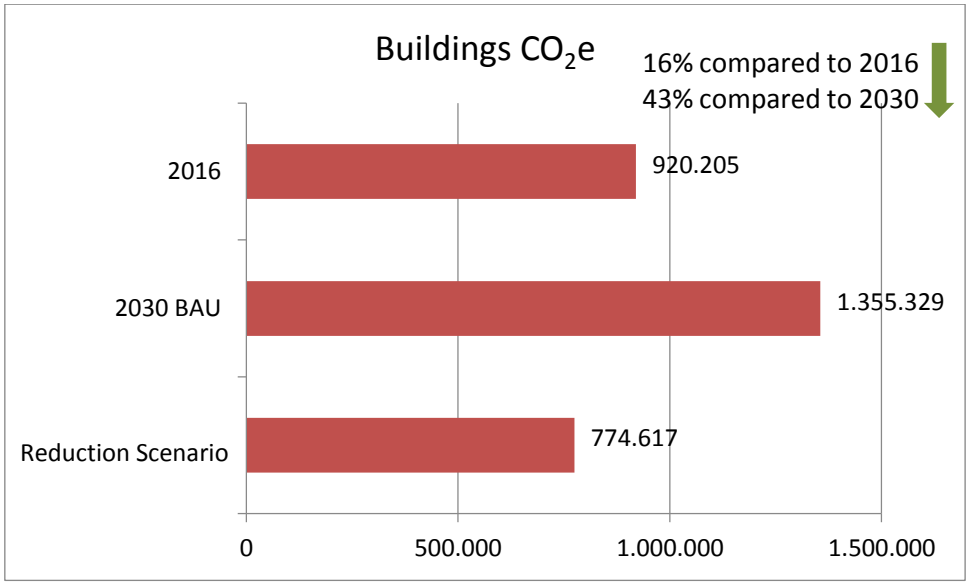


Figure 5-3: Emissions from Buildings 2016, 2030 BAU and Reduction Scenario Comparison

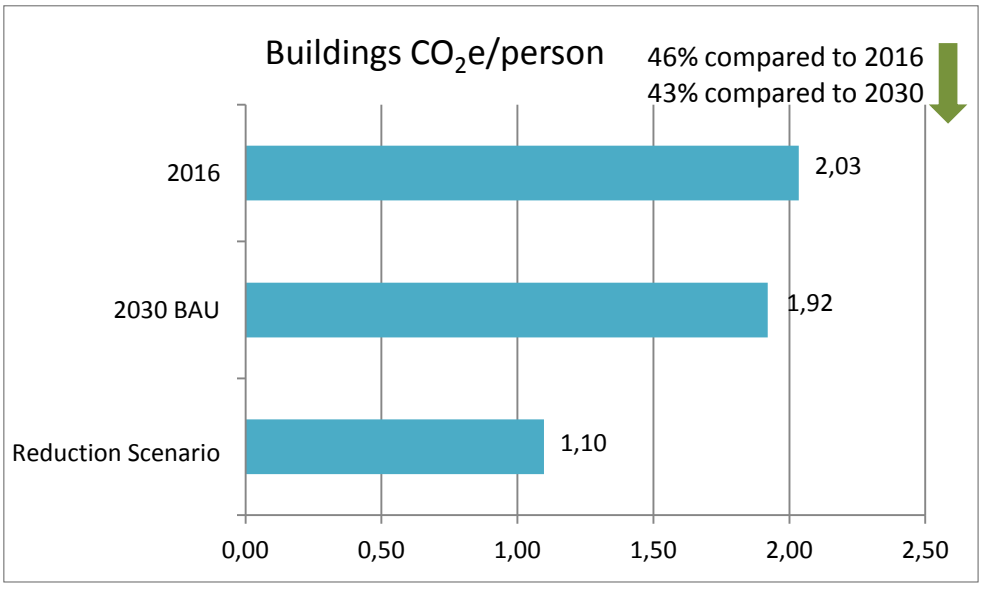


Figure 5-4: Emissions from Buildings 2016 (per capita), 2030 BAU and Reduction Scenario Comparison

Reduction measures demonstrated that emissions per capita could be reduced by 46% based on the baseline year and by 43% based on 2030 BAU scenario. It was indicated that local governments could

be influential in energy efficiency and renewable energy applications in buildings, either existing or newly constructed, through permit and licensing processes and plan notes.

The 2nd most important element of emissions is the transportation sector. Although transportation is not a sector that much falls under the authority of Kadıköy Municipality, the existing or potential future measures particularly adopted for mass transportation by Istanbul Metropolitan Municipality were calculated concerning to what extent they could reduce GHG effects from transportation either due to the ongoing studies conducted by Istanbul Metropolitan Municipality or the inclusion of transportation as one of the primary reduction topics of the Climate Change Action Plan for Istanbul carried out simultaneously. The two figures below show the emissions from transportation in Kadıköy and reduction scenarios by absolute and per capita values. With a range of measures to take, it is projected that the emissions from transportation can be reduced by approximately 112 thousand tons CO_2e in 2030.

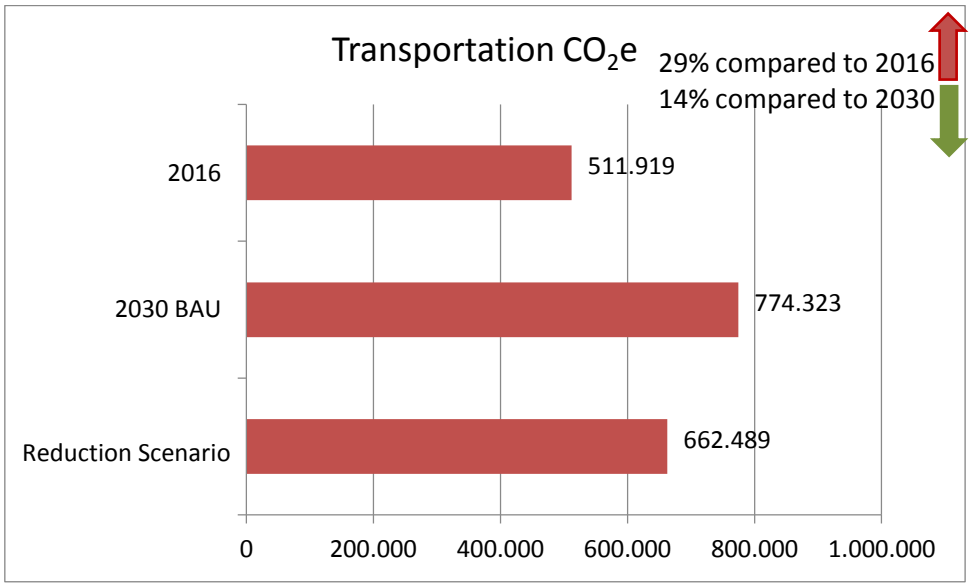


Figure 5-5: Emissions from Transportation 2016, 2030 BAU and Reduction Scenario Comparison

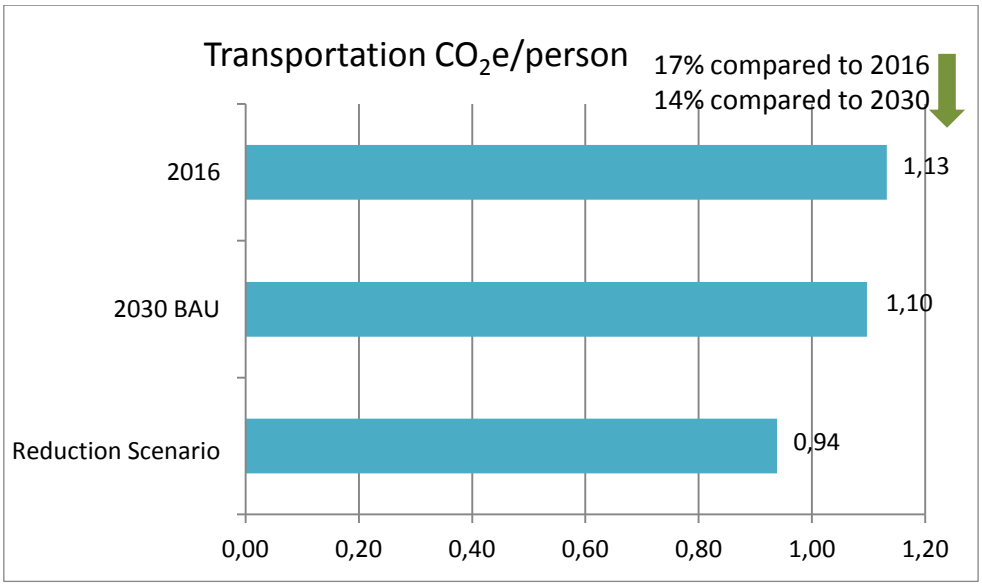


Figure 5-6: Emissions from Transportation 2016 (per capita), 2030 BAU and Reduction Scenario Comparison

Reduction measures project that emissions per capita can be reduced by 17% based on the baseline year and by 14% based on 2030 BAU scenario. Any reductions achieved in these sectors should be planned together with Istanbul Metropolitan Municipality.

When all of these measures include 105 thousand tons CO_2e reduction achievable by building, industry and biofuel potential and renewable energy practices and 7% natural energy recovery by 2030 in the light of the projections furnished by the governmental public bodies and the recent developments in energy efficiency in Turkey, the indication is that approximately **842 thousand tons CO_2e** out of **2.2 million tons CO_2e** GHG emissions could be saved, if no measure was taken in 2030.

Table 5-1: Reduction Measures and Rate of Saving

TOPICS OF REDUCTION MEASURES	Energy Saving (MWh)	tCO_2e Reduction
Urban Development - Built Environment	1,784,476	466,294
Transportation	418,715	111,834
Renewable Energy	149,229	73,808
Awareness Raising Campaigns	144,490	40,610
Other (Wastewater & Industry)	75,605	44,363
Natural Energy Efficiency	383,665	105,651
TOTAL	**2,956,179**	**842,560**

*Emissions are assumed to "naturally" decline by 7% through national policies and technological advancements for energy efficiency.

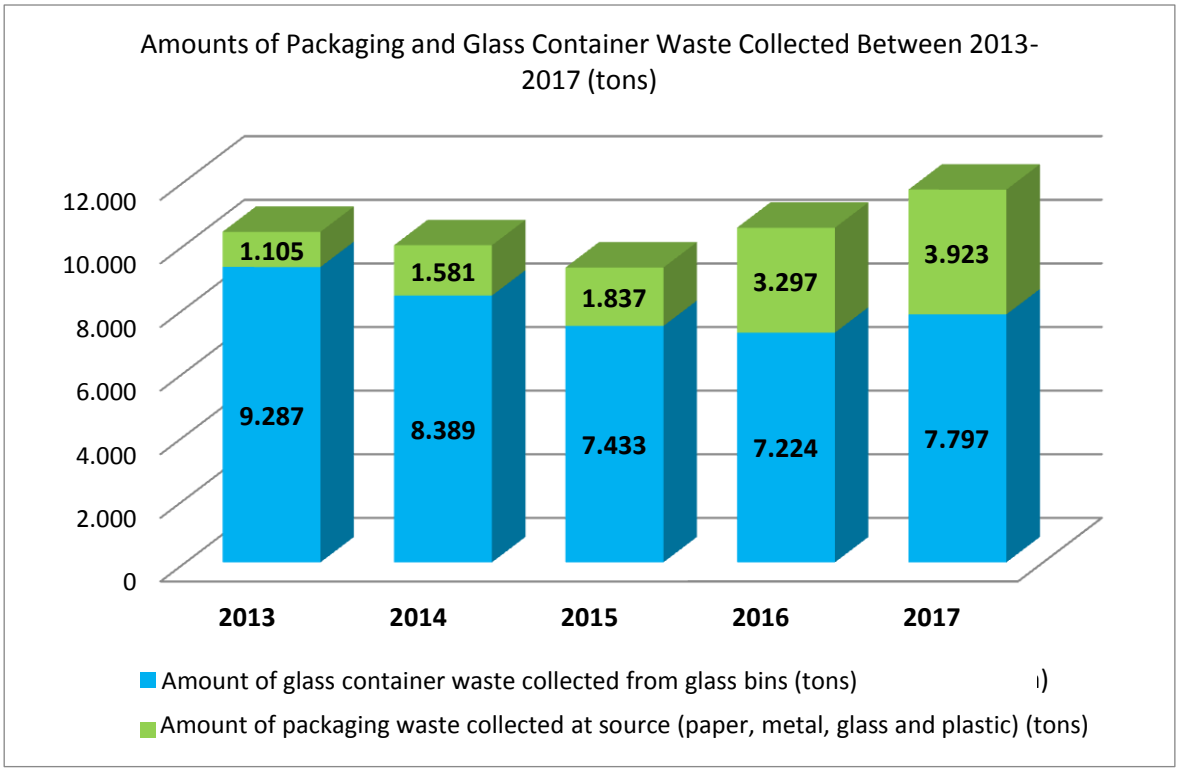
6 MODEL PRACTICES IN KADIKÖY

6.1 RECYCLING ACTIONS

The sustainable environmental management is one of the most important steps of protecting the balance between economy and environment, and recycling any types of waste. Therefore, the practices adopted mainly in connection with vegetable waste oil, waste batteries and packaging waste are supported by the Waste Management Office through information activities and rendered widespread across the District.

Established on 27.11.2008, the Waste Coordination Center operates to provide coordination between public members and contractors during the collection, handling, separation and disposal of packaging waste, glass container waste, vegetable waste oil, waste batteries and accumulators, and domestic waste drugs and textile waste materials and waste electrical and electronic appliances across Kadıköy district in accordance with legal procedures on a separate basis from any types of domestic waste, and to carry out awareness raising activities regarding waste. The amount of recycling materials collected by Kadıköy Municipality over the half decade is summarized in Figure 6-1.

In addition, the amount of domestic waste drugs which were initially collected as of 2016 totaled 647 kg in two years, while the amount of textile waste materials which were initially collected as of 2017 was 739 tons.



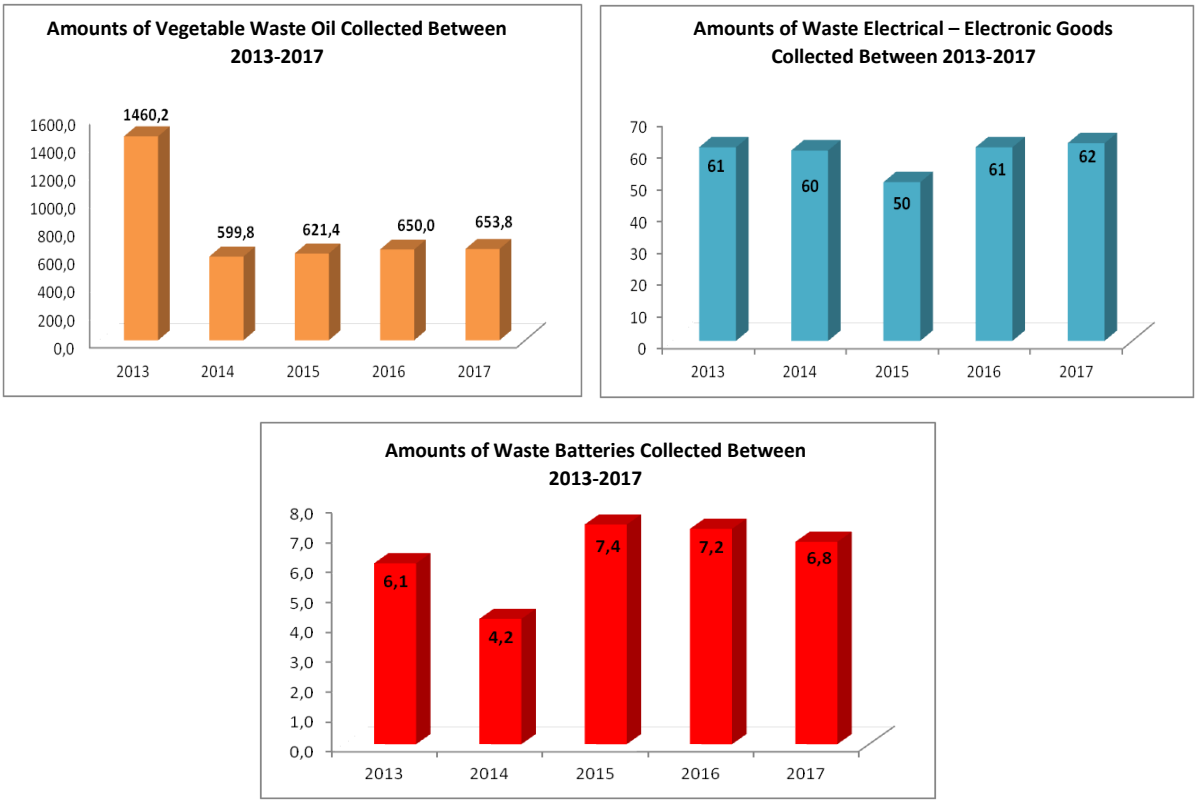
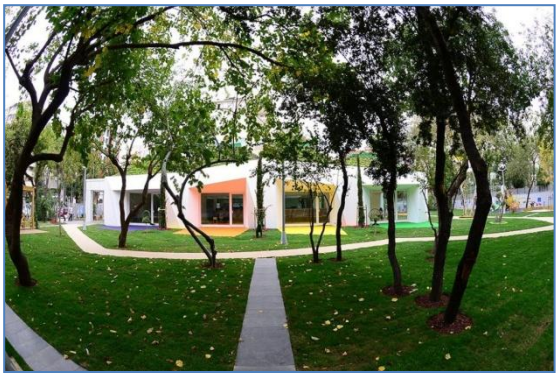


Figure 6-1: Rates of Recycling for Kadıköy District

6.2 ECOLOGICAL HOME

Bahriye Üçok Ecological Nursery School completed by Kadıköy Municipality in Sahrayıcedit Neighborhood was built with a fully ecological design from construction to internal furnishing and basic infrastructure such as energy and water installations. The building is provided with heating and lighting systems using solar panels, and natural products were preferred in educational materials. In addition, the green home accumulates and uses storm water for irrigation and sanitation purposes.

The green home project initiated by Kadıköy Municipality aims learning and educational venues which are robust in all aspects, featuring an applied educational system that is energy-efficient and eco-friendly, and provides children and teachers with long-standing, safe, healthy, comfortable and economical environments. All resources, such as energy, water, materials, building plots, and capital, were used effectively to protect the ecological system during the design, construction, operation, use, maintenance, repair and refunctioning of the building.

Bahriye Üçok Kindergarten

6.3 Lighting for Parks and Gardens

There are 80 parks and gardens across Kadıköy district, the lighting for which the Municipality is responsible. As of March 2018, the number of areas lit by LED systems reached 72 across the district. Of a total of 2066 fixtures, 1966 were replaced with energy-efficient (LED) fixtures. These actual transformations are carried out in accordance with the General Lighting Regulations and 2017-2023 Energy Efficiency Action Plan of the Ministry of Energy.

The LED fixtures used consume 75 Watts from the time of activation (around 8.00 p.m. in the summer and 6.00 p.m. in the winter) to midnight (12.00 a.m.). After this period, they reduce the consumed power by 50% and consume 37.5 Watts, continuing running with low power consumption until switched off in the morning (around 8.00 a.m. in the winter and 6.00 a.m. in the summer).




Parks on Atıfbey Street and Saklıbahçe Street

6.4 Solar Collector Project for Kadıköy Municipality Head Office

The design pre-study surveys conducted to meet the hot water need of dining hall with solar collectors installed in our Municipality head office measured the quantity of hot water in use to be an average of 27 m³ per month and calculated the annual quantity of water in use to be 327 m³ (327 tons). Acknowledging that solar collectors will provide maximum efficiency during the 8-month period, the reduction in carbon dioxide emissions is calculated to be 3.7 tons as a result of saving 5,525.28 kWh energy that we consume to have 216 m³ hot water.

6.5 CODALOOP

Funded by EU EraNET 2015 Smart Cities and Communities and developed in partnership between Amsterdam University, Delft Technical University, Graz University and P1M1 with further support of our Municipality, CODALoop is intended to calculate the amount of energy used by people and drive them towards the pattern of energy-efficient use.

With the implementation of the program developed, public members are able to calculate energy use, identify which elements increase the value of consumption and have an understanding of reduction measures. The first user meeting for CODALoop was held at Hasanpaşa Social Support Center on November 23, 2017 as hosted by our Municipality with a high level of attendance by residents of Caferağa, Feneryolu and Sahrayıcedit Neighborhoods.





CODALoop Project User Meeting

The said residents attending the meeting together with utility bills calculated individual energy consumption scores, entering energy consumption data to CODALoop Web Platform, where the top 3 users having the lowest score were awarded the energy badge. In addition, the Travel and Stakeholder Meeting for CODALoop Community Data-Loops for Energy-Efficient Urban Lifestyles joining together the teaching assistants from Amsterdam University, Delft Technical University, Graz University and Yıldız Technical University was held on November 30, 2017 at the Design Workshop Kadıköy.

6.6 KEMAL SUNAL PARK AND ECOLOGICAL LIFE CENTER

A 1,520 m²-green space combined with the adjacent building plot was transformed into Kemal Sunal Park and Ecological Life Center with the amendment to the actual zoning plan that currently included only a playground and seating units in line with the resolution adopted by Kadıköy Municipality Council.

The park area combining the elements of ecological theme together included chicken coops for instilling love for animals, and raised plant beds for plantation activities, and an aerated lagoon available for the observation of natural formation.

The Ecological Life Center building, consisting of 60 m^2 in total, was designed in line with bioclimatic design principles consistent with theoretical and applied training programs hosted at the building, which observe ecology and provide sustainability.

As the construction material, bales of hay were preferred for natural, healthy, high thermal performance and energy efficiency, earthquake- and fire-proof and low ecological footprint

properties of hay. A bale of hay has benefits for its low level of production cost and thermal insulation properties, such as allowing both for the reduction in operating costs and the maintenance of a more healthy natural humidity-temperature balance needed by worms.

In July 2017, several training sessions were held on ecological architecture techniques and practices as organized by Kadıköy Design Workshop along with collective workshops open to external participation, where the building construction was completed with the contributions of 40 volunteers from different fields using bulk bales of hay, grouting hay, compacted earth and natural plastering techniques. When selecting the heat pump for heating and cooling mechanics, the project design included passive solar positioning systems for lighting and rainwater collection systems for water harvesting.

A number of online announcements were made through quarterly programs offered by the Ecological Life Center opened on June 5, 2018, the World Environment Day where continuing educational and workshop activities intended for all age groups are carried out regarding ecology, waste management and natural life.

With a participatory and sustainable *understanding* supported by non-governmental organizations and volunteers, the Ecological Life Center offers an amusing scientific environment for ecological education in a healthy place built by ecological criteria away from any chemicals which may adversely affect human health, where the information capable of responding to nature's demands is conveyed and workshop activities ensuring the production of natural materials used in daily life for a healthy living are carried out.







Ecological Life Center

6.7 DISASTER EDUCATION AND AWARENESS RAISING PARK

Allowing every individual to know and experience disasters and their occurrence and actions to take during a disaster and potential measures to adopt before a disaster with the help of several simulation programs, the Disaster Education and Awareness Raising Park aims to enhance the level of awareness and knowledge of individuals and create a distinguished environment particularly intended for children with amusing applied educational techniques, precluding educational environments from being boring confined spaces.







Disaster Education and Awareness Raising Park

The disaster education and awareness raising park including various functional areas, such as Earthquake Simulator, 5-D Movie Theater, Portable Fire Extinguishing Simulation, outdoor educational activities, educational workshops for adults, functional park furniture, information boards, and educational hall, has a fully education-based concept and further joint activities will be carried out with non-governmental organizations.

The Park, for which the tendering process was completed in 2017, will be put into service in October 2018 with infrastructure operations fulfilled.

6.8 KADIKÖY ENVIRONMENT FESTIVAL

The World Environment Day 5 June is celebrated through Kadıköy Environment Festival organized at Göztepe Freedom Park. Addressing the theme of "Ecological Life in the City" for 2017 and the theme of "Marmara Sea and Biological Diversity" for 2018, the Environment Festival that focuses on nature with a participatory understanding joins all components together, and is organized in an ambience open to the participation by all democratic mass organizations, non-governmental organizations and platforms and initiatives where all laboring components stand side-by-side to protect the nature.





Environment Festival 2017

The festival program in which participating organizations are involved with their booths is developed together with participants and includes a multitude of activities such as workshops, bull sessions, theatrical performances, movie screening, book reading, dramas, exhibitions and concerts. Over 20,000 people have been visiting our festival that lets all Istanbulites meet "those striving for the nature" and offers activities allowing the participants of all ages to improve their experiences about ecological life.





Environment Festival 2018

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