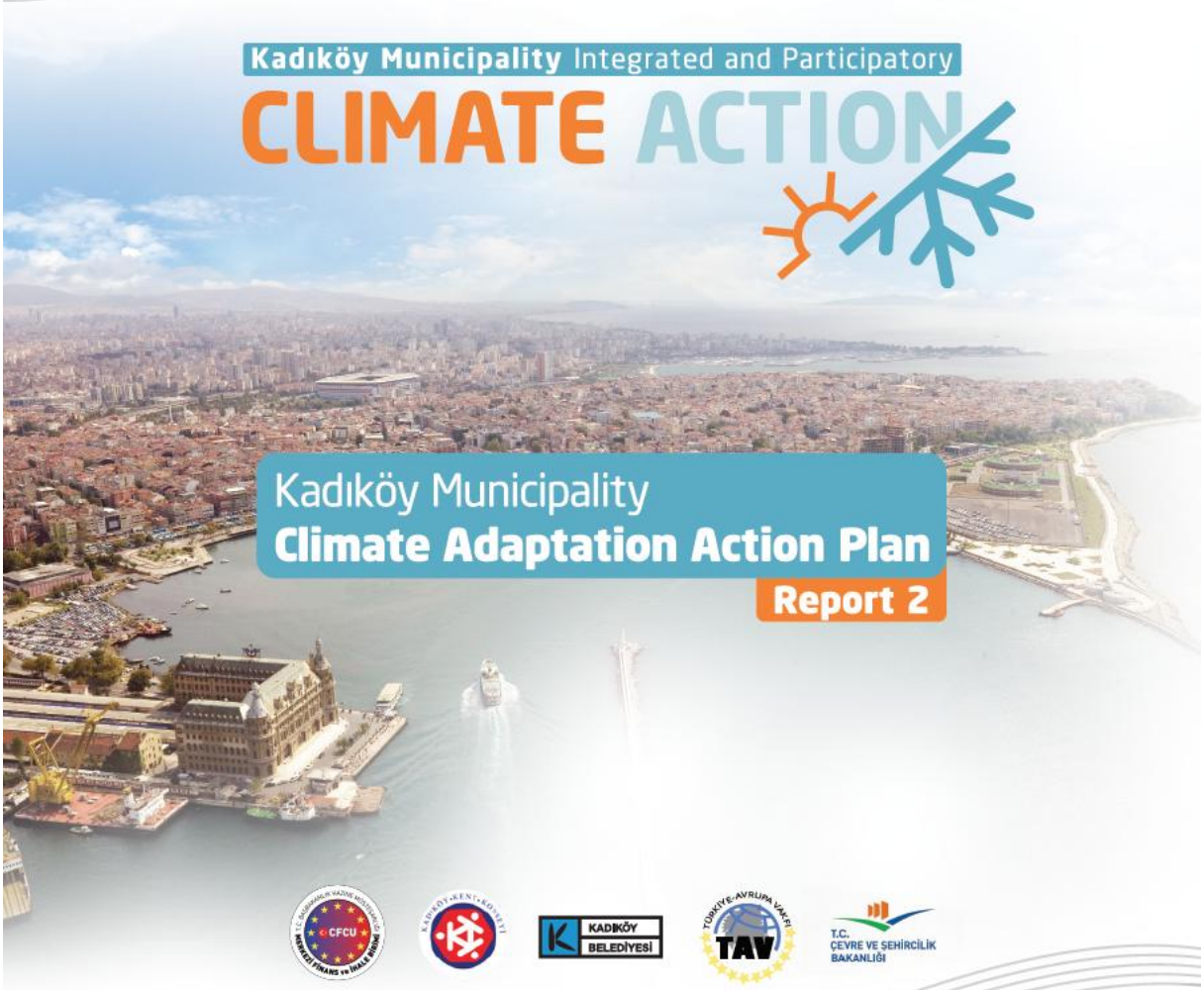
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Kadıköy Municipality Integrated and Participatory

CLIMATE ACTION



Kadıköy Municipality
Climate Adaptation Action Plan
Report 2

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.

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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
CBCC	Coordination Board on Climate Change
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 projected 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, of which Kadıköy Municipality became a member on January 4, 2017, 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 participated 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 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 *Enhancing the Organizational Capacity for Fight against Climate Change* and with new objectives of Paris Agreement on climate change, and was entitled to the grant awarded by the Prime Ministry Central Finance and Contracts Unit upon application filed for the "Grant Scheme for Capacity Building in the Field of Climate Change in Turkey" in line with the studies conducted to reach its goals. To that end, Kadıköy Municipality aims to prepare a "Climate Adaptation Plan" as well as enhancing its objective of emission reduction by being involved in the new formation that intends to reduce GHG emissions 40% by 2030 under the Covenant of Mayors (CoM) platform and the "Integrated and Participatory Climate Action for Kadıköy Municipality".

Kadıköy Climate Adaptation Plan

The impacts of climate change on cities will be noticeable as a result of the increasing number of extraordinary weather events and the long-standing changes in averages of weather events. In this context, there is a higher likelihood of occurrence of hydrological hazards (such as overflow-flooding, storm/coastal flood; mass movement-rockfall, landslide, collapse, etc.), meteorological hazards (such as tornado, etc.) and climatic hazards (extreme temperatures, drought, fire, etc.) in the city, which

are included in natural hazard types. The potential time-bound impacts will affect the built environment (floods, heat island), infrastructure (water, sewer system), human health, biological diversity, air quality and socio-economic structure.

Two key approaches can be referred to in connection with the strategies for fighting against climate change impacts: (1) reduction and (2) adaptation. In urban context, these fighting strategies should be supported by sustainability and durability concepts which are the strategies for protecting urban resources.

As seen in "Sustainable Energy Action Plan" (Report 1) prepared for Kadıköy, the reduction strategy incorporates the practices such as storing and absorbing carbon, reducing energy demand, reducing vehicle demand with recreational facilities provided in the city and its immediate vicinity (reducing vehicle demand with the increased number of walkways) and enabling food production in the city and its immediate vicinity as based on the direct mitigation of carbon emission which is the primary source of climate change. The adaptation strategy aims to mitigate the apparent impacts of climate change and thus enhance the quality of urban life. The adaptation approach focuses on management of high and abruptly changing temperatures, waste resources management, flood and soil erosion mitigation, and coastal flood mitigation. It is important for cities to develop a sustainable urban structure resistant to long-term and abrupt impacts in fight against climate change. Therefore, the provision of sustainability with long-term reduction strategies is possible by making cities more resistant to shocks, such as climate change, with adaptation strategies that can respond to abrupt changes. The transformation process, delivering a holistic approach to fight against climate change, will be possible with the activation of reduction and adaptation strategies in cities.

The issue of green spaces, biodiversity and corridors comprising the primary thematic area designated for Kadıköy refers to those necessary actions taken for human-nature adaptation which is one of most fundamental issues in the process of adaptation to climate change. It includes a number of benefits such as developing a green-blue network system designed to protect and improve biodiversity, balancing the said system in terms of green space amount, access and distribution as well as reducing the heat island impact.

The second topic includes long-running practices for mitigating the impact of urban heat island and reducing the dense population of and pressure over cities. It is, in particular, necessary for rapidly urbanizing and dynamically developing urban regions like Kadıköy to mitigate the environmental damage caused by growth, on the one hand, and to enhance the living comfort of urbanites by mitigating the heat island impact resulting from the over-density of cities, on the other hand.

The water areas addressed under the third topic play a significant role for adaptation strategies to urban climate change. Accordingly, there are some developing design concepts such as water-sensitive urban design (WSUD). The water-sensitive urban design integrates water management, natural hydrological and ecological cycle management, protection and preservation, and urban planning and design with one another. The latest solution patterns in the form of a Sponge City are experimented in the cities exposed to water-induced urban threats.

The public health addressed under the fourth topic is one of the issues of top priority for enhancing urban living standards during the climate adaptation process. The potential actions applicable to this topic include a set of practices such as supporting individual wellbeing, providing sustainable mobility solutions that help improve the quality of urban live and putting unhealthy areas in the city into re-use.

This report demonstrates that we should substantially focus on how to integrate the administrative organization and planning discussed during the workshop with Kadıköy city actors and partners with urban strategic means summarized above and strategic instruments stressed for climate adaptation. Some of the potential lessons learned from this will be the key to green transformation of Kadıköy district center which is mentioned as inferences in this chapter.

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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, 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 increasingly. 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 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. In September 2017, Kadıköy Municipality was entitled to the grant awarded by the Prime Ministry Central Finance and Contracts Unit upon application filed for the "Grant Scheme for Capacity Building in the Field of Climate Change in Turkey". Kadıköy Municipality entitled to the grant plans to enhance its objective of emission reduction by being involved in the new formation that adopts the

objectives for 2030 in the Covenant of Mayors (CoM) platform within the scope of "Integrated and Participatory Climate Action for Kadıköy Municipality".

Kadıköy Municipality 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 primary 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.

Another crucial component, which should be submitted by Kadıköy Municipality in line with its commitments under the Covenant of Mayors and to which this report relates, is **Kadıköy Municipality Climate Adaptation Action Plan**. As detailed in this report, the Plan was prepared with the intent to have an understanding of climate change in Kadıköy district, determine the strategies for providing optimal adaptation and implement these strategies converting them into rational policies.

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
- Climate Adaptation Plans.

The methodology of and workshop on Sustainable Energy Action Plan is detailed in the other report.

Climate Change Adaptation Plan

The areas of Kadıköy district likely to be affected were identified with Istanbul Provincial Climate Change Exposure Scenarios and various literature reviews. A "Climate Change Adaptation Workshop" was held later on May 9, 2018 with the participation of universities, Municipal functions and other urban stakeholders, who were engaged in further studies dealing with Kadıköy district. The outcomes of this workshop will be detailed in the related chapters of the report. The areas of Kadıköy likely to be affected were identified as follows where workshop desks focused on these subjects.

- Green Spaces, Corridors, and Biodiversity
- Impact of Urban Heat Island
- Water Management
- Public Health
- Administrative Organization

During the workshop, every participant of each thematic group was asked to grade self-assessment forms that were already distributed to groups, and thus some efforts were used to put forward the current state in terms of climate adaptation strategies of Kadıköy. Then, the answers to any questions raised by those moderators on the desk were sought. A number of solution proposals were developed following the discussions conducted in line with the resulting outcomes where prioritization was carried out.





Picture 1: Views from the Climate Adaptation Workshop of May 9, 2018

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[1], C40[2] and Covenant of Mayors[3], 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 [4].

Given the impacts listed above, it is understood that cities need 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 pillars. 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.

[1] ICLEI: Local Governments for Sustainability
[2] C_40: Network developed by 86 metropolitan governments in the world
[3] CoM: Covenant of Mayors; association to which the European Union members submit their commitment in climate and energy aspects
[4] 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).

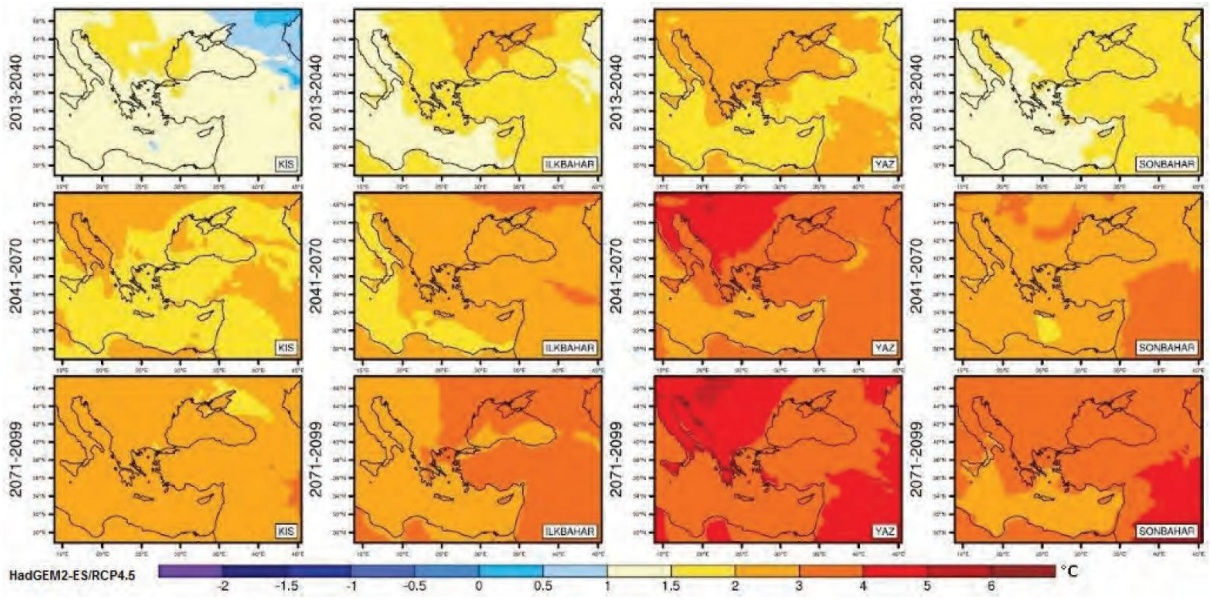


Figure 2-1: TSMS temperature projections based on MGM_ RCP4.5

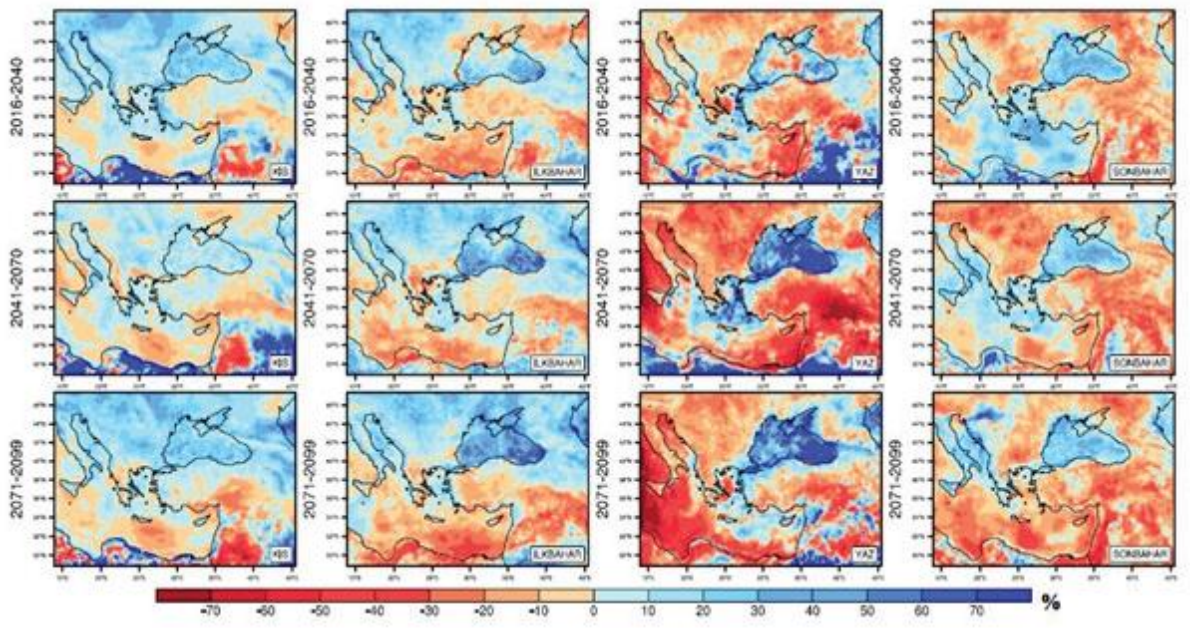


Figure 2-2: TSMS temperature projections based on RCP4.5
Source: 6th National Communication of Turkey on Climate Change pg. 161

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.

While the potential impacts of climate change seem to result in a severe threat in the future in Turkey, these impacts are also projected to bring about some opportunities when planned well. This should be considered in terms of the pressures over natural resources and the barriers to and opportunities for the development of climate-dependent sectors, particularly of water resources. The climate change in Turkey is projected to result in specific adverse impacts such as reduced number of water resources, rising number of flood events, and fires, drought and desertification, and associated ecological disturbances. The climate projections developed in line with the Joint Program for Enhancing the Capacity of Turkey to Adapt to Climate Change project that the precipitation regime, i.e. the water cycle, will change with a considerable impact on nearly all economic sectors, settlements and climate-related natural disaster risks with apparent temperature increases, supporting other studies. When these change projections are construed, the changes in precipitation and temperatures of Turkey will have an impact on water resources, agricultural production, human health, natural disaster risks and economic growth and threaten ecosystem services governing the quantity and quality of factors comprising the key input for production such as water. The **National Adaptation Strategy and Action Plan on Climate Change** focused on five key areas recognized by participatory processes where the potential areas of exposure to climate change in Turkey are supported by technical and scientific studies. These are:

- Water Resources Management;
- Agriculture and Food Security;
- Ecosystem Services, Biodiversity and Forestry;
- Natural Disaster Risk Management; and
- Human Health.

The effective adaption policies and practices become complexed for a number of subjects such as rapidly growing population, increasing urbanization and economic policy priorities in Turkey. However, the existing sustainable development policies and targets can also be reported to promote the efforts of adaptation to climate change.

Some of the policies that have been recently adopted by several sectors in Turkey support the adaptation to the impacts of climate change. Foremost among them are modern approaches and rural development policies for the management of water resources such as sustainable forest management, rational use of water in agriculture and integrated river basin management. Although not indicated directly, the recent strategical documents and policies (Agricultural Strategy, TAKEP, Rural Development Strategy and Action Plan, Energy Efficiency Strategy etc.), long-term policy programs (Rural Development Program/IPARD, TUBITAK Vision 2023, National Forestry Program, Turkish National Program to Combat Desertification etc.) and action plans (National Action Plan to Combat Desertification (2005, RG), Southeastern Anatolia Project Action Plan, Biodiversity Strategy and Action Plan, Forestation and Erosion Control Campaign Action Plan, Waste Management Action Plan, Wastewater Treatment Action Plan etc.) include several activities for adaptation to the impacts of climate change just as many as those for emission reduction in fight against climate change.

2.3 CLIMATE ADAPTATION STRATEGY OF TURKEY

The large-scale change experienced with the increasing global temperature is another issue that entails the adoption of measures for any countries vulnerable to climate change, such as Turkey, as is around the world. The Ministry of Environment and Urbanization attaches too much importance to the capacity buildup for the ability to adapt to impacts of climate change, and to the immediate development and adoption of any plans required in this aspect. In this context, Turkey prepared a National Climate Change Strategy with the intent to contribute to global efforts of mitigating the impacts of climate change under its own specific circumstances and by its own means. The document in question sets out the Turkish policies for national mitigation, adaptation, technology, financing and capacity buildup. Turkey aims to make energy efficiency widespread, promote the use of clean and renewable energy resources and integrate climate change policies with development policies for becoming a nation that is capable of offering high living standards and welfare to all its citizens with a low level of carbon concentration.

The climate change in Turkey is projected to result in specific adverse impacts such as reduced number of water resources, rising number of flood events, and fires, drought and desertification, and associated ecological disturbances. The climate projections developed in line with the Joint Program for Enhancing the Capacity of Turkey to Adapt to Climate Change project that the precipitation regime, i.e. the water cycle, will change with a considerable impact on nearly all economic sectors, settlements and climate-related natural disaster risks with apparent temperature increases, supporting other studies. When these change projections are construed, the changes in precipitation and temperatures of Turkey will have an impact on water resources, agricultural production, human health, natural disaster risks and economic growth and threaten ecosystem services governing the quantity and quality of factors comprising the key input for production such as water.

The following table taken from the National Adaptation Strategy and Action Plan on Climate Change includes the major examples of impact and the sectors and regions likely to be affected, and assesses the severity of impacts on a relatively exclusive basis to sectors and regions in line with climatic impacts resulting in drought, floods and self-generated fire events in Turkey.

The National Adaptation Strategy and Action Plan on Climate Change focused on five key areas recognized by participatory processes where the potential areas of exposure to climate change in Turkey are supported by technical and scientific studies. These areas are described below.

Table 2-1 Impacts of climate change, and sectors/regions likely to be affected by climate change in Turkey

Impacts	Severity	Potential Regions Affected	Potential Regions/Themes Affected
Change of river/basin regimes	Low	All regions	Ecosystem services and biodiversity
Soil loss/salinity	Low	Mediterranean, Black Sea and Aegean Regions, Southeastern Anatolia Region	Tourism, ecosystem services, biodiversity and seafood
Decreasing seafood production	Low	Mediterranean Region	Agriculture, food security, water distribution network
Decreasing hydropower potential	Low	Mediterranean Region	Energy, industry
Migration of species to other locations for survival	Low	Mediterranean Region	Tourism, agriculture, food security
Disturbance of marine ecosystem	Low	Mediterranean, Aegean and Black Sea Regions	Ecosystem services and biodiversity
Coastal erosion	Low	Black Sea Region	Fishery, unemployment
Decreasing surface water	Medium	Western Anatolia Region	Agriculture, water distribution network infrastructure
Decreasing agricultural productivity	Medium	Mediterranean and Aegean Coasts	Agriculture (employment), food security
Soil loss/deprivation of soil quality	Medium	Southwestern Anatolia Region	Survival of agricultural workers, food security, shallow lakes and wetlands
Flood	Medium	Black Sea and Southeastern Anatolia Regions	Survival of agricultural workers, human health
Growing shortage of potable water	Medium	Afyon, Izmir, Kayseri, Muğla, Manisa	Agriculture, industry, energy
	High	Istanbul, Ankara, Aydın, Nevşehir, Bursa	Urban areas

2.3.1 Water Resources Management

The issue of top priority widely recognized by all nations for the use of water resources is the principle of satisfying core requirements that are necessary for the maintenance of life. After this amount of requirement is satisfied, the existing water resources are distributed in the most proper manner in consideration of other requirements. The priority in use regarding the distribution of water potential is listed as follows:

1. Need for potable water
2. Need for water required for animals and wildlife maintenance
3. Need for agricultural irrigation water
4. Need for water in energy and industry
5. Need for water in commerce, tourism, fishery, etc.

Substantial studies were conducted regarding the management of water resources under the Turkish Adaptation Strategy and Action Plan on Climate Change;

Based on the 6th National Communication on Climate Change published by the Ministry of Environment and Urbanization, Turkey's potential of surface and underground water resources consumable is 112 billion m^3 per year in average, 98 billion m^3 of which are surface water and 14 billion m^3 underground water (6th National Communication). The current rate utilizing existing 112 billion m^3 available water resources is approximately 36%. The quantity of available water per capita in Turkey is approximately 1,519 m^3. Of available water, 32 billion m^3 are used for irrigation, 7 billion m^3 for drinking and utilization and 5 billion m^3 for industrial purposes. In this case, 74% of water resources available in Turkey are used for irrigation, 11% for industry and 15% for urban consumption.

The total amount of water consumed in Turkey is projected to increase by three times from 2004 to 2030. The projected total amount of water used in 2030 is approximate to the amount of existing water resources that can be used on a sustainable basis (on a yearly basis) where there is a probability of considerable exposure to water stress considering many adverse impacts such as climate change effects, reduced precipitation, increased number of irrigation areas, existing storage area bases filled with sediments and non-uniform distribution of water resources. The levels of water stress in Turkey and EU countries were estimated by the Europe Environment Agency for 2000 and 2030. Accordingly, the projection is that the central and western regions of Turkey will be exposed to water stress over 40% as from 2030. This rate will be 20 to 40% in southeastern and Eastern regions.

While climatic conditions play a significant role as one of the causes of these circumstances, the other primary issues that should be addressed for adaptation to the impacts of climate change are the excessive use of water in irrigation, use of leakage underground water, problems arising from the operation of existing facilities, losses and leakages in networks, administrative and organizational problems, delayed investments, and water pollution occurring for several reasons.

The surface water in Turkey becomes arid, the soil quality deteriorates and the initial events of erosion and flood occur in coastal regions due to the high temperature differences between seasons caused by climate change and the reduced amount of precipitation in Turkey. This particularly puts water resources necessary for food production and rural development at risk.

For the purposes of sustainable development principle relating to industrial investments designed to mitigate water stress, a number of studies are carried out for water saving and reuse of waste water (clean production practices in the industry) as well as some practices adopted for losses and leakages in city water supply network (actions for reducing water leakages in the supply network, activities for saving irrigation water). Some river basin-based approaches are developed to provide efficiency in water management, developing action plans on river basin protection that set out the principles of integrated protection and controlled use and ensuring the monitoring of practices. The river basin protection action plans were completed for 25 basins across Turkey. Some of the subjects considered important are outlined below under the studies carried out in relation to water resources management, climate change, impacts, probability of exposure, and sustainable rational use of resources.

- Increasing Storage Capacity
- LAKE-WATER Project
- River Basin Protection Action Plans
- Achieving Water Saving in Irrigation
- Drought Management Efforts

- Supply of Potable and Industrial Water
- Efforts for Protection from Flooding

The objective of efficient and integrated management of water resources included in the Tenth Development Plan is intended to mitigate the direct vulnerability to the impacts of climate change. The Tenth Development Plan listed the policies on water management in Turkey as follows in general terms:

1. The omissions and uncertainties in the water management legislation shall be eliminated, clarifying the roles, powers and liabilities of organizations and improving the cooperation and coordination between all concerned organizations and institutions engaged in water management.
2. A national river basin classification system shall be developed such that it allows for the protection and sustainable use of water resources.
3. Actions shall be taken to identify and monitor the quality and quantity of underground and surface water, develop information systems, protect and improve water resources and avoid and control pollution.
4. Actions shall be taken to ensure that the whole water potential of our country is used sustainably in line with requirements and a price list is prepared for use.
5. Necessary measures shall be taken to particularly achieve water saving in river basins, fight against drought and avoid pollution, assessing the impacts of climate change and all activities in catchments on the quality and quantity of water.
6. Measures shall be taken to protect quality agricultural lands and forest assets particularly natural protected areas of specific importance. In this context, the specific combat with desertification and erosion shall be made more effective and the preventive measures shall be concentrated through the monitoring of environmental and social impacts of agricultural activities on soil resources.
7. The National Soil Database shall be built to provide access to up-to-date and robust land information, using remote sensing and geographical information systems, and the effective land use shall be achieved particularly for agricultural purposes with a land use planning study in place.
8. Alternatives, such as quantitative restrictions and differentiated pricing, shall be developed for underground water resources to achieve sustainability in irrigation.
9. The operating processes of irrigation associations shall be reviewed, and alternatives shall be developed to make the system more effective.

2.3.2 Agriculture and Food Security

Agriculture is known to be not only a victim of climate change, but also one of the causes of this change. The destructive impact of climate change on agriculture should be considered jointly with the issues of development, food security, environment, biodiversity, and sustainability of ecosystem services.

Because Turkey is located in the Mediterranean basin which is most exposed to climate change and the agricultural sector is very important in national economic and social aspects, Turkey is included in the category of vulnerable countries in terms of the impacts of climate change on agriculture and food production.

The objectives under the topics 'agricultural sector' and 'food security' of the Turkish Adaptation Strategy to Climate Change are outlined as follows;

1. Review existing strategies and action plans and legal regulations for adaptation to climate change,
2. Review any executed interorganizational protocols with a perspective of adaptation to climate change,
3. Improve and promote R&D activities for the effective use of products, soil and water,
4. Enhance the capacity and number of organizations engaged in R&D and scientific activities,
5. Develop the Soil and Land Database and the Land Information System in consideration of the impacts of climate change,
6. Conduct and monitor disaster analysis for agricultural drought, and
7. Determine socio-economic impacts of climate change on agriculture.

2.3.3 Ecosystem Services

Divided into three biological regions with considerable biodiversity assets, Turkey is situated between 200 ecological regions at a global scale. These regions are listed among the most crucial ecological zones around the world for preservation assets contained in them.

Since the most critical factors identifying the type of an ecosystem are temperature and precipitation regime, climatic changes will result in the alteration of nature and functions of ecosystems. Recently, the impacts of climate change on species and ecosystems have become increasingly more severe. Specifically, the species with a limited number of habitats and vulnerable ecosystems are considered to be affected by climate change to the greater extent.

In addition to the protected areas announced to protect rate species, global vulnerable ecosystems rich in biodiversity will play a critical role in the process of combatting climate change, providing shelters for species. It is still literally unknown how the changed climates will affect the expansion areas of ecosystems within the existing protected areas. Within the scope of climate change, the protected areas are important for;

- Emission reduction; maintenance of the protected areas that specifically include ecosystems providing carbon absorption, such as forestlands and peatlands; and announcement of new areas,
- Adaptation to climate change; ecosystem services; and preservation of the distribution of species and ecosystems within the protected areas, and
- Resistance achieved by ecosystems and species against climate change through the existing network of protected areas.

It is known that "Key Biodiversity Areas" (KBAs) cover 26% of the total area of Turkey and 305 KBAs are identified across the country. Protecting KBAs means the continuation of many endangered species. Turkey is a country having the richest flora in Europe, North Africa and Near East geographies with approximately 11,000 types of flowering plants and ferns, one third of which is endemic.

After Turkey becomes a signatory to the United Nation's Biodiversity Convention in 1996, the "National Strategy and Action Plan on Climate Change" was prepared as Turkey's obligation in accordance with article 6 of this convention. This strategic plan was updated in consideration of the compulsory compliance of any actions taken by Turkey in this respect with the Europe Union's

regulations on nature conservation, and six thematic study fields important for adaptation to the impacts of climate change were developed accordingly. These thematic fields are;

- Agricultural biodiversity,
- Forest biodiversity,
- Steppe biodiversity,
- Mountain biodiversity,
- Inland water biodiversity, and
- Coastal-marine biodiversity.

Turkey has been carrying out on-site preservation studies since 1950. The total surface area of protected areas reached 4.6 million hectares. This corresponds to 6% percent of national surface area. The protected areas of Turkey having different statuses are classified below.

- 42 National Parks
- 42 Natural Parks
- 31 Nature Reserve Areas
- 14 Special Environmental Protection Areas
- 135 Internationally Important Wetlands

The objectives set for ecosystems and biodiversity based on the Turkish Adaptation Strategy to Climate Change are as given below;

1. Review existing strategies within the scope of adaptation to impacts of climate change,
2. Identify and monitor impacts of climate change on species in forestlands,
3. Identify the alteration of land use in forestlands caused by climate change,
4. Monitor the health of forest ecosystems,
5. Carry out research and development activities in protected areas to identify and monitor the impacts of climate change,
6. Consider the activities for adaptation to climate change in socio-economic development of villagers in forestlands and promote rural development in this way,
7. Identify and monitor the impacts of climate change on mountain, steppe, inland water and marine - coastal ecosystems and on ecosystem services offered by such ecosystems,
8. Integrate the adaptation to climate change with the framework of marine and coastal zone management, and
9. Protect forests from fires.

2.3.4 Natural Disaster Risk Management

Based on climate change scenarios, a potential one to two Celsius degree increase in average air temperatures means a several times multiplied increase in extreme air temperatures and heavy rainfall events. In recent years, many locations of the world witness countless hydrometeorological disasters unparalleled for their severity, impact, duration and place of occurrence. As the disaster legislation and organizations in Turkey mainly focus on post-disaster crisis management, there is the failure to prioritize the prevention of risks and mitigation of potential impacts. Consequently, disaster and risk management policies fail to observe the priority of risk mitigation. Turkey is situated in a geography that includes all types of natural disasters but active volcanos and typhoons. While

earthquakes are considered the most important in Turkey, the awareness of meteorological disasters have risen recently.

The number of people who died from floods between 1900-2014 in Turkey is 1,342 and the number of affected people is 1,778,520, resulting in a loss totaling USD 2.2 billion. 700 mortalities were caused by landslides and avalanches, 100 by storms and 15 by fires. The mortalities caused by extreme temperatures were reported to be 100.

The National Disaster and Emergency Response Plan was prepared, which could serve as a guide for the integrated coordination of risk mitigation, preparation, response and post-disaster improvement activities relating to disasters. The policies on disaster management set out by the Tenth Development Plan are as given below;

- The organizational powers and responsibilities shall be regulated again to enhance the effectiveness of disaster risk identification, assessment and control and of response activities carried out during and after a disaster.
- With particular importance attached to high risk disaster areas, the activities intended for micro zones designed to identify disaster risks shall be completed and disaster risks shall be taken into account in public zoning planning processes.
- Risk and loss mitigation activities, varying depending on socio-economic and physical features of regions and different types of disasters, shall be expedited and post-disaster improvement plans shall be prepared for high risk disaster areas.
- Implementation mechanisms for disaster risk mitigation shall be strengthened and the priority shall be given to the enhancement of shared spaces that are specifically important in preparing for and responding to disasters, such as hospitals, schools and dormitories, and critical infrastructures such as energy, transportation, water and communication.
- A disaster information management system, which provides a fast, secure and effective data transfer between public bodies and organizations, shall be established to respond to disasters more effectively. The communication infrastructure shall be strengthened to the further extent for the provision of effective and seamless communication.
- Building and infrastructure facilities shall be constructed with further resistance against disasters where construction inspections shall be improved through independent, skilled and competent persons and organizations.

Threats and risks should be identified for managing any natural disasters associated with climate change, and therefore, natural disaster risks, such as floods, avalanches and landslides, should be determined primarily. In fact, the National Climate Change Strategy stipulates the identification of natural disasters that are likely to grow in numbers in connection with climate change, such as floods, avalanches, landslides, etc., and the adoption of necessary measures using early warning systems to minimize the impacts of disasters. The objectives set for natural disaster risk management based on the National Adaptation Strategy and Action Plan on Climate Change are as given below;

1. Identify any natural disaster risks associated with climate change, such as floods, avalanches and landslides,
2. Review the applicable legislation on natural disasters in line with climate change and identify the code of practice,
3. Enhance the capacity of rural organizations for responding to natural disasters associated with climate change, and bring the said capacity to the level of ability to conduct a drill,

4. Develop a community-based disaster management system for responding to potential disaster risks caused by climate change, and
5. Carry out educational activities that will enhance social awareness and participation in relation to the impacts of potential disasters and risks caused by climate change.

2.3.5 Public Health

The impacts of climate change on human health can be either direct or indirect. While the extraordinary climate events, such as floods, extreme heat waves and storms, has a direct impact on human health, the long-term impacts of climate change are indirect effects on human health causing problems associated with water, food and sheltering. Disturbing ecosystems, the climate change may lead to changes in the distribution of vectors carrying contagious diseases and the population density, and thus to the increase in the frequency of any vector-borne diseases.

The direct and indirect impacts of climate change on human health can be listed as follows:

- Injuries and fatalities linked to extreme climate events,
- Diseases and mortalities connected with temperature,
- Cancer,
- Cardiovascular disorders,
- Foodborne diseases and poor nutrition,
- Asthma, respiratory allergies and respiratory tract diseases,
- Impacts on human growth,
- Diseases relating to mental health and stress,
- Neurological diseases and disorders,
- Vector- and animal-borne diseases, and
- Waterborne diseases.

A number of initiatives were undertaken by the Ministry of Health to minimize the adverse impacts of climate change on human health and develop appropriate measures against potential impacts. The Ministry's existing and intended activities against the adverse impacts of climate change on human health are carried out under the following three topics;

i. Impacts of hot temperatures and extreme heat waves,
ii. Impacts of severe weather events, and
iii. Epidemics.

In recent years, there has been many mortalities in Turkey in connection with heart attack, cardiovascular diseases, kidney disorders, respiratory tract diseases and metabolic diseases particularly as a result of heat waves. Public information activities are maintained by the Ministry of Health in relation to hot temperatures and heat waves specifically during the summer months, monitoring mortalities and diseases arising from temperatures.

"The National Program and Action Plan on the Mitigation of Adverse Impacts of Climate Change on Health" published by the Public Health Agency of Turkey in 2015 established a correlation between climate change and public health, provided statistical data applicable worldwide and on a basis specific to Turkey, and listed and described the potential diseases caused by climate change. The

Action Plan listed targets and strategies separately for each adverse impact. The program is outlined below.

1. Mitigate the impact of extreme weather events (extreme precipitation, extremely hot and cold temperatures) and natural disasters (flood, fire, etc.) occurring as a consequence of these events,
2. Strengthen the organizational infrastructure for monitoring diseases encountered and/or growing in our country as a result of climate change, and enhance intra- and inter-organizational cooperation,
3. Provide water and food security, and fight against water and foodborne diseases,
4. Carry out necessary activities so that vulnerable groups are not affected by the adverse impacts of climate change,
5. Reduce negative contributions of health institutions to climate change,
6. Raise awareness among public members for more effective protection from the adverse impacts of climate change on health, and
7. Conduct monitoring and assessment activities

3 KADIKÖY AND IMPACTS OF CLIMATE CHANGE

Climate parameters vary from one year to another and for longer periods (decades) for natural reasons. In recent years, the natural variability of climate emerges along with the human-induced change. The change resulting from human activities manifests itself in the form of increase in average global surface temperatures which cannot be described by natural variability.

The primary objective of climate change adaptation measures is to adopt risk management practices designed to mitigate threats by identifying sectoral vulnerabilities and fragile infrastructures and to make the city more durable and resistant against climate change in this way. Risk-based approaches are primarily intended to control the impact of consequences while defining scenarios. Adaptation activities focus on the mitigation of destructive impacts of potential threats, not on the elimination of risks.

Although the probability of occurrence of destructive extreme climate events cannot be eliminated, the damages caused by them can be mitigated. In other words, climate adaptation strategies aim to mitigate the damage caused to the city's fragile infrastructure by inevitable impacts of climate change.

Many scientific studies demonstrate that Turkey is situated in a very vulnerable geography in terms of water resources and temperature increase. In particular, cities will be more affected by these temperature increases with the impact of urban heat island.

The Intergovernmental Panel on Climate Change (IPCC) contributing to International Climate Negotiations demonstrates how the world will be affected by potential temperature changes with several sets of modeling in its reports published since 1990. IPCC's 5th Assessment Report published in 2013 addresses the climate change-induced critical risks against the European zone including Turkey under the following 3 topics:

1. Increase in the number of people affected by and in economic losses caused by floods on river basins and coasts due to the growing urbanization, rising sea level, coastal erosion and high river flowrates/discharges;
2. Considerable reduction in the amount of water that exists through extraction from rivers and underground resources with the water drainage and flow decreasing as a result of increasing water limitations (particularly in the Southern Europe), growing water demand (for irrigation, energy and industrial use and domestic use) and rising evaporation demand; and
3. Increase in the number of people affected by extreme hot weather and in economic losses; impacts on health, welfare, labor productivity and air quality, and risk of forest fire in the Southern Europe.

The answer of how Kadıköy will be affected by climate change can be deduced from those activities carried out in relation to Turkey and Istanbul. Two critical sources of reference considered in this aspect are the inferences on Turkey included in IPCC modeling coordinated by the Eurasia Institute of Earth Sciences and the "Assessment of Climate Change Scenarios for Istanbul" prepared for Istanbul under "Istanbul Climate Change Action Plan" coordinated by Istanbul Metropolitan Municipality.

3.1 CLIMATE CHANGE SCENARIOS FOR ISTANBUL

Temperatures[5]

In Turkey, the start of temperature increase dates back to 1990. The situation is the same in Istanbul. No considerable trend is seen in seasonal temperatures until 1990's. However, the summer season became dissimilar to other seasons from 1990, being exposed to warming above 2 °C. Similarly, t-he warming during other seasons was approximately 1.5 °C. The natural variability is higher in other seasons compared to the summer season.

The mean annual temperature clearly demonstrates the warning taking place following the early 1990's. The rate of warming happening after 1990 is above 2 °C. After 1997, mean annual temperatures did not fall below the average of 1961-1990.

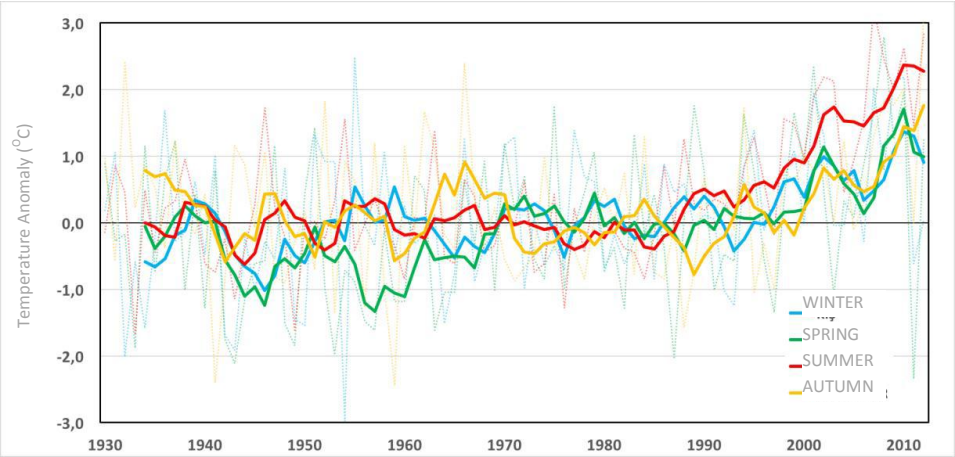


Figure 3-1: Mean temperature changes for Istanbul province, by seasons, Göztepe Station readings

Based on the pessimistic scenario, the temperature increase will be nearly linear, and reach 5.0 °C by the end of the century. These analyses indicate that the temperature increase in Istanbul will exceed 1 °C even in the most optimistic scenario.

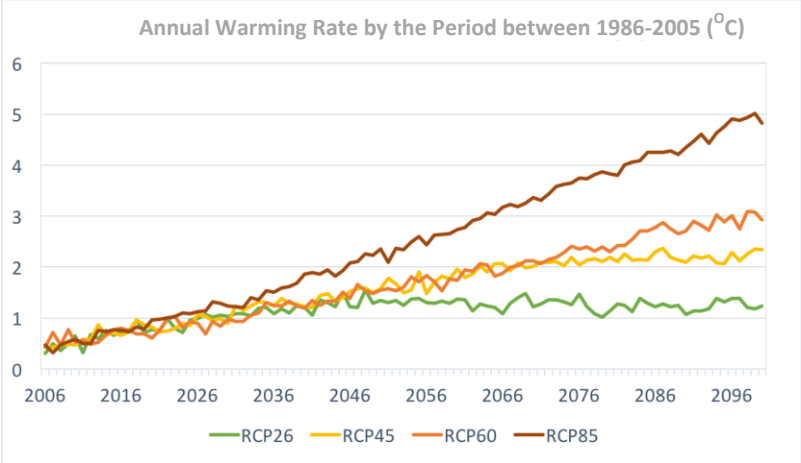


Figure 3-2: Temperature change scenarios for Istanbul province;

[5] "Assessment of Climate Scenarios for Istanbul", Istanbul Climate Change Action Plan Report, www.iklim.istanbul

RCP2.6 optimistic scenario, RCP4.5 moderate optimistic scenario, RCP6.0 pessimistic scenario, RCP8.5 most pessimistic scenario

Based on several global emission scenarios, the mean temperature increase in Istanbul is projected to range between 1-5 °C compared to the period from 1986 to 2005. These increases will be lower in the winter months and higher in the summer months. No considerable change in precipitation is projected for the period from 2016 to 2035. Some models show decreasing precipitations in the following periods. In the case of a pessimistic scenario (RCP8.5), the rate of decrease in precipitation exceeds 30% in the summer months.

Precipitations[6]

The precipitation regime of a region depends on a plenty of factors such as elevation, land cover, upwind and proximity to sea, particularly the general circulation of atmosphere. The amount of seasonal precipitation in Istanbul displayed no considerable trend for many years. The variability is much higher for winter precipitations compared to other seasons. While, as seen in the figure, the early 1980's were very wet during the wettest winter season, the early 1990's were very arid.

Based on the 21st century climate change scenario simulations, the future patterns of precipitation in Istanbul will be altered (Figure 7). RCP2.6 scenario indicates that there will be no considerable change in precipitation for Istanbul, and RCP8.5 scenario demonstrates that precipitations will be reduced and this rate of reduction will exceed 80 mm (approximately 12%) by the end of the century based on today's values (1986-2005). The rate of reduction will not exceed 5% based on RCP4.5 scenario, and 8% based on RCP6.0 scenario.

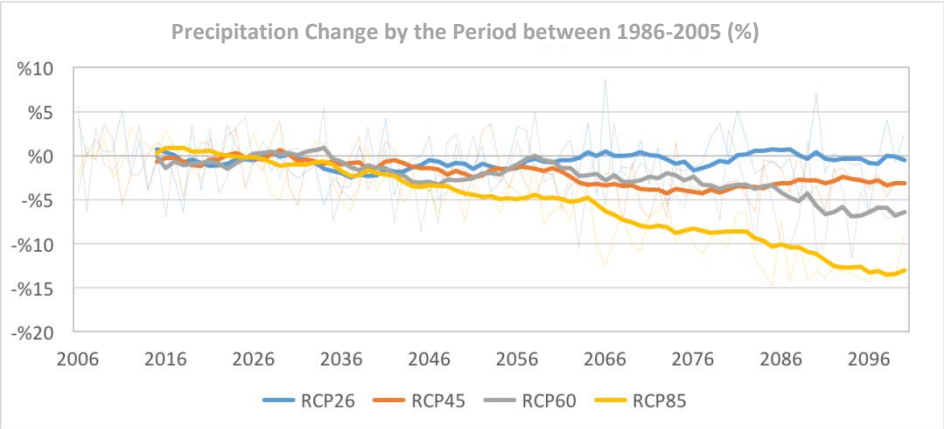


Figure 3-3: Precipitation change scenarios for Istanbul province;
RCP2.6 optimistic scenario, RCP4.5 moderate optimistic scenario, RCP6.0 pessimistic scenario, RCP8.5 most pessimistic scenario

Water flows will not be reduced only for the reduction in precipitation. The temperature increase will intensify water loss suffered through surface evapotranspiration. Therefore, the expected total reduction in flowrate is approximately 20% for the mid-century and 30% for the end of the century.

In parallel to the change in temperature and precipitation patterns, the projection is that there will be less snowfall across Istanbul, the snow cover will generate later and melt earlier, the snow cover will shift to higher elevations and these changes will have an impact on urban water supply.

[6] "Assessment of Climate Scenarios for Istanbul", Istanbul Climate Change Action Plan Report, www.iklim.istanbul

The number of wet days in Istanbul, which is approximately 112 days, will decrease by 3 to 12 days by the mid-century and by 3 to 23 days by the end of the century. Based on the pessimistic scenario, the total amount of actual precipitation will rise by 20% during very wet days and by 59% during extreme wet days at the end of the century. Although, in more optimistic scenarios, this rate decreases, it is seen that there is a considerably higher risk of flooding as a result of heavy rainfall. The length of dry period will increase from 45 days to 50-57 days by the mid-century and to 49-68 days by the end of the century. The length of the longest wet period will decrease from 10 days to 8.5 days.

Drought[7]

One of the most powerful meteorological disasters, drought takes hold of Istanbul from time to time and has an adverse impact on social welfare, particularly leading to the reduction in water resources. The event of drought that dominated Istanbul from 1989 to 1994 resulted in severe sufferings. Major water supply issues emerged as this drought coincided with the increasing rate of immigration and urban sprawl after 1980's. Istanbul suffered a further severe drought between 2007-2008. Water resources declined to the severe extent. However, this problem was avoided with less severe consequences compared to the drought of early 1990's as a result of water transfer from Melen creek and return of precipitation. Droughts across Istanbul are effective mostly for a period of two years or less. While any events of drought longer than two years are rare, the droughts which may take place in the near future (as was between 1989-1994) continue to pose a severe threat against Istanbul.

Sea Level[8]

It is projected that a 1-m rise will not cover large areas in Istanbul, but the structures like ports, marinas and shipyards in low-elevation zones and similar locations, such as Üsküdar coast, Istanbul port, Kadıköy coast, some parts of the Golden Horn, Yenikapı, Zeytinburnu, Ataköy, Maltepe, Pendik and Tuzla (Marmara in general), seem to be adversely affected by the rise of sea level. Given that a one-unit rise of sea level creates an impact area that is 100 times larger on a horizontal plane, the coastal parts of Istanbul (Marmara in particular) can be said to have a higher level of vulnerability to sea level due to climate change in general.

Starting with the period between 1986-2005, sea levels are expected to rise from 45 to 75 cm by 2100. The causes of this rise are melting of glaciers and expansion of warming water. Apart from these, there are more radical projections. Istanbul and, thus, Kadıköy will be affected by these changes to a given extent as a coastal city.

3.2 VULNERABILITIES OF AND RISKS AGAINST VARIOUS SECTORS

While cities give rise tı climate change, they are substantially affected by the consequences of climate change. Any unexpected climate events likely to occur by climate change will not only result in several infrastructure issues, but also bring about the exposure to more problems. Therefore, having and advance understanding of these unfavorable conditions and setting out associated risks will be the first step in undertaking the efforts of adaptation to climate change.

[7] "Assessment of Climate Scenarios for Istanbul", Istanbul Climate Change Action Plan Report, www.iklim.istanbul

[8] "Assessment of Climate Scenarios for Istanbul", Istanbul Climate Change Action Plan Report, www.iklim.istanbul

The probability of occurrence of risks, included in the following table, in Kadıköy is assessed based on the scenarios for the potential impacts of climate changes summarized above on Istanbul and Kadıköy.

Table 3-1: Probabilities of Occurrence of Climate Change Risks in Turkey

Climate Event	Risk Level	Expected Change	Frequently Expected Change	Time Range
Extreme Heat	High risk	Increase	Increase	Short term
Extreme Cold	Low risk	Decrease	Decrease	Medium term
Heavy Precipitation	High risk	Increase	Increase	Short term
Floods	High risk	Increase	Increase	Short term
Rise of Sea Level	Medium risk	Increase	Increase	Long term
Drought	Medium risk	Increase	Increase	Medium term
Storm	Medium risk	Increase	Increase	Short term
Landslide	Low risk	Increase	Increase	Long term
Forest Fire	Low risk	Increase	Increase	Long term
Other	-	-	-	-

The sectors under the risk of exposure to climate change and the vulnerability analyses are given below.

3.2.1 Buildings

Kadıköy is a location having a dense level of urban transformation. Inspecting the construction of new buildings consistent with regulations is of importance at this point. The non-compliance with design and the faulty workmanship and construction operations, which are encountered frequently in connection with older buildings, should not be repeated for new buildings. Although a substantial part of the building stock will be renewed by 2030, the risks against older buildings are still present.

The potential effects of climate change on the existing building stock can be; cooling induced by extreme heat and consequent increase in power demand; loss of value in heat island zones; flooded buildings as a result of storm water and storm; and roofs and shutters flying away. Heavy precipitations expected to happen in the following years and associated storm waters and floods are elements of threat against the building stock. In addition, the expected medium- and long-term rise of sea level puts those buildings along the coastal line at risk.

Considering these risks, differentiated architectural understandings should be developed for new buildings that are to be located away from stream beds and coasts. The major potential measures to take include green roof applications, rainwater harvesting, water-saving fixtures, natural ventilation, strong insulation, renewable energy production integrated with the building stock, and energy efficiency applications. Inspections conducted to check that regulations are followed should be carried out more frequently.

3.2.2 Transportation

Transportation is not only one of the major causes of climate change due to the concentrated GHG emissions, but also one of the sectors that will be affected by climate change at the highest level.

Istanbul is a city where mass transportation vehicles are used very intensely for its dense population, and unfortunately a great portion of transportation, including mass transportation, is provided by road. The infrastructure of transportation will be most affected by events of heavy precipitation, storms, heat waves, temperature increase during the summer, storm waters and floods and changes in sea level. Roads, bridges and tunnels, walkways and rail systems, maritime transportation and airports are under risk and these infrastructures should be made resistant against climate changes.

Kadıköy is a critical hub of passageway for Istanbul. Ferries, sea buses, metrobuses, buses and metro lines are used intensely within the district. Additionally, Kadıköy is the point of initial departure for Marmaray on the Anatolian side. Any potential infrastructure problems resulting from climate events will affect the entire transportation to a substantial extent.

3.2.3 Energy

The increase in temperatures will intensify power demand for cooling in Istanbul Province. This refers to an additional load over power networks. Furthermore, it is important to make electricity and natural gas networks resistant against the adverse impacts of climate change such as storm water, flooding and storm. Extreme temperatures may result in technical losses for mains transmission and distribution cabling. Heavy precipitation, floods, storm waters and storms pose a high risk against energy infrastructure. The coordinated activities should be undertaken based on the cooperation between the concerned energy distribution companies in this aspect. Additionally, as stressed in the "Sustainable Energy Action Plan", it is important to develop photovoltaic applications, featuring energy storage systems, and central heating systems and soil-based heat pumps and alternative-fuel systems for residential buildings and workplaces and to make energy-efficient applications widespread for reducing the increasing power consumption.

3.2.4 Waste

Like other district municipalities, Kadıköy Municipality collects and transports any type of domestic waste to waste transfer stations under the possession of the Metropolitan Municipality located out of district boundaries. Heavy precipitation, floods and storm waters pose a medium risk for the proper fulfilment of waste collection operations. There is a further risk that any waste present in the waste collection center may infiltrate in surface and underground water in case of any flood and storm water.

3.2.5 Public Services and Health

Speaking of public services sector, the first thing to cross one's mind is the city's critical infrastructures. The most important elements of these infrastructures are water distribution channels, sewer channels, storm water channels, natural gas distribution lines, and telecommunications infrastructure. All these structures, specifically those which are more proximate to sea, are particularly threatened by the changing precipitation regime, heavy precipitation, flood and storm water, and storm and changing sea level.

The growing number of health issues and injuries arising from extreme weather events, such as heat wave, flood and storm water, may reach dimensions that could render the health industry incompetent. Similarly, the infrastructure of hospitals affected by the same weather events will make things still harder. In case of potential emergencies associated with drought and food security, the hygienic and adequate access to food will be critical. Individual **Action Plans** should be developed to be prepared for such circumstances.

3.2.6 Water Resources

The water resources of Istanbul mainly contain surface water located out of provincial boundaries and transported from provinces, such as Sakarya, Düzce and Kırklareli, to Istanbul. The mean temperature increase, summer temperature increase, heat waves, change in precipitation regime, flood, storm water and humidity are critical risk factors for water resources of the city, and water management is one of the areas that will be most affected by climate change.

3.2.7 Tourism

Kadıköy district has recently become one of the leading attraction centers for eating and drinking and entertainment. Additionally, Kadıköy is a district having an extensive number of high street shops and stores. The formation of urban heat island results in adverse conditions against both district residents and visitors. The rise of sea level along the coast will have an impact on the visitors visiting coastal areas. Heavy precipitation and storms and floods may lead to both inconveniences in transportation and cancelation of any events and activities. In addition, the financial loss arising from physical damage and the increase in insurance costs are included in the issues adversely affecting the tourism sector.

3.2.8 Other (Industry, Land Use, Forestry and Biodiversity)

The industrial sector was not analyzed, because Kadıköy district has no manufacturing facilities but minor industrial establishments such as machine shops.

The forestry sector was excluded from the analysis due to the existence of dense housing and the lack of areas and forests suited to natural habitats.

The overall mitigation of vulnerability will be possible using accurate planning and management processes.

3.3 GREEN SPACES / GREEN CORRIDORS

Urban green spaces are of great importance to public health and environmental quality other than to aesthetical and recreative activities. Natural spaces developed with a green infrastructure system offer great benefits to urban environment and urbanites. Green spaces and green infrastructure systems are seen to keep a city resistant against the impacts of climate change. The benefits offered by them, such as prevention of extreme weather events, purification of water and air, improvement of public health, and noise reduction, are indicative of how green systems are important within urban dynamics. Furthermore, good urban design practices furnished with green systems necessary for the land use for a sustainable planning will lead to the improvement of living conditions, minimizing the impact of urban texture on the environment.

Under a study conducted by Istanbul Commerce University, the maps prepared for the level of green space use around residential buildings show that the frequency of using parks around residential buildings is higher on the Anatolian Side compared to that of European Side. There is a high frequency of using parks around residential buildings on the Anatolian Side, particularly in coastal settlements of Kadıköy, and in Üsküdar and Kartal-Pendik districts[9].

Similarly, the same study shows that the frequency of using parks located out of the surroundings of residential buildings is generally low. The settlements having a relatively high frequency of green

[9] Urban Green Area Use and Green Area Satisfaction in Istanbul, 2014

space use at this level are planned developed residential zones located in regions close to the coast in Bakırköy and Kadıköy districts. Moving away from the coast, the frequency of use has a tendency to decline.

The amount of green spaces per capita in Kadıköy is 3.03 m² based on the latest surveys. New technologies and distinct perspectives should be developed to enhance the amount of green spaces so that this value is raised and brought to the level of model European Cities.

Table 3-2: Amount of green spaces across Kadıköy district

Green Space (m^2)	2010	2015
Green Spaces Controlled by Kadıköy Municipality	510,000.00	610,000.00
Green Spaces Controlled by the Metropolitan Municipality	800,180.00	800,180.00
Grand Total	1,310,180.00	1,410,180.00
Population of Kadıköy District	532,835	465,954
Green Space per Capita	2.46	3.03

*Source: Kadıköy SEAP and Updated Strategic Plan for the Period between 2017-2019

Kadıköy district has 80 parks distributed over several neighborhoods. The figure below (Figure 3-4) shows the mapped indication of parks, the number of which is given in the following table (Table 3-3) by neighborhoods.

Table 3-3: Number of parks controlled by Kadıköy Municipality (by Neighborhoods)

Neighborhood Name	Number of Parks
Osmanağa	2
Caferağa	2
Zühtüpaşa	1
Rasimpaşa	1
Koşuyolu	7
Acıbadem	6
Hasanpaşa	1
Göztepe	6
Sahrayıcedid	14
Merdivenköy	8
Dumlupınar	1
Eğitim	3
Erenköy	1
Fenerbahçe	4
Suadiye	2
19 Mayıs	9
Bostancı	2
Feneryolu	4
Kozyatağı	7
Total	**80**

The quality of urban green spaces is as much important as their quantity. The public access to green spaces in a short span time of time or at short distances is an important factor for enhancing the quality of life. In addition to their shortage, the accessibility of green spaces is another major issue. When the number of parks located in 21 neighborhoods shown in the table above is indicated on the map as follows, one can remark that a great portion of the population has the inconvenience of being unable to have access to parks.

While, as discussed in the chapter Urban Heat Island, the distance from green spaces poses no problem since the existence of a less dense detached housing with local gardens has meet the need for green spaces in Kadıköy district until today, the increase in rapid green space loss caused by the recent urban transformation practices growing in number can lead to problems from now on.



Figure 3-4: Green Spaces in Kadıköy District (the maps received from the Municipality were used)

Under the Covenant of Mayors, the following table shows the expected changes in several variables that could be correlated to green spaces. The table in question will be used as a part of the potential exposure analysis for Kadıköy district.

Table 3-4: Adaptation Indicators for Green Spaces

Potential Exposure Indicators	Unit	Expected Change*	Time Schedule**
Protected (ecologically/culturally vulnerable) areas and forestlands	%	N/A	
Lands with soil erosion and soil quality issues	%	Increase	Long term
Loss of habitat resulting from extreme weather conditions/events	%	Increase	Long term
Percentage change in forest composition (changeovers/losses among tree species)	%	Not assessed due to the lack of forestlands	
Forestland destroyed by pesticides and pathogens	%	N/A	
Change in green & blue surface areas associated with each other	%	Increase	Medium term
Change in combined green & blue areas	%	Increase	Medium term
Percentage change in impervious/impermeable surfaces and soil humidity	%	Increase	Short term
Coastal line alteration identified upon basal slip	%		
Change in protected species and recovered habitat	%	N/A	N/A
Ratio of coastal lines/rivers/streams/coastal areas	%	Change not expected	
Decrease in native species	%	Increase	Medium term

*Increase, decrease, no change, not available

**Now, short, medium and long term, not available

No comment was provided on these indicators, because it is impossible to mention about the existence of a considerable (natural) forest mass in Kadıköy district. Impermeable surfaces are projected to grow larger in the district that undergoes a dense urban transformation process. The loss of habitat and soil will be inevitable as a result of this dense housing. Since Kadıköy Municipality intends to establish a greater connection between blue and green spaces in the district with this plan, the expectation of an increase in this indicator was given.

3.4 IMPACT OF URBAN HEAT ISLAND

The impact of urban heat island is characterized as the regional and local climate change occurring due to the decrease in green spaces in cases such as the growing number of concrete-covered surfaces. Considering the structural development of Kadıköy, it is seen that the amount of green spaces is very low and the rate of housing is very dense. The district climate is also exposed to temperature change since natural areas within the district are covered with concrete and natural landscape areas are diminishing. There are numerous studies on the research of urban heat islands and parameters triggering this formation. Based on these studies; population size (urban size) and population growth rate, urban morphology, urban density, vegetation, urban surface reaction, wind direction and speed and consumption habits and lifestyle seem to be the most critical factors in the formation of heat islands.[10]

[10] Yıldız Technical University, Institute of Science. Anthropogenic Effects on Urban Climate in Istanbul: Investigation of Urban Heat Islands. Çağdaş Kuşçu, Department of Urban and Regional Planning, Urban Planning Program

Based on the results from academic studies analyzing the correlation between land use and thermal environmental features, the zones with high temperatures are proven to be comprised of densely populated residential areas and commercial areas and heavy traffic areas, while the zones with low temperatures are found to consist of green spaces, less populated residential areas and unoccupied areas. The changed surface cover, increasing concretion and high level of exhaust gases emerged as factors that increase temperature (Page 56).

Cities are hotter than the surrounding countryside. This phenomenon is called "Urban Heat Island" (UHI). This is caused by the lesser reflectance of surface and building materials used in cities compared to natural surfaces with vegetation. It was found out that the urbanization of Istanbul specifically increased the mean temperature by about 1°C between 1950-2000 in the summer season. In this case, one should add UHI-induced temperature increases to those temperature increases obtained under projections.

Alexandri et al. correlated the measure of temperature decrease in urban spaces to vegetation, existing urban geometry and climatic conditions (Kuşçu, 2012). The studies conducted show that these parameters are effective from 0.4°C to 19.9°C. Likewise, many studies demonstrate that urban forests, green spaces, cool roofs and roof coating, and housing patterns with proper geometry are effective factors for reducing heat islands. Therefore, the effects of urban trees and green spaces on urban climate change should not be disregarded as well as the positive effects of urban forests[11]. Shading, wind reduction and evapotranspiration properties of trees reduce the amount of energy used by buildings for cooling purposes during the summer, providing up to 1% reduction in consumption costs incurred by cooling equipment and power facilities. In addition to energy saving, urban trees and light-colored surfaces are also effective for mitigating CO_2 increase in the atmosphere. The vegetation used as a natural resource for cooling cities diminishes the amount of necessary energy for direct cooling and thus reduces the use of necessary fossil fuels for electricity generation.

Urban features critical for the formation of heat islands and impacts of these features on earth's energy balance	
Shortage of vegetation	Evapotranspiration decreases
Common use of impermeable surfaces	Evaporation decreases
Increasing heat radiation for urban materials	Heat storage increases
Decrease in solar reflectance of urban materials	Heat storage increases
Urban geometries blocking heat distribution	Heat storage increases
Urban geometries slowing down winds	Circulation decreases
Rise in air pollution level	Net radiation increases
Increased use of energy	Anthropogenic impacts become intense

[11] Importance of Green Spaces in Minimizing Urban Heat in the Istanbul Metropolitan Area, Çağdaş Kuşçu

Spatial Development of Kadıköy

Kadıköy has developed in the form of a center since the early 20th century. It has maintained the nature of a center until today for its location in Istanbul and its position as a coastal district. For its geographical location, Kadıköy is situated at the heart of maritime transportation on the Anatolian Side where access roads intersect with connection to bridges crossing the Bosporus. For this reason, the housing in Kadıköy developed expanding along the coastal line until highway D100.

As in all Turkish cities, the impact of urbanization was initially seen during 1980's in Kadıköy district. The social and green space inventory of the district grew smaller as a result of the introduced public zoning amnesties and adjustments, initiating the process of dense housing. Starting with the renewal of those buildings destroyed upon Istanbul earthquake of 1999, the urban transformation process greatly increased the number of buildings renewed at the building plot scale through equivalence increases introduced by the Law No. 6306 on the Transformation of Zones under Disaster Risk and applicable regulations thereon enacted by the concerned Ministries and the Regulation No. 30196 on Type Zoning of Planned Zones. The spatial structure and social condition of Kadıköy, undergoing the process of demolition and reconstruction of over 4.000 buildings between 2010-2018, started to be affected adversely as a result of its urban infrastructure remaining unchanged despite the increasing population.

Large-scale urban transformation projections becoming increasingly popular recently do not only result in increased story heights, but also give rise to severe population increase. As seen in Figure 3.5, the urban area has a dense and severe housing pattern. It is also remarkable that green spaces and unoccupied urban areas cover a small amount of area.



Figure 3-5: Occupancy - vacancy map for Kadıköy
(Generated under the research in line with the map and information obtained from the Municipality)

As seen in Figure 3.6, the amount of urban green spaces is very low compared to housing. It can be reported that no actions were taken to increase the amount of green spaces while the spatial development of Kadıköy took place. In this context, it is inevitable that the urban area will be exposed to the impacts of climate change.

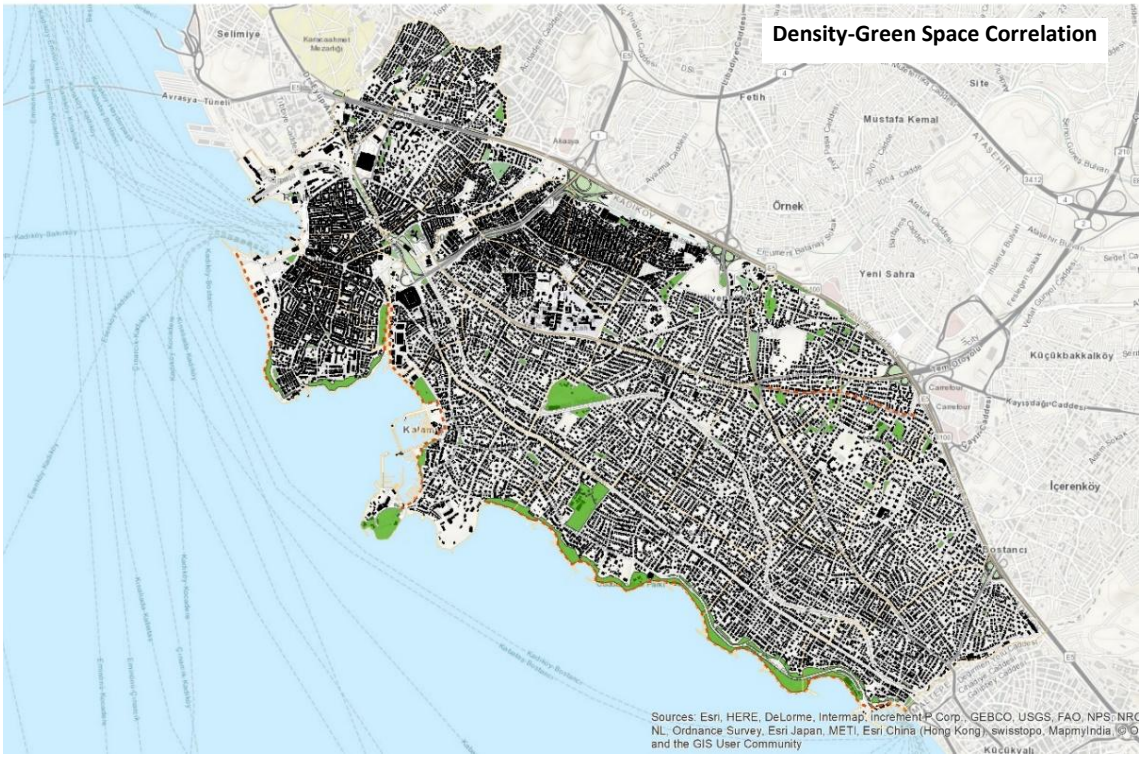


Figure 3-6: Density and green space correlation in Kadıköy (generated under the research)

One of the most critical factors for mitigating the impacts of climate change and developing a resistant city is to make sure that the urban spatial development is fulfilled as fostered by green corridors and spaces, making the right decisions on land use. In this context, one can remark that Kadıköy district should follow a green-oriented housing model with less dense buildings, reviewing the decisions on land use within the district.

Formation of Heat Islands in Kadıköy

The urban climate literature indicates that row housing pattern is not favorable for dense and high housing and the absorbed solar radiation can disperse only if the use of floor area is less than 50% in highly dense multi-story regions. For hot and humid regions, the urban regulations provide that buildings should not be tall and of the same height and perpendicular to prevailing wind direction, and in such a configuration, buildings serve as a wind barrier, undermining ventilation conditions. It is stressed that the zones that densely include tall buildings are exposed to strong heat island impact due to the weakening regional ventilation conditions and this leads to the increase in thermal stress over residents living in hot and humid regions, thus resulting in the increased rate of air conditioner use and the development of a vicious circle. The properties of a 4- to 15-story building that is detached, littoral and surrounded by gardens and trees along the streets can be defined for Kadıköy district, whose neighborhood gross density value is 400 persons/hectare.

The urban profile with variable heights, i.e. detached buildings of several heights, is theoretically reported to decrease the temperature of zones by providing wind motions in hot and humid climates.

Additionally, it is mentioned that a portion of high wind momentum is transferred to low air flow as a result of the placement of narrow tower-type buildings spaced from each other, increasing the wind speed at ground level and thus enhancing outdoor air comfort between buildings. In addition to these factors, one can explain why the aforementioned equivalence values of Kadıköy region are low considering the effect of vegetation that reduces temperature. Based on the results of tree diagram models included in a study conducted by Yıldız Technical University, the temperature of vegetation density in Istanbul was observed to fall down to 4.5˚C[12].

The urban density is not desirable particularly in sultry climates, because it diminishes air flow on the streets and thus potential of natural ventilation along buildings. However, the criticality of the role of urban design is highlighted at this point[13].

The adverse impacts of anthropogenic factors, such as the level of housing, traffic, energy consumption etc., increasing as an inevitable outcome of urbanization and associated rising population do not only induce global climate change at a macro scale, but also result in urban warming issues with consequences putting human health at risk at a micro scale. In particular, tropical and middle-latitude zones bring climatic comfort conditions of cities above the critical threshold[14].

Included among the most crowded cities of the world, Istanbul has natural ventilation corridors as an advantage offered by its physical structure. The Bosporus, the Golden Horn and valleys are the channels that connect air flow from sea to settlements, playing a critical role in cooling the city and cleaning its air. This is an important advantage in climatic aspects. Nonetheless, any types of housing resulting in the continued loss of dense soil reduce the positive effects of natural facilities day by day. In particular, tall multi-story buildings constructed in zones proximate to sea shores block sea breezes that could scatter pollutants. In consequence, the valleys having cold air channels turn into closed ponds and become hot zones being effective in the counter direction.

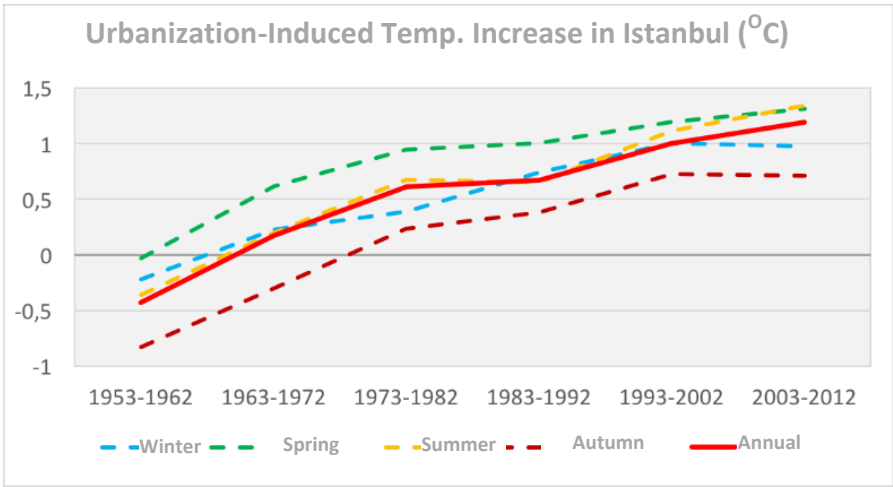


Figure 3-7: Time-dependent change in annual minimum temperature differences per decade for Göztepe and Kumköy

Source: Study on Climate Scenarios by Istanbul Metropolitan Municipality

[12] Same thesis

[13] Yıldız Technical University, Institute of Science. Anthropogenic Effects on Urban Climate in Istanbul: Investigation of Urban Heat Islands. Çağdaş Kuşçu, Department of Urban and Regional Planning, Urban Planning Program

[14] Dominance or Integration in Human-Nature Relationship? A Paradox of Urban Development and Green Areas in Istanbul, Çağdaş Kuşçu Şimşek, pg.173

Given that the building stock of Kadıköy is considered to change greatly in the next 25 years and urban density will rise due to urban transformation, the district's vulnerability to the impact of urban heat island is considered to be adversely affected in the long term.

The table below shows the expected changes in several indicators that could be correlated to Urban Heat Island. The table in question will be used as a part of the potential exposure analysis for Kadıköy district.

Table 3-5: Adaptation Indicators for Impacts of Urban Heat Island

Potential Exposure Indicators	Unit	Expected Change*	Time Schedule**
Number of extreme cold or extreme hot days/nights (by comparison of weather temperatures during the day/at night in a reference year or season)	number/year	Increase	Short term
Number of days/nights with heavy precipitation (by comparison of precipitations during the day/at night in a reference year or season)	number/year	Increase	Now
Number of consecutive dry days/nights	number/year	Increase	Now
Average monthly / annual temperature changes	% / year	Increase	Now
Current energy consumptions per capita and projections for 2020/2030/2050	MWh	Increase	Now
Frequency of hot/cold waves	average month/year	Increase	Now
Monthly / annual temperature changes	%	Increase	Now
Average monthly / annual precipitation changes	%	Decrease	Medium term
Number of successive (perpetual) dry days	number of days	Increase	Now
Number or percentage of public/residential/service buildings affected by extreme weather conditions/events	%	Increase	Now
Percentage of grey/blue/green spaces affected by extreme weather conditions/events (heat island impact, flood, landslide/landslip, forest/land fire)	%	Increase	Now
Number or percentage of Transportation/Energy/Water/Waste/Informatics infrastructures affected by extreme weather conditions/events	%	Increase	Now
Percentage changes in shading effect and in heat island impact experienced across the district in connection with this state of shading	%	Increase	Medium term
Residential/commercial/agricultural/industrial/touristic areas under the risk of floods, drought, hot wave, forest/land fires	%	Increase	Now
Public, residential and service building renewed/restored for adaptation purposes	%	Increase	Medium term
Transportation/Energy/Water/Waste/Informatics infrastructures renewed/restored for adaptation purposes	%	Increase	Medium term

*Increase, decrease, no change, not available

**Now, short, medium and long term, not available

For Kadıköy, the expected changes were assessed on an exclusive basis to those indicators given in the table above as discussed in the previous chapters. The expectation for Kadıköy is the estimated increase in the number of extremely hot days rather than in extremely cold days. Although average precipitations are expected to decline in the medium and long terms, the frequency of heavy precipitation is already on the rise as observed in recent years. As witnessed in cities unprepared for this condition, a range of inconveniences are experienced in relation to transportation, energy, water, waste and informatics infrastructures and these inconveniences are expected to rise. Having undertaken a number of initiatives as a local government having a high level of awareness of this subject, Kadıköy Municipality will mobilize the competent concerned functions, either at infrastructure facilities or buildings, regarding adaptation to climate change through awareness raising campaigns to be carried out across the district. While the impacts of climate change already seemed to manifest themselves, the performance of necessary actions will only be possible in the medium and long terms.

3.5 PRECIPITATION AND WATER MANAGEMENT

Precipitation and water management are the most critical issues that should be discussed for fight against climate change. Because Kadıköy Municipality is a district municipality, it is ineligible to respond to the subject matter well enough as the primary executive and supervisory mechanism regarding water operations. However, the Municipality may engage in green infrastructure operations that will enhance social welfare with the grey infrastructure of water lines, sewers and roads. *Green infrastructure*: is a network of areas that is a multi-purpose resource offering ecological, environmental, social and economic services with natural vegetation for which public planning or private agricultural planning or environmental planning is carried out. These services are improved further when making the green infrastructure connection. Ecological connectivity allows for the improvement of natural environment and lets organisms move and spread. Additionally, it refers to partially transformed zones that maintain ecological processes, and flows (water, materials, genes, etc.) characterizing such processes[15]. In this context, the green infrastructure practices appear as a concept which should be taken into account together with water management.

On the other hand, the region and the basin in which water areas are located are critical when dealing with urban areas for the management of water areas. Located in Marmara River Basin, Because Kadıköy is a district municipality. This indicates that the urban area should be considered in line with micro-river basin criteria.

Kadıköy district has an active coastal line that includes the coves of Haydarpaşa and Kalamış and the headland of Fenerbahçe. The shoreline stretching from Fenerbahçe Headland to Bostancı has a very straight line without many coves and headlands. However, the shoreline drastically lost its naturalness with actual land fills.

The major streams of Kadıköy are Kuşdili Creek (Kurbağalıdere), Çamaşırcı Creek (Bostancı Creek), Turşucu Creek and Seyit Ahmet Creek.

Kurbağalıdere runs through Ümraniye, Üsküdar and Kadıköy districts and discharges into the sea, flowing along the Fenerbahçe Stadium in the north-south direction. The area where the creek discharges into the Bosporus is very large for its bed. It has a highly level topographic structure on

[15] Tabanoğlu, O. Recommendation on Adaptation Strategies to Climate Change for Antalya, 2018. Istanbul.

both shores, having no formation of valley. Kurbağalıdere has a total length of approximately 50 km together with its tributaries of Ünalan, Karga, Esatpaşa, Ayvacık, Kavaklı, Küçükbakkalköy, Şerifali, Taşlıdere, Uzunçayır and Kasriali. The uncovered creek running through the built-up area is partially covered; contracted as its bed moves away from the sea; in built condition; and shaped by bridges. The depth of some parts of the creek close to the Bosporus reached 7 to 8 m after cleaning up the bed.

Kadıköy River Basin containing Tugay, Kör, Esenyurt, Kurbağalıdere, Küçükyalı, İdealtepe, Çamaşırcı, Turşucu and Seyit Ahmet Creeks of Istanbul having 68 creeks started to slowly lose its beauty in the course of time due to neglected investments and unplanned housing for many years. Creeks were cleaned up after 2005 within the scope of "Kadıköy Environmental Protection Project" put into practice.

In the late 1970's, Kadıköy River Basin creeks exposed to wastewater inflow started to cause unpleasant smell and view, carrying wastewater to coasts. The shores of Kadıköy known for their elegance throughout history started to succumb to pollution. In the mid-2000's, ISKI (Istanbul Water and Sewerage Administration) put Kadıköy Environmental Protection Project into life with the intent to save Kadıköy River Basin from wastewater and restore its beauty. Kadıköy Environmental Protection Project was intended to collect and remove wastewaters flowing into creeks after making them unharmful to environment at a treatment plant. The creek reclamation activities planned under Kadıköy Environmental Protection Project are:

Table 3-6: Creek Reclamation Activities under Kadıköy Environmental Protection Project

Creek Name	Intended Length for Reclamation
Kör Creek	2,800 m
Esenyurt Creek	2,800 m
Küçükyalı Creek	5,500 m
İdealtepe Creek	17,700 m
Çamaşırcı Creek	14,400 m
Turşucu Creek	4,200 m
Kurbağalıdere	30,000 m
Seyit Ahmet Creek	5,00>

The streams of Kadıköy River Basin that earlier flowed into Marmara Sea and regional rivers directly are collected and transferred to Kadıköy Wastewater Treatment and Marine Outfall Facility with the help of investments fulfilled under Kadıköy Environmental Protection Project[16].

Although there is no Kadıköy-specific study conducted on the impact of climate change on water resources, "Climate Change Scenarios for Istanbul" provides an insight into this subject. Based on this study, the projections for Istanbul Province are as given below.

[16] Examination of Rivers' Recreational Potential as an Urban Coastal Space: Case Study, Eskişehir Porsuk Creek and Istanbul Kurbağalıdere, Istanbul Technical University - Institute of Science, Master's Thesis, Melike Önen, Landscape Architect, 2007

- Changes in stream flowrate and underground water detention durations resulting from the changed precipitation pattern
- Impact of the change in aquatic organisms on water quality as result of rising water temperatures
- Frequency of floods and increase in the amount of floods

95% of water demand is met by surface resources since underground water reservoirs (aquifer zones) of Istanbul are very limited in number. The water level of the known aquifers of Istanbul declined drastically as a result of recent excessive industrial water extraction operations, resulting in partial salinization[17].

In line with the data from ISKI Annual Reports, it is seen below that the consumption per capita follows a horizontal path while it rises by 2% in particular years.

Table 3-7: Amount of Water Supplied from Treatment Plants of Istanbul to the City, and consumption per capita

m^3/year	2013	2014	2015	2016	2017
Amount of Water Supplied to the City	909,454,169	924,448,577	965,155,404	998,622,627	1,020,641,179
Population	14,160,467	14,377,018	14,657,434	14,804,116	15,029,231
m^3/year/person	64.22	64.30	65.85	67.46	67.91

Table 3-8: Projection of Population and Water Demand for Istanbul Province

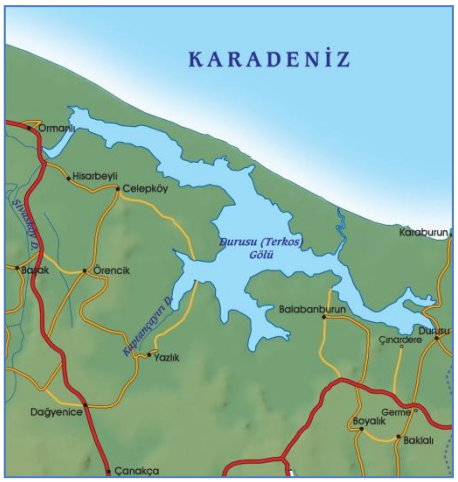
Years	Population (million)	Annual Water Demand (million m^2/year)	Daily Water Demand (million m^2/year)
1990	6.6	426	1.2
1995	8.4	525	1.4
2000	10.3	615	1.7
2007	12.6	714	1.9
2010	13.3	753	2.1
2015	14.7	965	2.7
2020	17.7	1163	3.2
2030	20.9	1449	4.0
2040	23.6	1723	4.7

Any countries having over 10,000 m^3 available water per capita per year is recognized as water rich countries, while those having less than 1,000 m^3 are recognized as water poor countries. The quantity of available water per capita in our country is approximately 1,500 m^3, where our country ranks among the nations limited by water. Based on the data from the Turkish Statistical Institute (TUIK), our population is projected to reach 100 million in 2030. In this case, the quantity of available water per capita in Turkey will be approximately 1,120 m^3[18].

[17] Vulnerability Analysis Report for Istanbul, 2017, pg.140
[18] Istanbul TMMOB Provincial Environmental Status Report, 2016 page 22

- Specific measures should be taken to avoid the pollution of urban potable water resources, and the existing treatment facilities should be improved by advance treatment techniques.
- The industry accompanied by uncontrolled overurbanization are increasingly more effective over water pollution. Consequently, habitable urban and regional plans should be prepared and any type of human- and industry-induced waste should be controlled.
- The Northern Forests damaged by mega projects feeds all wetlands of Istanbul. If these projects are not halted, there will be irreversible consequences for water basins[19].

The vulnerability analysis on water resources of Istanbul concluded that the water resources sector could be under the risk of average temperature increase, summer temperature increase, heat wave, precipitation change, flood and storm water, water availability, storm, fire (forest fire), urban heat island and drought. The factors, such as growth period, heavy precipitation, change in sea level, coastal erosion and air quality, were not projected to have an considerable impact on water resources sector, and these factors were predicted to pose a minor risk against the water resources sector[20].





Durusu (Terkos) Lake Ömerli Dam

The table below shows the expected changes in several variables that could be correlated to Kadıköy Water Management. The table in question will be used as a part of the potential exposure analysis for Kadıköy district.

Table 3-9: Adaptation Indicators for Water Management

Potential Exposure Indicators	Unit	Expected Change*	Time Schedule**
Coastal line/rivers affected by extreme weather events	%	Increase	Medium term
Zones at high elevation	%	Decrease	Long term
Current water consumption per capita and projections for 2020/2030/2050	m^3	Increase	Now
Change in the amount of water extracted from wells or other resources	%	N/A	
Change in water loss (e.g. leakage from water distribution systems)	%	Increase	Medium term
Change in rainwater accumulated for re-use	%	Increase	Short term
Overflow of rainwater depending on infiltration into soil	%	Increase	Short term

[19] Istanbul TMMOB Provincial Environmental Status Report, 2016 page 22
[20] Istanbul "Climate Change Risks, Opportunities and Vulnerabilities Analysis", 2017

Change in solid waste collected/recycled/stored/incinerated	%	Increase	Short term

*Increase, decrease, no change, not available

**Now, short, medium and long term, not available

Based on the projection that extreme weather events will become more severe, the number of coastal lines and rivers that are likely to be affected is also expected to increase. The expected increase in sea level in the long term will cause decrease in elevation. The adverse impacts of extreme weather events on infrastructure will adversely affect water loss. Thanks to the actions initiated under the leadership of Kadıköy Municipality, the use of rainwater is expected to rise. The actual studies on recycled wastes result in an continual increase in the use of such wastes.

3.6 PUBLIC HEALTH

As is known to all for ages that the quality of air we inhale has a direct impact on our health. Air pollution, population increase, urban growth and industrial advancement increasingly have continued impacts of variable content. Energy consumption, fossil fuel combustion and increased number of motor vehicles in city centers result in the deterioration of air quality. Regional migrations, acid deposition, increasing amount of greenhouse gases and tropospheric ozone production reveal the effects of today's air pollution reaching a global extent. The pollutants caused by traffic, transportation, industry and heating are the major elements of (anthropogenic) air pollution[21].

The impacts of air pollutants on environment and human health are known to be dependent on time, space, impact duration, concentration and other characteristics. Air pollution increases both the rate of mortality associated with cardiovascular and pulmonary diseases and the number of patients seeking medical assistance in connection with such diseases. Apart from this, air pollution has a specific adverse impact on lung development in children, and enhances the prevalence of chronic airway diseases such as asthma and chronic obstructive pulmonary disease (COPD) in regions heavily polluted.

Air pollution mainly affects respiratory and circulatory systems of human. A study conducted in Russia has demonstrated that any pollutants settling in soil penetrate into the digestive system by food.

Pollutants have adverse impacts on health in proportion to their length and solubility in water. While large particulates cannot pass through nasopharynx, the agents below PM 2.5 can permeate into lung tissue. If an individual suffers a respiratory system disorder, the factors can be limit value and thus lower or in other words, the individual suffers health problems at an earlier age than a healthy person.

The major impacts on health are asthma, allergy, chronic obstructive pulmonary disease (COPD) and cancer. The group most affected by air pollution is children aged under 5, patients with chronic diseases and elderly people. The adverse impacts on health become more severe, when these circumstances are backed by some factors such as low social status (such as being homeless), inability to have access to healthcare institutions (e.g. disaster conditions), smoking/drinking habits and nutrition disorders.

[21]http://cevresagligi.thsk.saglik.gov.tr/bilgi-dokumanlar/halk-sagligina-yonelik/992-hava-kirlili%C4%9Fi-ve-sa%C4%9Fl%C4%B1k-etkileri.html

A research carried out by WHO in May 2018 estimates that 9 of every 10 people inhale polluted air in the world and an average of 7 million people lose their lives due to health problems caused by particulates every year[22].

The table below shows the expected changes in several variables that could be correlated to public health. The table in question will be used as a part of the potential exposure analysis for Kadıköy district.

Table 3-10: Adaptation Indicators for Public Health

Potential Exposure Indicators	Unit	Expected Change*	Time Schedule**
Number of people injured/evacuated/relocated as a result of extreme weather conditions/events (cold/heat waves)	Number/year	Increase	Short term
Number of mortalities resulting from extreme weather conditions/events (cold/heat waves)	Number/year	Increase	Medium term
Number of risky/problematic events in terms of water quality	Number/year	Increase	Short term
Number of risky/problematic events in terms of air quality	Number/year	Increase	Now
Change in the lost agricultural land due to extreme weather conditions/events (drought/water shortage, erosion)	%	N/A	N/A
Native animals and plants affected by diseases from extreme weather conditions/events	%	N/A	N/A
Annual harvest percentage and change in pastures	%	N/A	N/A
Percentage change in harvest amount based on adaptation	%	N/A	N/A
Change in water consumption for agricultural purposes	%	N/A	N/A

The Covenant of Mayors includes many indicators of food security since it considers this subject of security an important topic of public health. Although extreme weather events and agricultural production loss are projected to affect Kadıköy district, no comment has been provided regarding these indicators since no production takes place within the district boundaries. However, the rising prices will have an adverse impact on the residents of Kadıköy. The extreme heat waves likely to occur in Kadıköy, about 20% of the population of which consists of people aged over 65, are projected to have substantial impacts on public health. Mortalities are expected to be seen more frequently in the medium term when temperatures will be increased further, although not in the short term.

3.7 ADMINISTRATIVE ORGANIZATION

The role of activities undertaken by local governments and local initiatives is crucial in developing strategies for the mitigation of climate change impacts and the adaptation to climate change. Because it is impossible to address the fight against climate change from a single perspective, local governments are required to enhance its services offered to urban residents with the help of subject-matter activities and stimulate them towards options with less carbon emission in areas - such as heating, residential building preference and transportation preference - by increasing the number of

[22] http://www.who.int/airpollution/en/

awareness raising activities. Moreover, they should make sure that local service operations are enhanced, establishing communication with superior managements.

While cities give rise to climate change, they should be considered dynamic structures that will play an effective role in fight against climate change. Therefore, administrative organizations of cities should be deemed responsible for urban management and future plans. Developing strategies by a participatory approach model and cooperation between administrative organizations adopted either for decisions on land use or during the process of combatting climate change is a must for a climate-resistant urban model.

The table below shows the expected changes in several variables that could be correlated to administrative organization. The table in question will be used as a part of the potential exposure analysis for Kadıköy district.

Table 3-11: Adaptation Indicators for Administrative Organization

Potential Exposure Indicators	Unit	Expected Change*	Time Schedule**
Current population and projections for 2020/2030/2050	Number of people	Increase	Short term
Population density (by comparison of national/regional mean values to the previous year)	number of people per km^2	Increase	Short term
Shares of vulnerable population in % (aged over 65 and under 25, people living alone, people with low income or unemployed people)	%	N/A	N/A
Percentage of the population living in regions under the risk of floods, drought, hot wave, forest/land fires	%	Increase	Now
Percentage of regions having no access to ambulance/firefighting services in case of an emergency	%	Increase	Medium term
Native animals and plants affected by diseases from extreme weather conditions/events	%	N/A	N/A
Number of days with service interrupted (energy, water supply, healthcare, civil defense, emergency, waste)	Number	Increase	Medium term
Number of hours with service interrupted (energy, water supply, healthcare, civil defense, mass transportation, emergency, waste)	Hour	Increase	Medium term
Time of response by police/ambulance/firefighting departments in any incidents resulting from extreme weather conditions/events	Minute	Decrease	Medium term
Percentage change in tourist inflow	%	Decrease	Long term
Percentage change in tourism activities	%	Decrease	Long term
Budget allocated to adaptation activities / researches carried out by urban and other stakeholders	€	Increase	Short term
Value of investment in educational, healthcare and emergency systems	€	Increase	Medium term
Length of roads/railways in regions under the risk of floods, drought, hot wave, forest/land fires (based on planning/map)	Km	Increase	Short term
Direct economic losses (in €) incurred as a result of extreme weather conditions/events (commercial/agricultural/industrial and tourism sectors)	€	Increase	Short term
Amount (in €) covered per year (insurance etc.)	€	Increase	Short term
Number of awareness raising activities/studies centered on public members and local stakeholders	Number	Increase	Short term
Number of training programs intended for the team	Number	Increase	Short term
Number of direct beneficiaries involved in the decision making process for adaptation procedures	Number	Increase	Short term

While, in the general sense, the resistance of any settlement to adverse impacts of climate change depends on the historical development of that settlement and the level of competence of its existing physical and social organization, the immediate enhancement of preparedness level now entails the incorporation of an approach similar to disaster plans into the planning of climate adaptation and urban resistance. The risks faced by a densely housed seaside settlement at the heart of transportation infrastructure, joining the city with the rapid destruction of green spaces, like Kadıköy, are summarized above by several areas. The approach to be adopted in this subject should be coordinated on a ground that regards international best practices considering modern urban practices and planning principles as much as possible, and built in maximum consideration of the knowledge and sensitivity of Kadıköy residents on this matter.

4 KADIKÖY DISTRICT ADAPTATION PLAN

The Climate Adaptation Action Plan prepared for Kadıköy under the commitments in CoM will set out; the potential risks faced by and the likelihood of exposure of the district against climate change scenarios; a self-assessment that evaluates the state of preparedness for climate change impacts; and the adaptation strategy and action plan on climate change. This strategy and action plan considers 5 key elements with the participation of experts:

- Impacts of urban heat island,
- Green spaces, green corridors and biodiversity,
- Urban waters and rivers, and precipitation and water management,
- Public health against the adverse impacts of climate change, and
- Administrative organization and planning to mitigate the adverse impacts of climate change.

The resulting Climate Adaptation Action Plan includes the future projections of a resistant and habitable Kadıköy to be developed by urban stakeholders in tandem with subject-matter experts.

4.1 SELF-ASSESSMENT

During the 1st part of Kadıköy Climate Adaptation Workshop held on May 9, 2018 with the participation of local stakeholders, Kadıköy Municipality and urban stakeholders were asked to assess the district's level of preparedness for adaptation to climate change within the scope of the topics given. The capacity of adaptation to the adverse impacts of climate change is one of the most critical characteristics of "resistant" cities as is known. For local governments, the capacity of adaptation to climate change is undoubtedly very closely related to the preparedness of very diverse local and national organizations and bodies and their medium-/long-term strategies. Consequently, it should be pointed out that the outlook of urban stakeholders on the district is an wholistic assessment of this complexed subject involving many actors and is not limited to the local government. Self-assessment was incorporated into a radar chart as an average of replies to a series of questions prepared for each theme. The questions allowed the experts to grade the district's current condition for climate adaptation at a scale ranging from "less prepared" to "highly prepared". The lowest score for positions named as Initial Stage, Development Stage and Advanced Stage is 1, while the highest one is 9. The chart given below reflects the general assessment of every topic. The questions that help the development of the radar chart are included in the appendix (Appendix 1) to the report as listed by themes.

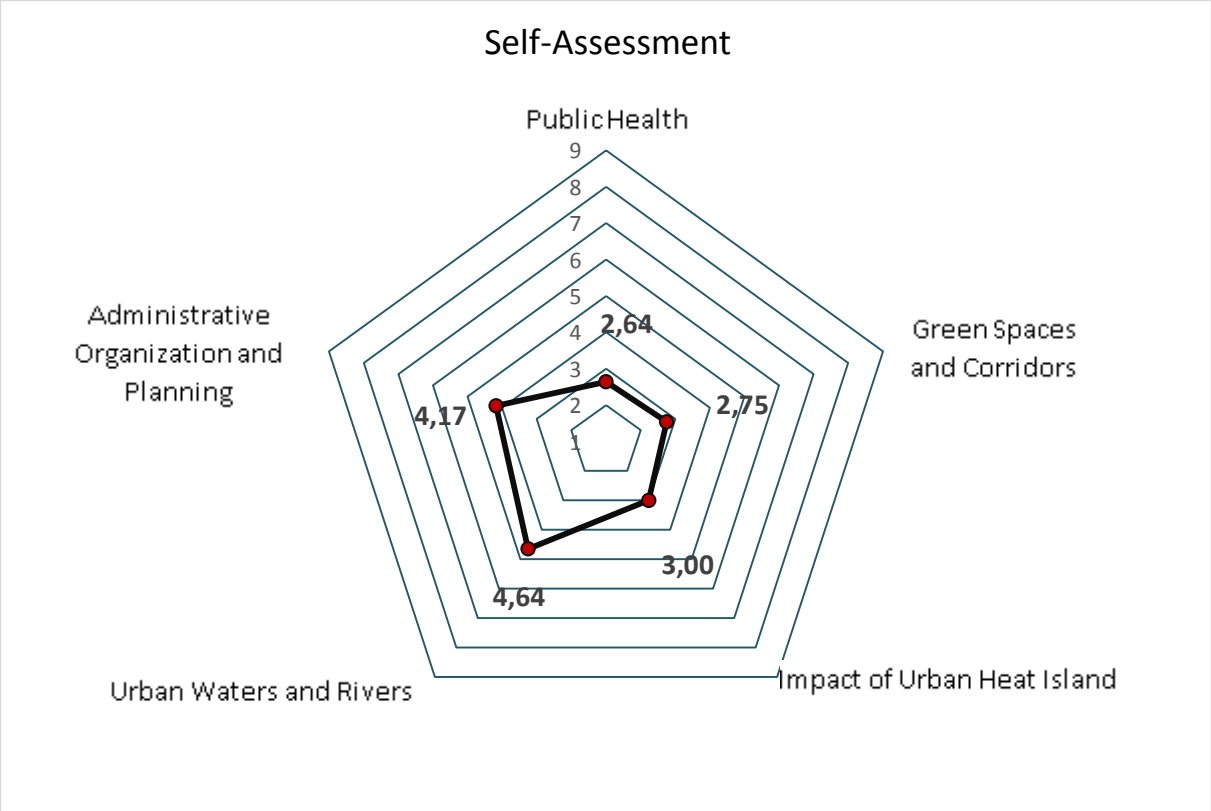


Figure 4-1: Results of self-assessment questionnaire for Workshop with Experts

As seen in the radar chart, the conclusion is that the district is at the late "Initial Stage" in the thematic areas of "Public Health", "Green Spaces and Corridors" and "Urban Heat Island Impact" and at the early "Development Stage" under the topics of "Administrative Organization and Planning" and "Urban Waters and Rivers". Consequently, it can be inferred that Kadıköy underwent the first stages of being a "resistant" town and now is ready for getting to the stage of activity planning and implementation. The recommendations for long-term strategies relating to the adaptation to urban climate change impacts are sought through the answers to experts' questions in the 2nd part of the workshop, starting with the omissions in health and living comfort that have a direct impact on town dwellers.

For the self-assessment stage, the assessments on each thematic area and the diagrams summarizing assessments are given in the same appendix to the report as listed by actions.

4.2 KADIKÖY CLIMATE ADAPTATION PLAN, STAKEHOLDER OPINIONS AND RECOMMENDATIONS

4.2.1 GREEN SPACES and CORRIDORS

Green spaces are not only zones that allow the urban metabolism to breathe, remove pollution and decrease average surface temperatures, but also are a public service that is based on the principle of equality for making use of spare times. It is important to get the habit of using green spaces by benefiting from this service and incorporate this habit into daily life for developing a healthy society and enhancing the quality of life in towns. The green spaces and corridors available in Kadıköy were assessed in line with their properties in this aspect.

The town of Kadıköy is an old settlement which ranks among the top districts of Istanbul for population density. For its geographical structure, the town having a rising topography in the north east direction features two main river beds within urban boundaries.

For dense housing in Kadıköy district, it is seen that the amount of green spaces used actively is very less. For urban boundaries, it is noticeable that there is no qualified large green space which can be used actively as a sink zone, except urban parks and green spaces along the coastal line. Hence, vacant spaces owned by the administrative bodies of the district should be designed as qualified green spaces under any circumstances.



Figure 4-2: Green Spaces and Dense Housing
(Generated under the research in line with the data and maps obtained from the Municipality)

The existence of green spaces and of green corridors crossing along/surrounding a town is one of the most important factors in fight against climate change. Green spaces and urban green corridors, which are of great importance for mitigating the impact of urban heat island, developing carbon sink zones, absorbing excess water through permeable surfaces in case of heavy precipitation and improving public health, are characterized as a urgent requirement for Kadıköy. Notwithstanding, it is notable that no adequate space was left around the water channels located north and east of the most critical river bed of the district and no blue-green correlation was established due to dense housing and public zoning decisions taken without any scientific data.

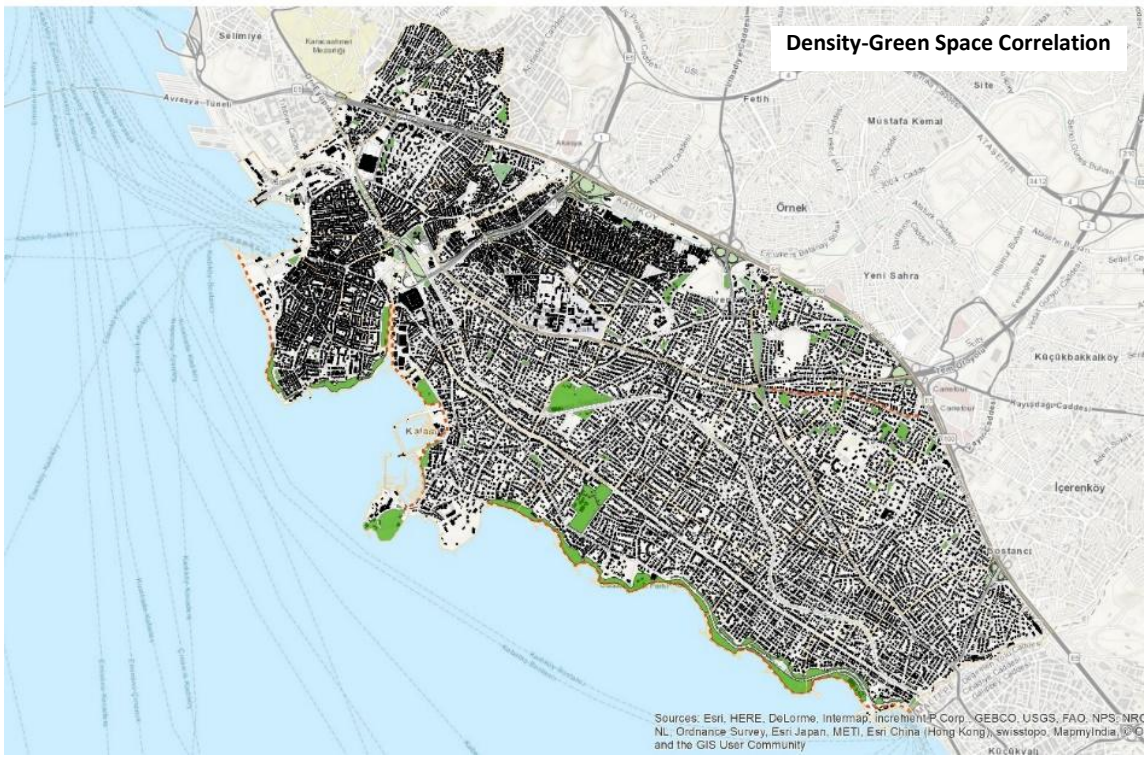


Figure 4-3: Density and green space correlation
(Generated under the research in line with the data and maps obtained from the Municipality)

The workshop has revealed that the green corridor, which should be developed using Kadıköy's geographical potential, is to be planned such that it covers a regional area as supported by upper scale plans without being limited by Kadıköy boundaries. However, local governments are reported to fail to establish concerned decision-making mechanisms at an upper scale due to the inadequacy of interorganizational cooperation. As per, however, the Municipal Law, the Law on Istanbul Metropolitan Municipality, the Public Zoning Law and applicable governing regulations in effect, Istanbul Metropolitan Municipality has administrative and civilian responsibility for many zones remaining within district boundaries, and additionally, it is highly important to establish mutual cooperation and joint effort platforms for urban planning that is resistant against the impacts of climate change since the Metropolitan Municipality is the ultimate decision maker on 1/5000- and 1/1000-scale plans prepared for Kadıköy and on those plan notes annexed to the said plans. Any local governments assuming the most critical role in fight against climate change must be in further collaboration with other public bodies, universities, non-governmental organizations and private sectors and share the related scientific climate data pertaining to towns. In this context, immediate actions should be taken to establish interorganizational cooperation and develop a network for data sharing. Additionally, it is evident that employees serving in a corporate structure should be kept informed of the related efforts and subjected to training and information activities should be carried out for the residents of Kadıköy regarding fight against climate change and use of green spaces.

Target 1: Ensure balanced and fair distribution of and increase the amount of green spaces	•Action 1.1 Identify existing green spaces •Action 1.2 Build green corridors
Target 2: Resolve infrastructure problems in green spaces	•Action 2.1 Adopt green infrastructure practices •Action 2.2 Enhance the number of green spaces by the review of plans
Target 3: Biodiversity inventory study	•Action 3.1 Identify endemic species •Action 3.2 Support green space enhancement with infrastructure activities
Target 4: Improve corridors and access zones	•Action 4.1 Determine the current state in areas such as noise and air pollution •Action 4.3 Improve transportation operations

Figure 4-4: Summary of target and action plan for green space enhancement and green corridors

Target 1: Provide accessibility for all public members by increasing the number of urban green spaces in a well-balanced and fair manner

The most critical issue for Kadıköy is how to increase the number of green spaces and how to achieve an easier accessibility to green spaces. In this respect, solution suggestions should be developed for transportation problems in Kadıköy in line with international models by the distribution of green spaces based on a fair and natural design basis. Another alternative for traffic and motor vehicle use, one of the greatest problems facing cities, could be the proposal of a mass transportation system with a high passenger capacity, which can be constructed underground in Kadıköy as distinct from Istanbul metro line.

Action 1.1: Ensure proper identification of existing green spaces, and assess needs

- Correlate existing green spaces identified by scientific studies with population (the related activities undertaken by Kadıköy Municipality are in progress), and assess new requirements by comparison to national and international standards
- Ensure a fair and natural design pattern for green spaces
- Ensure availability of new green spaces by expropriation and new mechanisms to be produced Review specific solutions such as the transfer of development right, and conduct feasibility studies
- Ensure revision of applicable regulations with the insertion of new classifications and standards for green spaces to the Building Code of Spatial Plans

Action 1.2: Develop a green corridor for fight against climate change (relates to public health)

- Make sure that the green corridor developed for adaptation to climate change covers Fikirtepe and Bostancı Valleys (air corridor)
- Plant trees between Haydarpaşa and the new pier to develop a green corridor
- Ensure the enhancement of accessibility by developing green rings in neighborhoods (amalgamation of bicycle paths and passive and active green spaces)

- Review mid-island arrangements in any feasible neighborhoods (e.g. Rasimpaşa, Caferağa, etc.), and use yards as green spaces

Target 2: Improve the current state by resolving infrastructure problems in green spaces

Given that Istanbul Metropolitan Municipality is the ultimate decision maker for the resolution of infrastructure problems in Kadıköy, the interorganizational cooperation is particularly stressed. Therefore, it is possible to assess any potential actions for Göztepe Freedom Park which is under the responsibility of Kadıköy Municipality. In addition, green infrastructure solutions should be taken into account to address infrastructure problems in green spaces of Kadıköy.

Action 2.1: Adopt green infrastructure practices (relates to water management)

- Build parklets in urban areas
- Enforce the use of materials with high level of water permeability

Action 2.2: Increase the amount of green spaces by regulations upon reviewing existing plans

- Ensure transformation of dry river beds into green corridors (relates to water management and public health)
- There are problems with the development of green spaces within building plot boundaries due to extraction distances. Survey and solution suggestions should be developed for taking an action in this respect (The solution may be basement floor space factor. The cooperation is required with the concerned Ministry and Istanbul Metropolitan Municipality).
- Reserve the entire coastal line for green spaces and include a 100-meter area from the reserved zone in this line due to the projection of sea level rising by 1 meter in the future in line with actual projections (The subject should also be assessed within the scope of Disaster Management studies.)

Target 3: Biodiversity inventory studies specific to Kadıköy, and planning of actions for biodiversity enhancement

Although there are actual biodiversity studies conducted across Istanbul, it is reported that a further inventory study should be carried out for biodiversity of Kadıköy. In addition, a number of studies should be conducted to enhance biodiversity in green spaces / corridors intended within the town.

Action 3.1: Identify endemic species

- Ensure development of biodiversity inventory
- Ensure performance of tree planting and vegetation that requires less water in green spaces as a measure against the risk of reduced precipitation expected in Istanbul
- Enhance biodiversity by building orchards
- Enhance biodiversity through water gardens (growing aquatic plants in these zones)
- Ensure preparation of a vegetation plan in case of exceptions regarding climate adaptation (e.g. which plants should be grown when the temperature increases by 2 ˚C with the impact of climate change)

Action 3.2: Support enhancing actions through green infrastructure practices by actions taken against the reduction of green spaces

- Ensure that a legislation is developed for the preservation and, if required, transfer of existing green assets (trees, etc.) in the building plot during urban transformation operations
- Ensure construction of infiltration sumps (water management)
- Ensure implementation of urban drainage solutions (water management)

Target 4: Enhance ecosystem services by improving the management of corridors and access zones

Action 4.1: Determination of current state in areas such as noise and air pollution, and corrective actions

- Ensure construction of a noise reduction curtain for the avoidance of noise pollution (can be constructed as a model for Marmaray line)
- Ensure construction of urban green structures

Action 4.2: Improve transportation operations

A considerable part of actions identified in this subject were also stressed by the participants of the workshop under the "Integrated and Participatory Climate Action for Kadıköy Municipality". Specifically, there is a huge demand for green pedestrian paths and continuous bicycle paths.

- Ensure development of urban green roads and tour rotes
- Provide primary integration of green spaces with rail systems for the achievement of accessibility to green spaces
- Increase the number of bicycle paths and stimulate the public to use bicycles (public health)
- Provide connected access roads between districts to ensure the continuation of existing bicycle path along the coast (public health)
- Put the light rail mass transit system into service, and ensure the installation of this rail system over the natural green system (green intersection)
- Plant horizontal and vertical transportation axes
- Narrow the motorways in zones available for encouragement of walk and mass transportation and plant other remaining zones

It is highlighted that the amount of green spaces in Kadıköy district should be increased urgently. The performance of reclamation works on existing water channels in accordance with scientific standards in correlation with green spaces is another important issue that lies ahead of us. The correlation between green corridors and water necessary for eliminating the impact of carbon emissions from dense housing becomes an issue that should be addressed at Istanbul scale. The interorganizational cooperation is required for avoiding transportation and infrastructure problems. In addition, it is highly important that awareness is raised among corporate employees and public members and "active and informed citizen" actions are taken for the sustainable transformation of green spaces.

Costs: Current prices were used to make an estimation of the actions intended to be taken by 2030.

Bicycle Path: The projection is that a 20-km long bicycle path will be constructed in Kadıköy district by 2030. The estimated average cost is TRY 1,046,000 (TRY 52,300 x 20 km) based on current prices. The cost may vary depending on the route to be determined and the mode of implementation.

Green Space Development: Based on the approximate implementation costs announced by the Chamber of Landscape Architects of the Union of Chambers of Turkish Engineers and Architects, the cost per m^2 of a park built by the Municipality together with landscaping using lawns and seasonal and perennial flowers, and vegetation achieved by tree and shrub planting, and environmental equipment is about TRY 450. No detailed study was conducted regarding the new parks intended to be developed. The average size of parks in Kadıköy district is over 5 thousand m^2. Given this amount, the cost of 20 new parks to be developed by 2030 is TRY 45,000,000.

Parklet building: The cost of parklets featuring wooden furniture capable of accommodating 4 to 5 persons, which include shrubs on its edges, is approximately TRY 30,000. The cost of 10 parklets to be built in locations heavily affected by heat island is TRY 300,000. (Source: Designs under UrbanGreenUP coordinated by Izmir Metropolitan Municipality)

Green corridor: The green corridor encircling Kadıköy district should be planned as connected to the interior parts of the district. More detailed calculations can be made upon setting the related route. If tree planting is intended at every 5 meters (1 tree approximately costs TRY 300) and the total length is roughly estimated to be 30 km, the Green Corridor will cost TRY 1,800,000. Any potential additional costs (e.g. expropriation, asphalt paving, etc.) associated with the green corridor crossing route were not taken into account.

4.2.2 IMPACT OF URBAN HEAT ISLAND

Analyzing the heat island map of Istanbul, it was observed heat islands were clustered in densely housed regions of some districts, such as Esenler, Bağcılar, Küçükçekmece, Güngören and Zeytinburnu, around Barbaros Boulevard and the continuing Büyükdere Avenue, in the parts of Maltepe and Kartal above highway E5 and partially in Üsküdar district. While Kadıköy is luckier than many others for being a coastal district, it is included among our districts where the heat island impact is felt intensely in its hinterland. Considering, in particular, the housing density growing with urban transformation, one can readily indicate that this will become far more intense.

Urban policies and land use decisions and actions are areas of response that are influential on shaping the urban climate. The Heat Island Impact with variable effect depending on urbanization is one of the issues discussed during the Workshop with Experts held under Kadıköy Climate Change Adaptation Plan. For the purposes of the workshop, the working group on heat island assessed the urban heat island impact on Kadıköy primarily in line with (1) integration with research and climate change strategies, (2) actions taken against adverse consequences, and (3) actions taken for incorporation into planning activities. As a result of the study conducted in line with experts' opinions, the district's preparedness for climate change in the related areas of action was assessed in the context of heat island impact. Based on the result of self-assessment, Kadıköy appears to be "hardly prepared" for the impact of urban heat island for adaptation to climate change.

The next phase discussed the factors determining the occurrence of urban heat island impact where an assessment was made based on those areas most affected by heat island on an exclusive basis to Kadıköy. Analyzing the data on temperature change between 2006 - 2017 obtained from the satellite

Landstat, the finding is that the regions of Kadıköy most affected by heat island are Medeniyet University located on the northern district boundary and its close proximity, and the immediate surroundings of Kadıköy Ferry Terminal situated in the west and Kuşdili Parking Lot Zone, and the immediate surroundings of Marmara and Medeniyet Universities' campuses in the hinterland. Wind speed is another variable influential on the formation of heat island. For the activity of Marmara Sea located in the southern district boundary, the southern coasts are zones least affected by heat island impact in the district. The district's being located by the sea allows cool airstreams to penetrate into inner parts and have a positive impact on climate comfort. In addition, the zone covering Göztepe Freedom Park and its close proximity appear to result in cooling effect due to the vegetation available in these locations[23](Figure 4-5).

The impact of urban heat island is reviewed at two diverse scales. The first one is Urban Canopy Layer which extends from the ground level to the roof level, while the second one is Urban Boundary Layer that refers to the atmospheric part of the planet above the roof level. For the first layer, the formation of heat island is influence by thermal properties of urban surfaces and radiations (Albedo Effect), urban macroform, and urban texture and structure compositions effective in sky clarity factor, and the existence of green spaces and plants. These factors should be considered for zoning plan decisions and urban transformation practices.

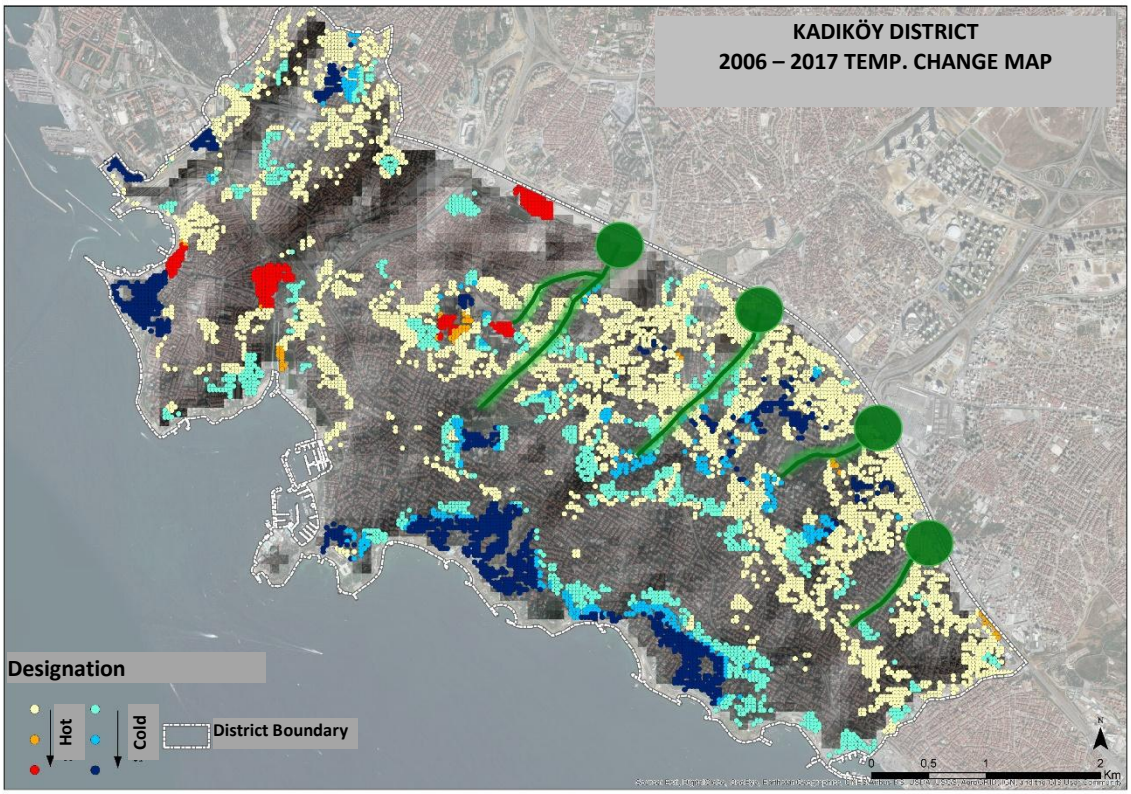


Figure 4-5: Temperature change map for Kadıköy district 2006-2017 (developed using the study by Kuşçu)

Green spaces have a critical position in the strategies designed to mitigate and avoid heat island impact, because they provide natural cooling through evapotranspiration. For the purposes of adaptation strategies, the planning of green systems and urban waters should consequently include

[23] Assoc. Prof. Çağdaş KUŞÇU, Investigation of Urban Heat Islands

an approach that encompasses the objectives of mitigating heat island impact. The development of decision-making and control mechanisms designed to provide the continuation of any soft grounds, which are left on surface in the said building plots featuring the underground parking lot solution, on the vertical plane is required for maintaining the existence of trees that produces a cooling effect in the said zone and mitigating the impact of heat islands. The contribution of green roof applications to the mitigation of heat island impacts is possible through implementation in buildings that are not very high structurally. The atmospheric air pollution, becoming more intense depending on urban activities, lifestyles and consumption habits, is the factor leading to the formation of heat islands in the second layer as well as cloud mass and its type, and wind speed.

The urban climate has a direct impact on the quality of life. One of the adverse consequences of the impact of climate change on temperature increases is the intensification of urban heat island impacts. The next phase of the workshop with the sub-working group discussed three different subjects to have the ability to designate the areas of action of top priority for climate change adaptation strategies: adverse impacts of urban heat island on urban climate; health problems and mortalities connected with the intensification of heat wave effects felt in the summer months; and increasing air pollution and energy cost depending on the rising energy demand and energy consumption for cooling requirements. The existing potentials of and risks against Kadıköy were assessed for producing adaptation strategies in each subject.

Following the death of about 70,000 Europeans in 2003 as a result of heat waves leading to rapid increase in temperatures, a catalog of "Urban Heat Island Mitigation Strategies" for many towns in Europe and American continents with the intent to make towns and local governments resistant against the impact of urban heat islands and heat waves and to mitigate such impacts. To that end, the "Targets and Actions on Urban Heat Island Mitigation in Kadıköy" are given below (Figuure 4-6).

Target 1: Enhance the number of green spaces and wetlands to mitigate the impact of heat island	•Action 1.1 Increase the number of green spaces in connection with green corridors and spaces •Action 1.2 Increase the number of wetlands
Target 2: Combat health problems caused by the impact of heat island	•Action 2.1 Reduce health concerns and avoid mortalities •Action 2.2 Increase the capacity for adaptation to heat island

Figure 4-6: Summary of target and action plan for urban heat island

Objective 1: Increase the number of green spaces to mitigate the impact of heat island

Another aspect focused for the production of climate change adaptation strategies to mitigate and avoid urban heat island impact is green systems along with vegetation activities. The most important means developed to mitigate the impact of urban heat island, which is used commonly, is vegetation and green systems. Therefore, when planning a macro-scale green system, the consideration should be on the areas feeling the intense impact of urban heat island with the awareness that green spaces

are natural coolants. An attempt should be used to achieve the mitigation of heat island impact, implementing micro-scale zoning plan decisions, urban transformation and green roof applications.

Action 1.1: Increase the amount of green spaces (relates to green spaces and corridors)

- Perform green roof applications in Rasimpaşa and Yeldeğirmeni (this is feasible, because there are not many tall buildings)
- Attach importance to the preservation of existing old large trees during forestation carried out across the district (these trees let the ground remain cool since they are broad-leaved and have a large shading area)
- Enhance the impact of cool air corridor, planting trees around river beds
- Build green walking corridors from that stretch from metro stations on the highway E-5 to district centers Enhance the effect of these corridors, covering them with vegetation
- Achieve reduction in solar power absorption rate and in ground temperature, using light-colored building materials for floor covering

Action 1.2: Increase the number of wetlands

- Prefer highly impermeable building materials, such as cobblestone, to ensure that rainwater is absorbed by soil on the streets
- Develop artificial wetlands

Target 2: Combat health problems associated with the intensification of heat waves in consequence of the impact of urban heat island

Action 1.1: Mitigate health concerns caused by the impact of urban heat island

- The actions for this adaptation will apparently encompass public health since the most concrete impact of heat island is seen on human health. The first action to take in this respect is developing "Action Plans".

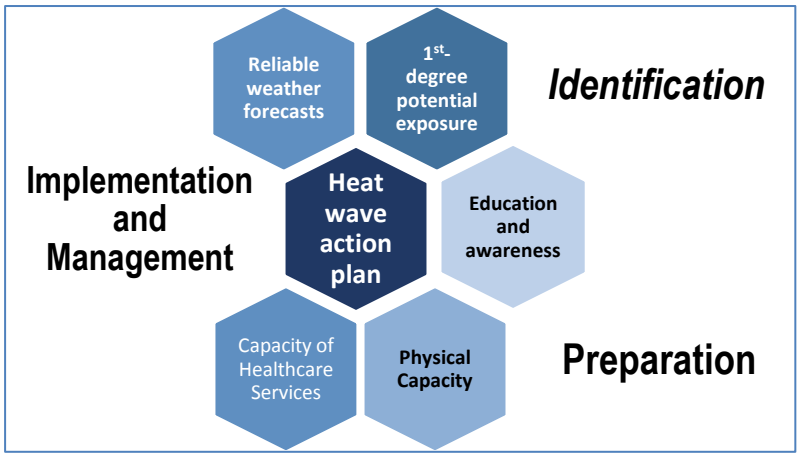


Figure 4-7: Chart of Heat Wave Action Plan components

The heat wave action plan is considered one of the actions that should be put into practice to mitigate the impacts and urban heat island and the associated potential exposure and to enhance

resistance against such impacts. Each component indicates the necessary areas of strategy development so that the action plan can be fulfilled effectively.

Table 4-1: Areas of action for Heat Wave Action Plan and strategies for suggestions produces in these aspects (relates to public health)

Action Area 1		**RELIABLE WEATHER FORECASTS**
	Strategy 1	Develop specific techniques and technologies used in weather data collection, measurement and estimation or cooperate with the organizations engaged in these activities so that weather forecasts are reliable
	Strategy 2	Warn urban administrations and public members against a potential heat wave incident in advance
Action Area 2		**1ST-DEGREE POTENTIAL EXPOSURE**
	Strategy 1	In case of any potential heat wave incident; identify the population likely to be exposed in the 1st degree by its quantitative and qualitative properties and by location Quality: Qualification is important for preparedness for awareness raising of and modes of response to identification, potential symptoms and risks that encompass exceptional circumstances such as age, respiratory and cardiovascular diseases, pregnancy, etc. Quantity: Quantification is critical for the size of the service to be rendered at the time of incident. Location: Location is important for identifying the areas to be responded at first step and determining on which items the activities governed by the action plan will focus.
	Strategy 2	Inform and warn any person, who will suffer recurrent health concerns and have a risk of death during the heat wave incident, of and against symptoms and risks
	Strategy 3	Organize and plan the services of transferring any person who is in need of help before the potential heat wave incident to cooling centers, keeping their health conditions under control
	Strategy 4	Put innovative methods into use for fulfilling and managing strategies 2 and 3 effectively (application development, call center establishment, etc.)
Action Area 3		**EDUCATION AND AWARENESS**
	Strategy 1	Raise awareness in the entire population within the action plan area of the adverse impacts of heat wave on public health, and offer educational programs in this respect
	Strategy 2	Fulfill information and awareness raising actions for the activities under action plan to be put into use by the local government in case of any potential heat wave incident
Action Area 4		**PHYSICAL INFRASTRUCTURE**
	Strategy 1	Establish "cooling centers" (public spaces with cooling systems; libraries, service buildings, sports halls, shopping malls, etc.) in certain public spaces, which are capable of specifically accommodating the population who have the potential to be exposed in the 1st degree as well as public members, in case of any increase in temperatures felt due to heat island impact and heat wave
	Strategy 2	Identify, in advance, the areas for provision of healthcare services, if the number of people exposed exceeds the capacity of existing hospitals and healthcare centers in case of any heat wave incidents Raise awareness among the public of which type of healthcare services will be offered in such spaces in order not to be late for response

Action Area 5	CAPACITY OF HEALTHCARE SERVICES
Strategy 1	Make necessary arrangements in place for the provision of healthcare officers from other centers (other district/provincial hospitals) for any locations exposed to heavier impacts in the expected timeframe of heat wave incident occurrence
Strategy 2	Coordinate arrangements, training programs and studies so that voluntary non-governmental organizations and/or public members trained in first aid are available for assistance to healthcare officers in pre-determined areas of response

Costs: The costs of a number of actions considered to mitigate the impact of urban heat islands are discussed in the previous chapter. The projected studies on future action plans are designed in line with personnel wages. No additional expenditure is projected.

4.2.3 PRECIPITATION and WATER MANAGEMENT

Featuring a pattern of dense housing and having an increasing extent of commercial activities, Kadıköy is an important center of attraction for all the residents of Istanbul for a wide range of cultural and sports activities. This leads to several types of pressure over the district's infrastructure. The reduction in green spaces in urban centers and the increase in concretion have a considerable adverse affect on absorption of water in case of precipitation. The measures taken against run-off are not always adequate. Improper or inadequate practices fail to avoid floods, and precipitations are incapable of feeding underground water reservoirs. One can rightly predict that any potential future droughts considerably result from the decrease in underground water levels.

Considering the examples of green cities at a global scale, the water areas, such as rivers, streams, etc., crossing the inner parts of a town are designed as open large public green spaces integrated with other green spaces (e.g. Madrid Rio, Hamburg River of Elbe, Vitoria Gasteiz, River of Heidelberg). The observation is that the streams of Kadıköy reclaimed are not well designed for correlation to green spaces with residential housing developed in their immediate surroundings. This is because Kadıköy Municipality has no authority over wetlands crossing district boundaries.

In addition, impermeable surfaces used in reclamation projects pose a problem. Necessary actions should seemingly be taken to respond to these practices which increase the risk of both storm water and flood and are not consistent with climate adaptation strategies. Such patterns of housing should be avoided through public zoning plans and strategies to be developed.

The concerned participants proposed a range of recommendations regarding the preservation of wetlands of Kadıköy district. It is particularly stressed that the housing of the circumference of rivers/streams should be avoided by planting these locations, as indicated in every phase of the workshop. For the purposes of this subject, it is remarked that the actions, which are also of importance to habitats and biodiversity, should be taken to preserve wildlife. It is pointed out that reclamation design sections for stream beds should be inserted into existing zoning plans so that a more robust coordination is achieved between public bodies (Figure 4-8).

Target 1: Incorporate the issue of water into the focus point of existing planning	•Action 1.1 Review of urban strategies, interorganizational cooperation
Target 2: Reduce storm water and flooding	•Action 2.1 Take actions for regions under risk •Action 2.2 Make rainwater management effective
Target 3: Water saving and wetland enhancement	•Action 3.1 Develop methods of rainwater collection •Action 3.2 Create new wetlands
Target 4: Awareness raising and information activities	•Action 4.1 Use of various media for educational and awareness raising activities

Figure 4-8: Summary Action Plan for Water Management

Objective 1: Redesign existing planning, project/investment and urbanization practices with focus on water

Action 1.1: Cooperate with other organizations by review of urban strategies (Administrative Organization)

- Create green corridors by the side of rivers reclaimed, and enhance absorption of water with the attachment of bicycle and pedestrian paths built using natural materials
- Raise the issue of removal of river preservation strip, which was 10 meter long earlier, by ISKI as an agenda item and offer a proposal for the adoption of a decision for re-introducing the preservation strip
- Insert wetlands as an item of Public Zoning Plans, and disallow housing in these zones

Target 2: Reduce storm water and flooding happening after abrupt climate incidents

Action 2.1: Take actions for regions under risk of storm water and flood

- Identify those regions under risk
- Avoid illegal housing
- Develop alternative routes for water collection lines to reduce rainwater load on streams
- Prefer permeable materials on firm grounds (walkways, highways, etc.)

Action 2.2: Perform an effective rainwater management

- Promote rainwater retention through green roof applications (heat island impact)
- Use underground reservoirs (either permeable or impermeable) for effective rainwater management
- Develop rainwater retention ponds, and use accumulated water for street sweeping and plant irrigation purposes

Target 3: Use rainwater / increase the number of wetlands for water saving

Target 3.1: Contribute to water saving through the collection of rainwater

- Introduce the mandatory use of permeable materials on main arteries, except on those included in street restoration and landscaping projects
- Conduct studies to use rainwater in residential sites and buildings for self-needs (such as use for garden watering, grey water purposes)
- Develop urban water retention reservoirs to enhance rainwater harvesting
- Preserve and manage protected areas, such as wetlands, located within and around the town, and surface and underground waters
- Apply natural urban coating materials (stone, soil), and avoid the use of floor covering that blocks the feeding of underground water

Action 3.2: Develop new wetlands

- Develop artificial wetlands in derelict areas
- Take measures to protect underground water level in construction pits
- Ensure transformation of the pool in Freedom Park into a natural pond
- Ensure development of rainwater collection ponds
- Ensure construction of infiltration sumps
- Ensure implementation of urban drainage solutions

Target 4: Awareness Raising and Information Activities

Action 4.1: Enhance educational and awareness raising activities

- Enforce development of grey water treatment systems in new buildings to be constructed
- Carry out awareness raising activities for efficient use to avoid immoderate water consumption (activity, advertising, school education programs, etc.)

Cost: The most important action to be taken across Kadıköy district regarding precipitation and water management is Reclamation Work. This is governed by the authority of the Metropolitan Municipality. For future works, the adoption of water-permeable surface use and planting works rather than conventional reclamation solutions will be critical for adaptation.

Education and awareness raising: The sum of TRY 100,000 was projected to be spent by 2030 for the preparation of related short information videos and visuals for share on social media and for the performance of leaflet preparation activities.

4.2.4 PUBLIC HEALTH

We can assess the impacts of climate change on human health under the two major topics; direct and indirect: Heat waves resulting from climate change, and air pollution and allergens have a direct impact on human health, while epidemics and natural disasters indirectly affect human health.

Heat waves result in cardiovascular diseases and increased number of mortalities and sudden deaths associated with such diseases. Additionally, air pollution has an adverse impact on cardiovascular health, resulting in further increase in COPDs. Allergens may cause asthma as a result of bodily reaction when contacted, inhaled or swallowed. For the purposes of the workshop, this set of information was used a baseline and efforts were used to develop solution suggestions.

Prevailing winds of Istanbul are northern and southern winds. The avoidance of any type of potential housing blocking these winds is vital for being able to ventilate the town particularly in the winter season when it is exposed to more pollutants and in the summer season when it is likely to be

exposed to heat waves. The air quality of the town may deteriorate as a result of the potential urbanization in the northern part of Istanbul, the increased number of tall buildings, blocking north winds, in east-west axis and other developments that are likely to impede the channel effect of the Bosporus, having an impact on winds prevailing in Istanbul.

Climate change and climate change-related environmental issues are expected to most affect vulnerable groups (elderly people, children, pregnant women, people suffering chronic diseases, the poor, etc.) across the district. Therefore, health problems suffered by these disadvantaged groups of the society are projected to increase further. Both organizational representatives interviewed throughout the study and participants of the workshop are of the common opinion that the most likely consequences of health concerns caused by climate change and associated environmental issues are increase in skin cancer and dermatophyte caused by UV radioactivity and temperature increase, increased number of rheumatic diseases, development of diseases, such as West Nile Fever, which have never been seen in our country, spread of allergy and allergy-based diseases caused by the extension of pollen season, and increased number of vector-borne diseases, particularly plague and malaria, as a result of flies and rodents growing in number.

The team working on this subject during the workshop decided that the impacts of climate change had to be assessed under 2 major topics: Impacts based on abrupt climate events and long-term effects.

Impacts Based on Abrupt Climate Events:

Heat strokes: The impacts of heat waves are felt intensely on disadvantaged groups; elderly people, pregnant women, little children, people suffering chronic diseases and the disabled in particular.

Both temperatures and air pollution become more intense as air current is blocked by tall buildings within the town.

Cardiovascular impacts: The heart rate of healthy individuals increases to speed up blood flow from body to skin in case of extreme cold or hot temperatures. This increases cardiovascular stress (pressure) and may result in death depending on an individual's health condition, age, etc. This becomes more serious specifically with the existence of air pollutants and the increase in UV rays.

Apart from this, blood vessel disorder, systemic inflammation, blood coagulation disorders and similar dysfunctions are other damages resulting from the reduction in stratospheric ozone concentration and the temperature increase. Another cardiovascular impact of climate change are vector-borne and zootonic diseases (VBZD). Based on some estimations, 10% of paralyses are caused by climate-sensitive VBZDs. The researches conducted on this subject are not at an adequate level[24].

Respiratory system impacts: The increased temperatures and the irregularity of precipitation will result in humidity increase and thus in development of diseases such as tuberculosis.

Infectious diseases: The number of rodents may rise during flash floods and the encounter with adverse impacts is possible due to the shortage of infrastructure (such incidents may also occur frequently in regions featuring dense construction activities). Consequently, Kadıköy may be exposed to infectious diseases to a slightly further extent.

[24] "Impacts of Climate Change on Health", Ministry of Forestry and Water Affairs, Turkish State Meteorological Service, April 2012

The alteration of temperatures and/or seasons caused by climate change also gives rise to the increase in the number of living beings such as vectors and ticks. Some areas appear to have an increased number of mosquitos due to the delay in bird migration. Kadıköy is under severe short-term threats.

Infectious diseases appear to rise during restoration and construction periods. Because Kadıköy is a district that is intensely affected by urban transformation, it may be slightly vulnerable in this respect. It can be a proper action to increase the number of activities on hygiene.

Foodborne diseases: Although the adequate number of studies were not conducted in this area, incidents of food poisoning appear to rise in hot periods. Kadıköy Municipality has no authority in sampling and this issue is referred to the Ministry of Agriculture and Forestry. Attention should be paid to poisoning caused by eggs and chicken and red meat.

The diseases which could grow in number as a result of drought and hygiene problems could include hepatitis A, cholera, typhoid, bloody diarrhea and cutaneous leishmaniasis.

Long-Term Impacts:

The future long-term impacts of climate change on public health can be listed as follows:

- Existing diseases becoming more severe
- Infectious diseases: Rodents, Crimean-Congo Hemorrhagic Fever, etc.
- Eye and skin problems based on solar ultraviolet effects: cataract, skin cancer
- Cancer and respiratory system diseases based on air pollution
- Physiological effects (trauma etc.)
- Increased number of or more severe exposure to allergy cases

There is no any study or statistical data specific to Kadıköy regarding the potential impacts of climate change on public health. Besides the lack of any committee to search the impact of climate change on public health, there appears no data platform by which the data from organizations, universities and non-governmental organizations is shared. The experts also stress that the data to be collected should be collected and shared with the related functions in an efficient, proper, reliable and effective manner.

The Targets and Actions summarized below are detailed in next chapters.

Target 1: Information and Monitoring	•Action 1.1 Collect and monitor statistical data •Action 1.2 Awareness raising
Target 2: Develop environments mitigating the impact of climate change	•Action 2.1 Develop healthy environments at buildings •Action 2.2 Develop healthy environments in public spaces
Target 3: Mitigate the impacts of extreme climate events	•Action 3.1 Minimize the impact of extreme climate events •Action 3.2 Minimize the exposure by vulnerable groups
Target 4: Take actions against drought and for food security	•Action 4.1 Increase water and food quality •Action 4.2 Fight against diseases •Action 4.3 Provide food security

Figure 4-9: Summary Action Plan for Public Health

Objective 1: Coordinate information and monitoring activities for the impact of climate change on health

Action 1.1: Collect and monitor statistical data

- Put forward, concretely, the impacts of climate change on public health and quality of life and the aspects of threat through academic and technical support and make them known to the public and raise awareness
- Collect the adequate number of data in initial phase so that the impacts of climate change on public health and air pollution level could be identified Collect and control data on a periodic basis, establishing a monitoring committee discussing climate change and its impacts on health
- Identify health concerns associated with climate change
- Monitor the development of any diseases identified, and carry out related awareness raising and communication activities

Action 1.2: Inform and raise awareness among the public

The awareness among the public should be raised regarding climate change and its impacts. Local governments may assume a critical role in this subject since they are the nearest bodies accessible by the public.

- Provide regular information about potential diseases associated with climate change, and keep the public informed of ways of protection from and fight against the said diseases
- Carry out educational – information activities on causes and impacts of diseases
- Carry out awareness raising activities for the public against increasing harmful effects of UV rays
- Develop a method for healthy and reliable use of closed-circuit cooling systems and for mitigation of adverse impacts intensifying climate change
- Review existing air pollution quality monitoring activities in consideration of "climate change", and revise these activities by the addition of related response actions
- Determine scientific aspects of the correlation between climate change and public health and make such aspects known to the public

Target 2: Develop environments mitigating the impact of climate change

Action 2.1: Develop healthy environments at buildings

- Provide necessary heat insulation at residential and commercial buildings Assume an incentive and supervisory role in local administration
- Install anti-allergen ventilation systems at buildings and carry out necessary inspections
- Perform urban planning in consideration of vector growth and air currents

Action 2.2: Develop a healthy environment in public spaces

- Use natural materials, which produce no pollutants and absorb no heat, in areas such parking lots and playgrounds
- Restrict the consumption of fossil fuels in the short term, which is the most important factors resulting in air pollution Achieve transformation towards renewable energy resources in the

medium term, and stop the use of fossil fuels in the long term Restrict the admittance of diesel- and gasoline-powered vehicles to urban centers after 2025-2030 as seen in many European cities

- Use electric vehicles in mass transportation (in coordination with the Metropolitan Municipality)

Target 3: Mitigate the impacts of extreme weather events and resulting disasters on human health

Our country has a large geography and variable climatic zones. Meteorological and hydrological disasters, specifically storms, floods, drought, hail and heavy snowfall, frequently take place in our country for its vulnerability to its geographical location and atmospheric conditions, resulting in considerable losses of life and property. A total of 598 meteorological natural disasters were reported across our country in 2018. Considering the distribution of these disaster for many years, the number of disasters happening in 2017 was the third highest value (the top 2 were 2015 and 2016). Of meteorological disasters observed in 2017, storms (36%), heavy precipitation/flood (31%) and hail disasters (16%) rank at the top and the proportional distribution of all disasters is given in Figure 2[25].

Additionally, the scientific studies conducted in our country warn us all against impacts such as temperature increases in Turkey, changes in regional precipitation regimes, increased risk of drought, observed increase in non-recurring precipitation rates despite the decreased number of wet days, and associated potential of risks[26].

Action 3.1: Ensure minimum exposure to extreme weather events

- Make healthcare institutions, coordination functions and trained teams prepared for extreme weather events
- Keep record of the details of those seeking assistance from healthcare institutions in case of extreme weather events, and make preparations for potential future actions to be taken for systematic information collection
- Develop concrete action plans for abrupt climate events

With the engagement of many organizations, specific Action Plans should be developed for incidents such as flash floods and heat waves. In this context, various functions of AFAD (Disaster and Emergency Management Administration), Istanbul Metropolitan Municipality and Kadıköy Municipality and central public bodies should cooperate.

- Plans for public information
- Identification of abrupt climate events step by step (as described in the chapter of public awareness raising),
- Measures against insects and vectors,
- Proper use of biocidal products, and

[25]"A Brief Review of Meteorological Natural Disasters Recoded in 2017 in Turkey", Ministry of Forestry and Water Affairs, Turkish State Meteorological Service, https://www.mgm.gov.tr/FILES/Haberler/2018/2017AfetDegerlendirme.pdf

[26] Climate Change Projections for Turkey: Three Models and Two Scenarios, Mesut DEMİRCAN, Hüdaverdi GÜRKAN, Osman ESKİOĞLU, Hüseyin ARABACI, Mustafa COŞKUN, Turkish Journal of Water Science and Management

- Development of early warning systems.

Organization is critical for enhancing awareness of the abrupt impacts of climate change. In this context, the means available to Kadıköy Municipality, neighborhood homes, billboards located in visible parts of the town, active social media accounts and SMS notifications for those unable to use smart phones can be used for this purpose.

For the purposes of future preparations, multi-stage warning levels should be determined in collaboration with other public bodies. In this context, warnings can be issued in advance of a pre-defined time (24 hours, 48 hours, etc.). For example;

- Issue of a warning after a temperature value above seasonal normals regarding weather temperatures,
- Adoption of decisions, along with a specialized committee, like the level of expected rapid precipitation intensity at which a warning should be issued, and
- Issue of a warning when air pollution reaches given levels.

Action 3.2: Carry out necessary activities so that vulnerable groups are not affected by the adverse impacts of climate change

- Identify vulnerable groups of the town, including address-based systems, within the scope of absolute cooperation of the Ministry of Health, Istanbul Metropolitan Municipality and Kadıköy district organizations with local government functions Coordinate the activities which are already carried out for the elderly people living on their own, children with parents living apart from each other, and vulnerable groups who benefit from social support services for the purposes of the subject initiatives undertaken by several functions of Kadıköy Municipality
- Do preparatory planning for emergency and non-emergency actions, and put the protocols on interorganizational cooperation into use

Warning messages to be delivered to vulnerable groups can be as given below (in line with the decisions taken for the action on early warning systems);

- Do not go out between given times,
- Drink plenty of water
- Postpone outdoor sports activities for a few days

Target 4: Take actions against drought and for nutrition and food security

Action 4.1: Provide Water and Food Quality

It is important to carry out awareness raising and information activities on hygiene particularly during times of drought.

Kadıköy district has a multitude of food premises having visitors from all around Istanbul. The inspection of hygienic conditions at these establishments is performed by the Municipality, and each of these businesses is accessible. As sampling is under the authority of the Ministry of Agriculture and Forestry, no inspection can be made in this respect. The growth of undesired germs is inevitable at

high temperatures. However, these establishments can be caused to pay more attention of hygiene rules through education and awareness raising.

Action 4.2: Fight against water and foodborne diseases

- Take measures against waterborne diseases
- Determine the impacts of drought on cultivation, new diseases associated with drought or extreme precipitation, impacts of existing plant pattern against the increase in losses from hail and freeze, and shortage of irrigation water, and take necessary actions

Role of Organizations in Implementing Solution Suggestions

Interorganizational communication and data collection activities appear to be crucial for solution suggestions. It is deemed necessary to establish an effective sharing network between concerned functions of local governments, Local Health Authority, Provincial Directorate of Environment and Urbanization, Provincial Directorate of Food, Agriculture and Livestock, Provincial Directorate of Forestry and Water Affairs, ISKI, DSI, NGOs, universities, trade associations and provincial executive committees. Studies should be conducted to collect data, monitor the collected data on a common platform and put solution suggestions into use, forming working groups that represent all organizations in any areas deemed necessary for public health. For extreme weather events, heat waves, floods and storm waters which are likely to be encountered to a more severe extent due to climate change, emergency and non-emergency action and elimination strategies should be set out through organization cooperation and these strategies should be announced and tried in the form of fire and earthquake training programs.

The ability of public members to follow various indicators of joint activities carried out by organizations will serve as a guide in seeing both the effectiveness of adaptation strategies in practice and in which direction the living standards of public members are changed.

4.2.5 ADMINISTRATIVE ORGANIZATION (MITIGATION and ADAPTATION COMBINED)

The policies proposed for climate change entail a serious cooperation and coordination between organizations for being issues that are of concern to all social, economic and administrative functions of the district. Several functions of local governments that have authority in many fields from transportation to public zoning as the entities closest to citizens must cooperate. Those mitigation actions and action plans proposed in every field throughout the report are efforts that can be conducted by a single function. In this context, public zoning, transportation and waste management functions cannot be considered to work separately.

The major roles of local governments include the cooperation between the central government and other public bodies in harmony as well as the development and implementation of an Action Plan. Consequently, not only Turkish municipalities, but also other central/local public bodies are required to fulfill an exceptional work distribution. The development of an independent function, which is similar to Energy Management / Climate Change supported at the highest level for fight against and adaptation to climate change, by global local governments - particularly by the EU - is one of the administrative formations that is used most commonly.

The topics that should be addressed with importance are developing a solution-oriented data bank, using technology support for information purposes effectively, make the generated data public and establish effective notification channels. To have an increased level of individual/societal support for adaptation to climate change, it is specifically important to build the capacity of and financially

support NGOs. The suggestions for education are highlighted as the last topic of this group. The suggestion is that education should be expanded across the society through contests at several scales and sizes that serve for idea generation. In addition, specific functions such as "Environmental Awareness Offices" should be incorporated into municipal organization so that local-scale contribution could be improved and continuous flow could be achieved under the sub-topic of organization.

Necessary actions for enhancing environmental, social and economic benefits of Urban Climate Adaptation Strategies (e.g. green employment) and matching those strategies up with other thematic strategies and areas

Environmental, social and economic benefits of Urban Climate Adaptation Strategies are summarized in the figure below.

Economic Benefits	Environmental/Ecological Benefits	Social Benefits
• Achievement of energy and water efficiency • Provision of time efficiency (in transportation) • Accurate investments • Enhancement of labor productivity • Enhanced local products/workforce • Decline in insurance costs • Decrease in economic losses associated with natural disasters	• Increased number of healthcare/sports activities • Increase in public open spaces • Preservation of biodiversity • Waste reduction • Prevention of raw material/soil pollution • Preservation of natural resources • Increase in the number of accessible green spaces	• Enhanced level of communication • Improvement of social adaptation • Increased motivation • Enhanced level of welfare • Decrease in health concerns

Figure 4-10: Listing of potential benefits achievable through the Climate Adaptation Strategy

It is critical to achieve integration of existing or intended other plans listed below with the Climate Adaptation Strategy in Kadıköy district so that these environmental, social and economic benefits are enhanced:

- Waste Management Plans,
- Sustainable Energy Action Plan,
- Transportation Master Plan,
- Disaster Risk Mitigation Plan,
- Environmental Plan,
- Organizational Strategy Plans,
- Emergency Plans, and
- Green Infrastructure Strategy.

Objective 1: Develop necessary means and mechanisms, i.e. suggestions for spatial planning/design processes, for transition process of implementing Urban Climate Adaptation Strategies (e.g. green infrastructure plan, guidance, handbook, biodiversity plan, green infrastructure implementation action plan)

The administrative means and mechanisms available for use for transition to climate adaptation strategies are discussed in a wide range that could be categorized from physical instruments to organizational cooperation and from legal and administrative regulation provisions to

education/awareness raising activities. Of these topics, specific attention should be drawn to the compulsory existence of coordinating structures (e.g. Advisory Councils, Strategy Management Center) to prioritize educational/awareness raising activities and develop a culture of organizational cooperation which is found to be absent. An analysis should be made on the recognition and feasibility of any mechanisms that will allow for operational mobility, such as green infrastructure plan, guide, handbook, biodiversity plan and green infrastructure implementation action plan illustrated in what sort of contributions climate change adaptation can make to spatial planning and design process. Some suggestions for individual solutions at building and equipment scale are given under the topic of physical instruments.

Action 1.1: Physical Instruments

Public Open Spaces

- Use local materials when selecting urban furniture in public open spaces and recreational spaces and observe the ecological footprint caused by such materials, and develop implementation guides in any subjects in design process that will affect climate change, such as social compliance, transportation, infrastructure and urban heat island
- Separate and develop green spaces in consideration of growing population and migration when planning recreational spaces in city centers

Building Sets

- Use renewable energy resources at Municipal and organizational buildings, and increase the number of green building systems Encourage private properties in this respect
- Store and use rainwater effectively

Action 1.2: Develop a district-scale organization through Organizational Cooperation

Developing a strategic plan like KCAAP entails cooperation and coordination between various local government functions. The most important functions of local governments are listed below.

- ✓ Environmental protection
- ✓ Land use
- ✓ Public zoning
- ✓ Economic and social services
- ✓ Building and infrastructure management
- ✓ Mobility and transportation
- ✓ Budget and finance
- ✓ Purchasing

The roles of these functions, who have the authority and mobility allowing all of them to work in coordination when required, can be listed as follows:

- Update inventory and KCAAP activities periodically;
- Organize the development of any projects put into use at the Municipality, which could serve as a model (energy surveys at Municipal buildings, prepare and implement renewable energy feasibility reports, take measures for energy efficiency, and take the abovementioned measures for transportation, etc.);

- Act as a guiding party in any projects developed by external stakeholders in line with the Action Plan, and carry out activities for joining various stakeholders together and improving the opportunities of incentive and financing;
- Monitor and assess the outcomes of mitigation actions implemented in town; and
- Engage in communication and popularization activities designed to raise awareness through examples of good practice.

It can be unfeasible to build a separate function, if the local government fails to find the adequate level of human and financial resources. Another option is to build a team of people selected from the concerned functions in an organization under the leadership and management a particular function.

- Develop an effective advisory council with NGOs, and expedite guidance activities involving the Municipality as a facilitator through integration achieved
- Take necessary coordination decisions so that climate adaptation strategy can be included in operational schemes and incorporated into organizational action plans
- Co-develop strategic plans and joint projects, building a function on climate change and water management under the umbrella of organizations such as ISKI, IMM, DSI and district municipalities Perform necessary related assignments, by informing and raising awareness among directors and decision makers, and carry out operations sustainable in practice so that the culture of cooperation can be established
- Establish administrative organization of climate adaptation plan on behalf of the concerned bodies and the city
- Provide integration of climate adaptation strategy with Disaster and Emergency Plans
- Held periodic interorganizational meetings, and follow in which direction the ongoing activities progress and whether new activities exist
- Organize a "green" workshop similar to World Cafe and obtain the opinion of public members on green space development (particularly on back gardens and yards)

In this context, an example pattern of structuring proposed by Kadıköy Municipality is described in the following figure. An assignment pattern that will cause team members within such an organization not to neglect working groups during their day-to-day tasks should be provided and it should be ensured that any activities to be carried out within working groups are included in the official job definition of teams.

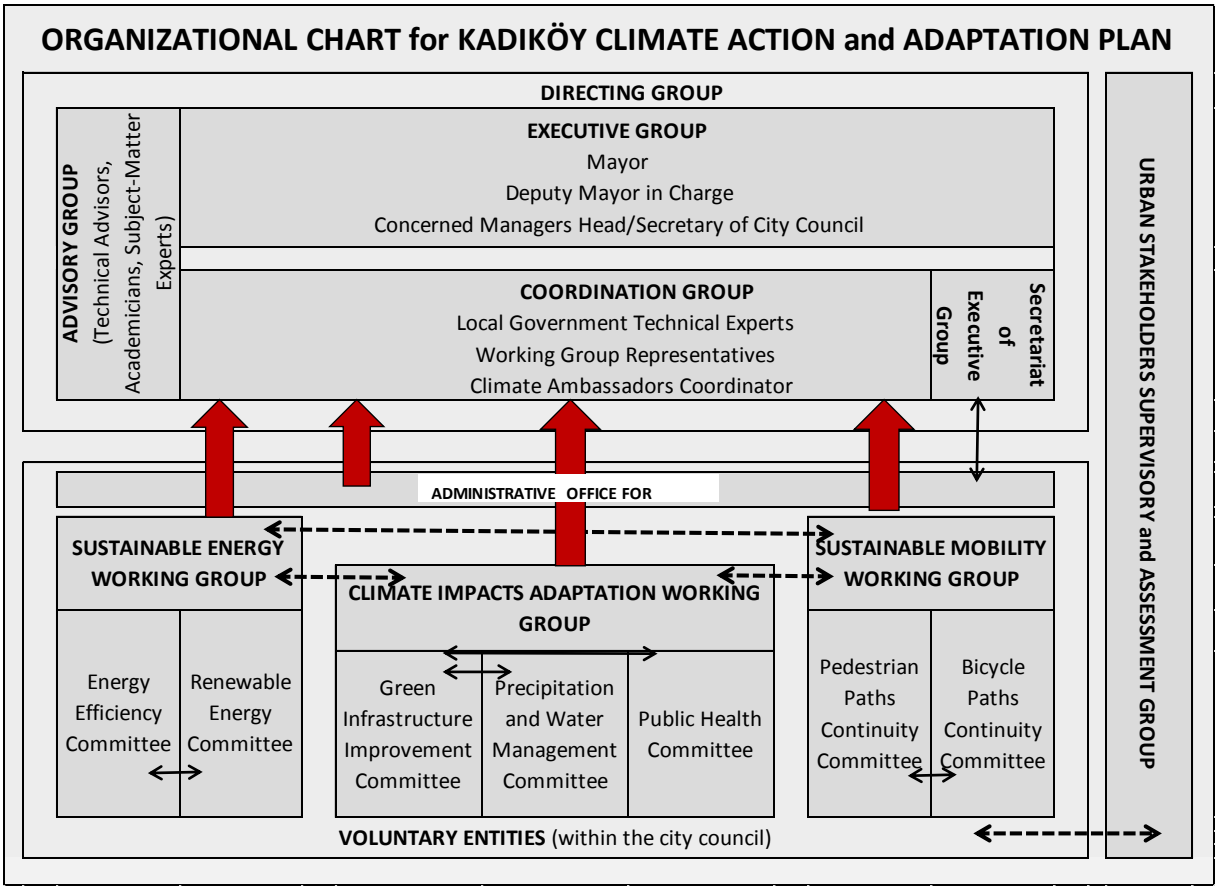


Figure 4-11: Example organizational structure for Climate Change

Action 1.3: Legal – Administrative practices

- Ensure absolute public engagement in the arrangements of local government to be developed for climate adaptation
- List housing requirements and implementation instruments for climate adaptation strategies in a set of criteria and turn such requirements and instruments into building requirements for tenders
- Develop legislative infrastructure/compliance with rules set out in terms of incentive means/legal sanctions (e.g. inspection of industrial zones) for climate adaptation

Action 1.4: Education/Awareness Raising

- Enhance the number and efficiency of awareness raising activities through the Ecological Life Center and the Disaster Education and Awareness Raising Park
- Prepare billboards, posters and leaflets in order to raise awareness of climate change
- Effectively communicate any strategies developed by organizations on climate change adaptation to individuals and entities through media organs, theater plays, short films, etc.
- Arrange seminars and workshops designed to keep individuals and entities informed under the Urban Climate Adaptation Strategy
- Measure (test, monitor and revise) periodic feasibility of Emergency Action Plans and share results with the concerned entities
- Ensure fulfillment of awareness raising activities by experts regarding global warming and climate change, particularly starting from elementary schools

- Incorporate climate change adaptation in daily life into curriculum under the coordination of local governments
- Explain economic and environmental benefits, introduced by green building systems under urban transformation practices, to developers and users, and distribute them widely in the form of a handbook

Target 2: Develop a Green Dashboard

The green dashboard, i.e. data collection and monitoring, can be fulfilled by effective monitoring on the system featuring individual interfaces shares with public members, decision makers and researchers. The requirement can be the fulfillment of good example practices (in heat island impact, energy efficiency and similar areas) and execution of pilot practices to enable an effective measurement. These efforts can be initiated in a sphere that is easy to implement and monitor such as a benefit analysis on waste management. The lack of interface which allows for the monitoring of existing areas of measurement and survey, particularly air quality and water quality, should be remedied. The examples of practices in Dublin, London, Amsterdam should be followed in this respect.

Action 2: Identify necessary actions for ensuring that critical data is collected, modelled and reported on a real time basis, ecosystem services are mapped and assessed, and the basis of data bank and planning and management efforts is established Compile any data which could be contained in user and administration panels The Green Dashboard is deemed appropriate for summarization by suggestions under three main topics (Figure 4-12).

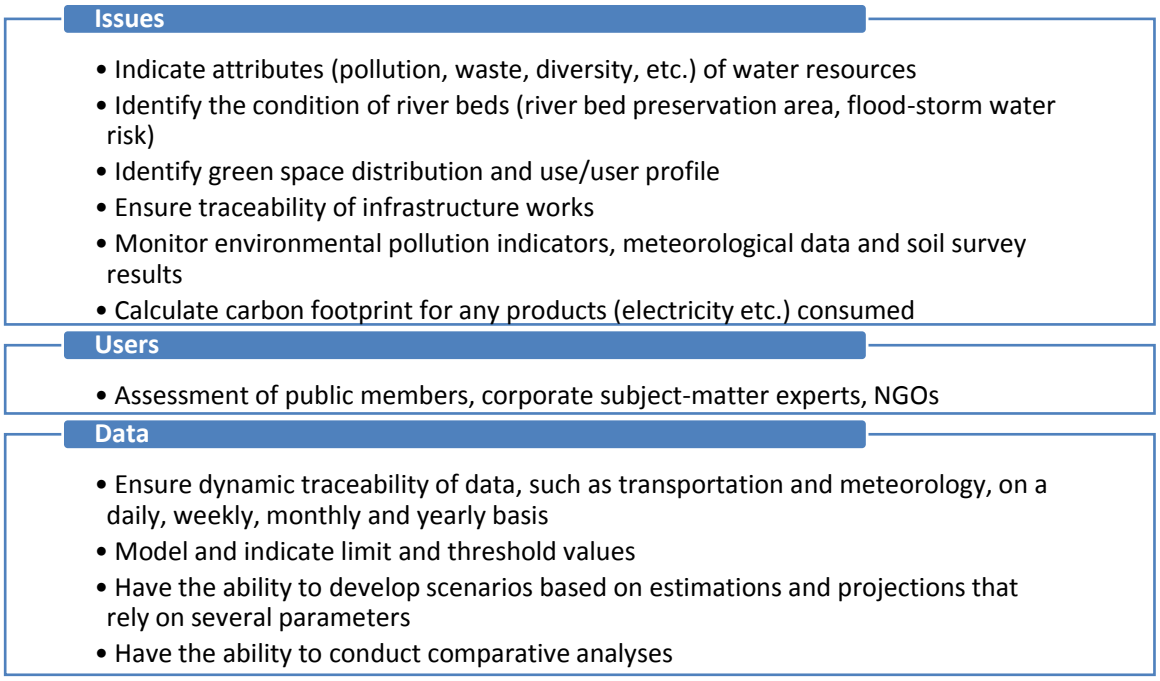


Figure 4-12: List of Suggestions for Green Dashboard

Target 3: Take necessary actions for enhancing environmental, social and economic benefits of Urban Climate Adaptation Strategies (e.g. green employment opportunities)

- Develop further strategies that are capable of functioning in accordance with, and being integrated with the Climate Adaptation Strategy

- Extend the scope of existing detailed plan on bicycle use and conduct studies for " Master Plan" or a more extensive detailed "Sustainable Urban Mobility Plan"
- Conduct potential improvement studies in areas expressed as "Green Jobs" - i.e. infrastructure practices such as grey water/rainwater, solar panel applications etc. - together with associations and NGOs

Target 4: Manage intra-organizational and interorganizational Urban Climate Adaptation Strategies on a sustainable basis

- Develop a diverse implementing structure so that the strategies develop are not under the initiative of individuals and not changed from period to period
- Set out methods to make obligations out of these strategies and enforce such obligations without any increase in the number of disaster events before it is too late
- Determine the composition of and establish "anti-climate change coordination committee" (This committee should must include city council representatives and NGOs should be engaged depending on its subject activity and agenda.)
- Ensure that these committees start working on the issue of disasters and local resource utilization (green procurement procedure) Ensure that procurement phases are "green" by specifications as in "Ecological Home" as an outcome of these activities
- Provide training programs on climate change and green strategies for Municipal functions and raise their awareness Influence and raise awareness of the perspective on project production by this way

4.3 CLIMATE ADAPTATION PLAN - CONCLUSION AND ASSESSMENT

Kadıköy Climate Action and Adaptation Plan (KCAAP) fulfills two key functions; first, it sets out a detailed reduction strategy (Sustainable Energy Action Plan – Report 1) for the mitigation of urban greenhouse gases resulting in climate change by keep extensive records of energy and GHG densities across Kadıköy, and secondly, it lays the cornerstones of a Climate Adaptation Strategy (Climate Adaptation Action Plan – Report 2) that will make the district more resistant against resulting adverse impacts of climate change already happening. With efforts used jointly with urban stakeholders, an important step is taken towards the fulfillment of local government's vision of a sustainable and resistant Kadıköy with participatory practices. The GHG reduction part of the report is assessed in an individual report.

Based on available historical data and actual studies, the Climate Adaptation Action Plan included under KCAAP analyzes the exposure potential of the town in the light of climate change scenarios developed in relation to Istanbul and Kadıköy, and combines suggestions for new planning practices with the perception of Kadıköy as an ecosystem that includes natural structures and systems and features the interaction between cultural and natural structures as well as being an area of dense anthropogenic activities. The studies conducted used the studies, which were already carried out for Istanbul Climate Change Action Plan, to a considerable extent.

Currently, the approach that deals with physical planning in terms of urban settlements within a plan hierarchy such as zoning plan, master zoning plan and environmental plan excludes ecological scales and concepts to a substantial extent. However, a pattern of understanding to be developed at diverse ecological scales will enable the development of instruments and mechanisms which today are the most fundamental deficiencies in the process of climate change adaptation. The assumption

that the balanced and robust maintenance of urban ecosystem functions is achievable through planning practices which consider such functions from an ecosystem perspective is the basic assumption put forward by Kadıköy Adaptation Action Plan. For thematic suggestions put forward by participatory processes, the solutions based on urban green network/infrastructure and nature outlined herein were found to be key concepts for putting the given multi-scale approach into use.

The adaptation strategy for Kadıköy aims to mitigate the apparent impacts of climate change and enhance the quality of urban life. The focus is on subjects such as management of high and abruptly changing temperatures, waste resources management, flood and soil erosion mitigation, and coastal flood mitigation. It is important for cities to develop a sustainable urban structure resistant to long-term and abrupt impacts in fight against climate change.

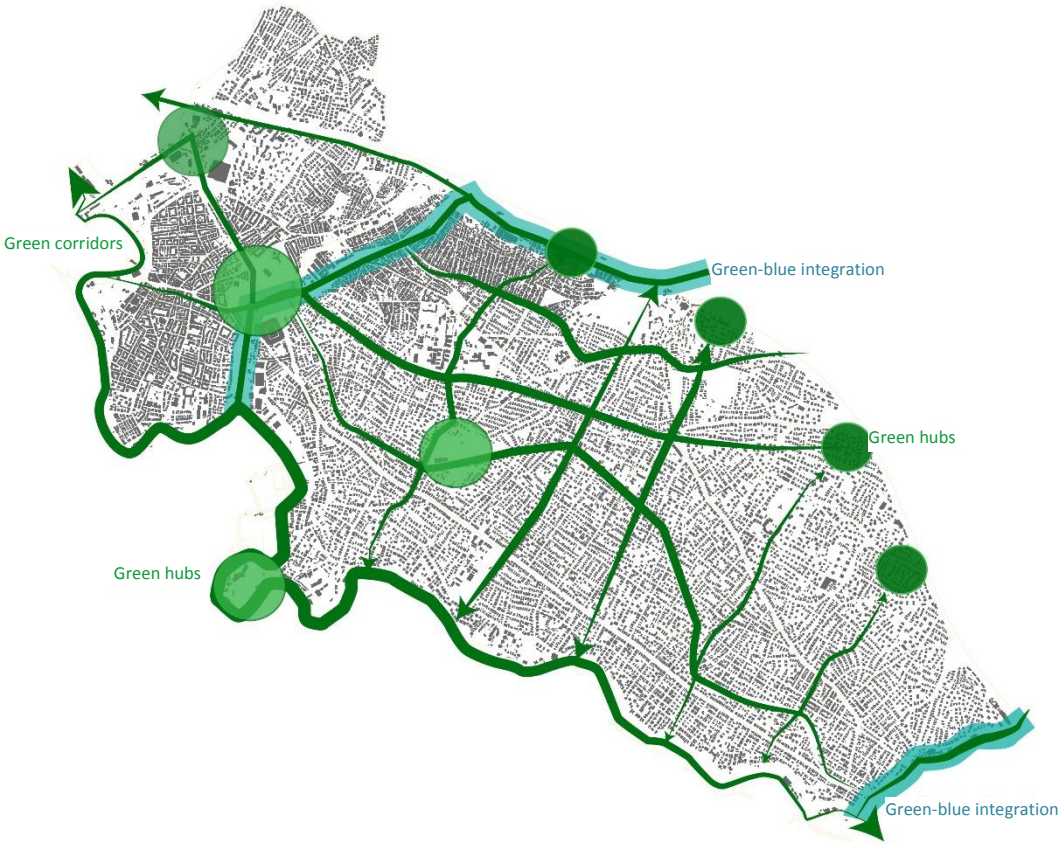


Figure 4-13: Green Corridor and Green-Blue Integration Proposed for Kadıköy District

All findings obtained throughout the study indicate that the amount of green spaces should be enhanced by many motives such as mitigating the impact of urban heat island and improving air quality across Kadıköy district. The performance of reclamation works on existing water channels in accordance with scientific standards in correlation with green spaces is another important issue that lies ahead of us. As proposed for Kadıköy in the figure above, the pillars of strategy proposed for climate adaptation are developing an urban green belt, enabling green settlement practices in zones most affected by heat island impact and adopting the modes of developments prioritizing pedestrian-bicycle-mass transit systems.

With the urban joint ownership of the climate issue at a local scale, it is extremely important to define and preserve Kadıköy's natural structure components as elements determining its urban

identity. As an outcome of self-assessment conducted for Kadıköy Municipality, a signatory to the Covenant of Mayors, under this study, the district's capacity of "Administrative Organization and Planning" which has already progressed from the initial stage to the development stage is an indication of the substantial improvement shown by Kadıköy in this respect. The Climate Ambassadors group formed by the Municipality under the project is a significant step devised so that the actors other than the local government are able to be involved in the process for the fulfillment of climate adaptation at a local scale.

The functioning of diverse ecosystems from natural structures to man-made structures developed to enhance the sustainability and durability of cities should be understood well and reflected into design decisions. Therefore, the planning integration of design approaches and instruments, such as "water-sensitve urban design", "green infrastructure strategies" and "nature-based solutions", that observe natural and cultural living form for the residents of cities in urban design practices is of great importance. Kadıköy Climate Adaptation Strategy will be a key document in developing design principles and guiding practices in this respect.

5 BIBLIOGRAPHY

Climate Change Projections for Turkey: Three Models and Two Scenarios, Mesut DEMİRCAN, Hüdaverdi GÜRKAN, Osman ESKİOĞLU, Hüseyin ARABACI, Mustafa COŞKUN, Turkish Journal of Water Science and Management

Ministry of Energy and Natural Resources, www.enerji.gov.tr

Energy Efficiency Law, No. 5627, 2007.

Air Pollution and Its Effects on Health; https://hsgm.saglik.gov.tr/tr/cevresagligi-ced/ced-birimi/650-hava-kirlili%C4%9Fi-ve-sa%C4%9Fl%C4%B1k-etkileri.html

Information on the effects of Air Pollution http://www.who.int/airpollution/en/

Energy Policies of IEA Member Countries: Turkey, 2009.

"Impacts of Climate Change on Health", Ministry of Forestry and Water Affairs, Turkish State Meteorological Service, April 2012

Transportation Master Plan for Istanbul, May 2011

International Local Government GHG Emissions Analysis Protocol (IEAP), ICLEI, 2009

IPCC 2006 Guidelines for National Greenhouse Gas Inventories, Jim Penman et.al., 2007.

"Dominance or Integration in Human-Nature Relationship? A Paradox of Urban Development and Green Areas in Istanbul", Çağdaş Kuşçu Şimşek

Green Economy for Climate, Istanbul Sabancı University Policies Center, May 2017

"Assessment of Climate Scenarios for Istanbul", Istanbul Climate Change Action Plan Report, www.iklim.istanbul

Istanbul "Climate Change Risks, Opportunities and Vulnerabilities Analysis", 2017

Urban Green Area Use and Green Area Satisfaction in Istanbul, 2014

Istanbul TMMOB Provincial Environmental Status Report, 2016 page 22

Kadıköy Strategic Plan 2015 - 2019

Anthropogenic Effects on Urban Climate in Istanbul: Investigation of Urban Heat Islands, Çağdaş Kuşçu, Yıldız Technical University, Institute of Science, PhD. Thesis, Department of Urban and Regional Planning, Urban Planning Program

Importance of Green Spaces in Minimizing Urban Heat in the Istanbul Metropolitan Area Çağdaş Kuşçu

Examination of Rivers' Recreational Potential as an Urban Coastal Space: Case Study, Eskişehir Porsuk Creek and Istanbul Kurbağalıdere, Istanbul Technical University - Institute of Science, Master's Thesis, Melike Önen, Landscape Architect, 2007

Low Carbon Development Strategies: A Primer on Framing Nationally Appropriate Mitigation Actions (NAMAs) in Developing Countries, UNEP, 2011.

McKinsey Global Institude, Cityscope 1.0, 2010.

Tabanoğlu, O. Recommendation on Adaptation Strategies to Climate Change for Antalya, 2018.

Istanbul

Pathways to a Low-Carbon Economy v.2 of Global GHG Abatement Cost Curve, McKinsey&Co., 2009.

Paving the way for low-carbon development strategies, Xander van Tilburg et.al., Energy Research Center of the Netherlands.

Republic of Turkey Ministry of Energy and Natural Resources 2010-2014 Strategic Plan.

The Greenhouse Gas Protocol Corporate Reporting Satndard Revised Edition, WBCSD-WRI.

TSI, www.tuik.gov.tr

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

"A Brief Review of Meteorological Natural Disasters Recoded in 2017 in Turkey", Ministry of Forestry and Water Affairs, Turkish State Meteorological Service, https://www.mgm.gov.tr/FILES/Haberler/2018/2017AfetDegerlendirme.pdf

National Energy Efficiency Action Plan, January 2018

Transportation Sector, Current Status Assessment Report, Ministry of Environment and Urbanization, 2010.

National Climate Change Strategy Document: Turkey Becoming a Solution Partner, Republic of Turkey, Ministry of Environment and Forestry

Urban World: Mapping the economic power of cities, McKinsey Global Institute, 2011.

World Urbanization Prospects The 2011 Revision, United Nations Economic & Social Affairs, 2012.

APPENDIX 1: RADAR CHART QUESTIONS

1. Impact of Urban Heat Island

ACTION	INITIAL STAGE			DEVELOPMENT STAGE			ADVANCED STAGE		
1. In consideration of medium- and long-term climate change projections and urban development in Kadıköy, the focus locations important for future heat wave impacts were identified by both CBS and land surveys.	No measurement or survey was conducted for heat island impact (HII). There is no available policy document or strategy for the impact of climate change on the city. However, initial steps are being taken for adaptation to climate change.			The city's regions having the potential of exposure to HII were determined, survey activities were initiated, and the requirement for strategy development was set out by the concerned parties in relation to the medium- and long-term criticality of the subject matter.			The current and future impact of urban HII was confirmed by surveys, any potential adverse consequences caused by this phenomenon were assessed and the policies and strategies used for eliminating such outcomes were developed. Some practices were carried out with cooperation and knowledge sharing performed between the concerned parties.		
	1	2	3	4	5	6	7	8	9
2. Kadıköy conducted a number of necessary scientific studies concerning adverse consequences of HII and assessed air pollution and effects on public health.	HII is known to result in adverse consequences in urban life. No correlation is established between physical urban planning and adverse impact of climate change.			Adverse consequences of HII were found in various aspects of urban life. While the contribution of HII to both public health and urban pollution is searched, there are no medium- and long-term consistent and feasible planning and strategy development activities due to the lack of cooperation between the concerned organizations.			The threat posed by HII to urban life was established by scientific projections, where common platforms were developed for the related interorganizational cooperation. A planning and strategic thinking pattern that will eliminate medium- and long-term adverse impacts of heat island is the focus point of all urban activities. There are a number of practices carried out in this respect.		
	1	2	3	4	5	6	7	8	9
3. The city has and fulfills necessary sets of planning to see what nature-based solutions are for physical urban planning, green space distribution, and reclamation of green corridors and waterways.	There is neither available body of information about the actions which should be taken to eliminate HII nor an effort of planning in this respect.			Necessary information and awareness raising activities were carried out to eliminate HII and mitigate its adverse consequences. The key principles of related medium- and long-term planning and interorganizational cooperation were set out, but not implemented yet.			Using the most adverse impacts of urban climate change, an analysis was performed to see which nature-based solutions are the most convenient for eliminating HII and actions plans were put into use.		
	1	2	3	4	5	6	7	8	9

2. Urban waters and rivers

ACTION	INITIAL STAGE			DEVELOPMENT STAGE			ADVANCED STAGE		
1. A planning effort was used on potential drainage issues and flood-storm water area management in consideration of urban water pattern as well as of the projections of medium- and long-term precipitation regime change and urban development in Kadıköy, particularly of existing stream/river corridors.	The projections of medium- and long-term precipitation regime change caused by climate change were not considered in urban water management. There is a lack or shortage of inventory in this respect.			Using joint efforts with ISKI and DSI, it was found out that a strategic water management planning was needed to account for the impacts of precipitation regimes altered by climate change, and an inventory was developed with actual analyses carried out; however, a strategic plan to be incorporated into public zoning plans was not made available.			The current and future impact of urban heat island on water resources was confirmed by surveys, any potential adverse consequences caused by this phenomenon were assessed and the policies and strategies used for eliminating such outcomes were developed. With ongoing practices, cooperation and knowledge sharing was performed between the concerned parties.		
	1	2	3	4	5	6	7	8	9
2. The water-oriented green infrastructure operations were completed for creating a flexible Kadıköy resistant against adverse impacts of climate change on water pattern of Kadıköy, where strategic plans were set out.	The thing unknown about the urban water pattern of Kadıköy is how it will be affected by climate change. There are no scientific studies conducted in this respect. No correlation is established between physical urban planning and adverse impact of climate change.			The water management planning of Kadıköy fails to go beyond conventional flood/storm water estimations. Although innovative approaches similar to green infrastructure are known to exist, there is no wholistic process of strategic planning. While there are a number of examples of exceptional "green river reclamation", they are not considered of priority to have an influence on physical planning. There are no medium- and long-term consistent and feasible planning and strategy development activities due to the lack of cooperation between the concerned organizations.			For the purposes of climate change adaptation across Kadıköy, a "Green Infrastructure" Strategy was prepared, strengthening the close ties between organizations, NGOs and local government planning functions. The adverse impacts of climate change on water pattern were established by scientific projections, putting a durable and flexible urban vision into use. The approach of "nature-based solutions", which is innovative at a global scale, should be adopted.		
	1	2	3	4	5	6	7	8	9

3. Green Spaces and Corridors

ACTION	INITIAL STAGE			DEVELOPMENT STAGE			ADVANCED STAGE		
1. The naturalness, continuity, accessibility and fair/balanced distribution and general potential for mitigating adverse impacts of climate change of open green spaces in Kadıköy are planned in further consideration of the town's development in the long term.	The impacts of green spaces on heat island and air pollution reduction and biodiversity enhancement are not established by scientific studies. While there is a general intention expressed to increase the number of green spaces, the rapid housing within the town hinders adoption of green-oriented strategies. Thus, it is impossible to mention about the existence of a medium- and long-term feasible strategy.			Within the framework of "green town" themes, there are many activities observed to fall under the scope of the said "action". The development of primary green spaces, access zones and corridors/belts was included in the town's physical planning, and the concerned parties made a set of assessments accounting for long-term climate change projections.			The "Green Infrastructure Strategy" for Kadıköy was developed and is implemented in consideration of medium- to long-term climate change projections. The town's long-term physical development is governed by "green infrastructure" strategies. The preservation and expansion of non-urban green belts as well urban green corridors and access zones was discussed within a synergy by NGOs and concerned national and regional organizations, where related policies and strategies and practices were developed.		
	1	2	3	4	5	6	7	8	9
2. Specific strategic activities ("Kadıköy Green Urbanization Strategied") based on scientific studies were carried out on the impacts of non-urban green belts and connected urban green spaces in Kadıköy (including the pattern of green waterways) on urban air, water and noise pollution reduction, biodiversity enhancement and low-carbon transportation (easiness of traffic, widespread pedestrian/bicycle networks), which became an integral part of urban planning.	The direct correlation of the said "Kadıköy Green Urbanization Strategies" with those studies on heat island, urban pollution, transportation sustainability and biodiversity was not established by scientific studies.			The impacts of "Kadıköy Green Urbanization Strategies" on the habitability of town were explicitly revealed in consideration of long-term impacts of climate change. Nevertheless, there are some hurdles to overcome to put those strategies into practice due to the lack of interorganizational cooperation, medium- to long-term limited freedom of action in physical planning, and some issues with local decision making authorization.			"Kadıköy Green Urbanization Strategies" were developed as backed by scientific studies in all areas with the intent to minimize adverse impacts of climate change and maximize living standards of urban residents by international modern city definitions. Brought to life with the sharing and cooperation between NGOs and all concerned organizations, the "Strategy" is the future vision of the town where it becomes a partner of all its stakeholders.		
	1	2	3	4	5	6	7	8	9

4. Public Health

ACTION	INITIAL STAGE			DEVELOPMENT STAGE			ADVANCED STAGE		
1. The potential impacts of climate change on urban air pollution and public health were established by scientific studies in consideration of projections of medium- to long-term climate change projections and urban development in Kadıköy.	While the adverse impacts of climate change on public health and urban air pollution is generally known, it is still unknown how Kadıköy will directly be affected in this respect, and which age groups and social layers face what kind of health threats. The concerned organizations have no knowledge sharing and cooperation between each other, and there is no strategy or action plan that deals with this subject.			Medium- and long-term adverse impacts of climate change on public health and urban and environmental pollution were established by scientific studies. For its medium- and long-term criticality, the requirement for strategy development and coordination is raised as an agenda item by the concerned organizations. However, there is no such an action plan available.			It is unknown how public health and urban air pollution will be affected by climate change. Any potential adverse consequences caused by this phenomenon were assessed and the policies and strategies used for eliminating such outcomes were developed. With ongoing practices, cooperation and knowledge sharing was performed between the concerned parties. Awareness raising and educational activities are being carried out.		
	1	2	3	4	5	6	7	8	9
2. The adverse impacts of climate change on public health and urban air pollution in Kadıköy were determined; suggestion solutions and the concerned organizations necessary for coordination were identified; and a set of action plans were developed starting from the most urgent items of top priority.	As there is no correlation established between the adverse impacts of climate change on public health and air pollution, the measures to be taken for eliminating this threat are not raised as an agenda item.			Physical/spatial solutions and social organization potentials were determined against the projections of climate change that could adversely affect crucial aspects of urban life. While the organizations necessary for coordination were identified, no medium- or long-term strategy was developed in this respect yet.			The division of labor based on coordination between all organizations, specifically in Kadıköy, was carried out for urban stakeholders and particularly for public health. The requirements of Adaptation Strategy that highlight nature-based solutions put forward upon scientific studies are fulfilled.		
	1	2	3	4	5	6	7	8	9

5. Administrative Organization and Planning

ACTION	INITIAL STAGE			DEVELOPMENT STAGE			ADVANCED STAGE		
1. The instruments, working procedures and interorganizational cooperation mechanisms were set out for putting Kadıköy "Green Urbanization Strategies", and the method of incorporating such elements as the focus point of spatial planning and design processes was identified.	No review was conducted on the town's green infrastructure projects and the potential for minimizing medium- and long-term adverse impacts of climate change. The rapid unplanned urbanization hinders the local government's capacity of decision making and implementation in this subject. There is an inadequate level of knowledge sharing, communication and cooperation between the concerned local and national organizations.			The instruments, working procedures and interorganizational cooperation mechanisms were set out for putting Kadıköy "Green Urbanization Strategies", and the method of incorporating such elements as the focus point of spatial planning and design processes was identified. There is an inadequate level of knowledge sharing, communication and cooperation between the concerned local and national organizations with serious problems faced during implementation.			The "Green Infrastructure Strategy" for Kadıköy was developed and is implemented by participatory planning methods in consideration of medium- to long-term climate change projections. The instruments, working procedures and interorganizational cooperation mechanisms were set out for implementation, and the method of incorporating such elements as the focus point of spatial planning and design processes was identified and is fulfilled. The decisions on the town's future are set by the local government in cooperation with supra-urban organizations and in agreement with urban stakeholders.		
	1	2	3	4	5	6	7	8	9
2. Environmental, economic and social benefits of Kadıköy "Green Urbanization Strategy" were established by scientific studies; the aspects of intra-and interorganizational sustainability, such as engagement, communication, education, organization, funding, green procurement and supply, were set out; and a "green dashboard" ensuring the transparency of the Strategy was prepared.	The benefits of the said Strategy including Climate Adaptation were pointed out, where initial steps were taken in this respect. Nevertheless, there are some hurdles to overcome to put those strategies into practice due to the lack of interorganizational cooperation, medium- to long-term limited freedom of action in physical planning, and some issues with local decision making authorization.			The impacts of Kadıköy "Green Urbanization Strategies" on the habitability of town were explicitly revealed in consideration of long-term impacts of climate change. Nevertheless, there is incapability to put those strategies into practice due to the lack of interorganizational cooperation, medium- to long-term limited freedom of action in physical planning, and some issues with local decision making authorization.			Environmental, economic and social benefits of Kadıköy "Green Urbanization Strategy" were established, and the Strategy's aspects, such as engagement, communication, education, organization, funding, green procurement and supply, were set out. A "green dashboard" was prepared.		
	1	2	3	4	5	6	7	8	9

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