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# MODULE 4

Training for the Institutional Capacity Building  
on Climate Change Adaptation



REPUBLIC OF TURKEY  
MINISTRY OF ENVIRONMENT  
AND URBANISATION



Environment and Climate Action  
Sector Operational Programme



İKLİMİ DUY  
Millî İklim Değişikliği Kurumu

WEGlobal



**İKLİMİ DUY**

İklim Değişikliğine Uyum Eğitimi



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# KISALTMALAR

COP21	21 <sup>st</sup> Conference of the Parties
COP26	26 <sup>th</sup> Conference of the Parties
AIDS	Acquired Immunodeficiency Syndrome
ACC	Adaptation to climate change
AAAA	Addis Ababa Action Agenda
ACRI +	Advancing Climate Risk Insurance
TPİDR	Agricultural Policy Monitoring and Evaluation Report
NH <sub>3</sub>	Ammonia
MÜSİAD	Association of Independent Industrialists and Businessmen
BAP	Bali Action Plan
CBA	Benefit/Cost analysis
IPBES	Biodiversity and Ecosystem Services
BECCS	Bioenergy with carbon capture and storage
BEPA	Biomass Energy Potential Atlas
CO <sub>2</sub>	Carbon dioxide
CO	Carbon monoxide
CARICOM	Caribbean Community and Common Market
CDM	Clean Development Mechanism
CCAP	Climate Change Action Plan
CCAMCB	Climate Change and Air Management Coordination Board
CCCCB	Climate Change Coordination Board
CIF	Climate Investment Funds
CSP	Concentrated Solar Energy
COP	Conference of the Parties
YÖK	Council of Higher Education
CBM	Criteria-Based Matrix
KHK	Decree Having Force of Law
DAC	Development Assistance Committee
N <sub>2</sub> O	Dinitrogen monoxide
AFAD	Disaster and Emergency Management Authority
DMDSS	Disaster Management and Decision Support System
DRR	Disaster Risk Reduction
EFPRC	Economics and Foreign Policy Research Center

EEB	Ecosystems and Economics of Biodiversity
EÜAŞ	Electricity Generation Joint Stock Company
ECCF	Energy and Climate Change Foundation
EPİAŞ	Energy Markets Operation Joint Stock Company
TÜRÇEV	Environmental Education Foundation of Turkey
EIA	Environmental Impact Assessment
ADAPT	European Climate Adaptation Platform
ECF	European Climate Foundation
EU	European Union
EUEI PDF	European Union Energy Initiative Partnership Dialogue Facility
IPA	European Union Instrument for Pre-Accession Financial Assistance
FAOSTAT	Food and Agriculture Organization Institutional Statistical Database website
FCCC	Framework Convention on Climate Change
GAS	General Administration Services
OGM	General Directorate of Forestry
MGM	General Directorate of Meteorology
MTA	General Directorate of Mining Exploration and Research
BMZ	German Federal Ministry of Economic Cooperation and Development
GIZ	German International Cooperation Agency
GCM	Global climate models
GEF	Global Environment Facility
GHG	Greenhouse Gas
GDP	Gross Domestic Product
GNP	Gross National Product
GNP	Gross National Product
G-20	Group of 20 Finance Ministers and Central Bank Governors
HIV	Human Immunodeficiency Virus
HEPP	Hydroelectric Power Plant
HFA	Hyogo Framework for Action
ICRM	Integrated Climate Risk Management
INC	Intergovernmental Negotiation Committee
IPCC	Intergovernmental Panel on Climate Change
IMPACT	International Agricultural Production and Trade Policies Analysis Model
IAEA	International Atomic Energy Agency
ICD	International Disease Codes
FEE	International Environmental Education Foundation

ILO	International Labor Organization
IMF	International Monetary Fund
IOM	International Organization for Migration
IICEC	Istanbul International Energy and Climate Center
İPM	Istanbul Policy Center
km	Kilometer
LULUCF	Land use, land use change and forestry
LPG	Liquefied Petroleum Gas
CH <sub>4</sub>	Methane
BŞB	Metropolitan Municipality
MEA	Millennium Ecosystem Assessment
Mt	Million tons
MAF	Ministry of Agriculture and Forestry
ETKB	Ministry of Energy and Natural Resources
MEU	Ministry of Environment and Urbanization
MH	Ministry of Health
MEB	Ministry of National Education
M&E	Monitoring and Evaluation
MCA	Multi-Criteria Analysis
MCA	Multiple Criteria Analysis
NAP	National Adaptation Plan
NAPA	National Adaptation Programs
UİDEP	National Climate Change Action Plan
NCCS	National Climate Change Strategy
UİDS	National Climate Change Strategy
UDSEP	National Earthquake Strategy and Action Plan
IRAP	National Radiation Emergency Plan
INDC	Nationally Determined Contribution Intentions
NO <sub>x</sub>	Nitrogen Oxide
STK	Non-governmental Organisation
NMVOG	Non-Methane Volatile Organic Compounds
SO <sub>2</sub>	Non-Methane Volatile Organic Compounds
NPP	Nuclear Power Plants
GM	Observational Method
ODA	Official Development Assistance
RG	Official Gazette
ppm	One Part Per Million

OECD	Organisation for Economic Co-operation and Development
OIZ	Organized Industrial Zone
BOTAŞ	Petroleum Transport by Pipelines Joint Stock Company
PEST	Political, Economic, Social and Technological
DEM	Prime Ministry General Directorate of Disaster and Emergency Management
PDRRP	Provincial Disaster Risk Reduction Plan
PPGIS	Public Participation Geographic Information System
PPP	Purchasing Power Parities
REC	Regional Environmental Center
RERA	Renewable Energy Resource Areas
ETKB	Republic of Turkey Ministry of Energy and Natural Resources
RBPD	Risk Based Plan and Design
TÜBİTAK	Scientific and Technological Research Council of Turkey
SFDRR	Sendai Framework for Disaster Risk Reduction
KOBİ	Small and Medium Enterprises
SIS	Small Industrial Sites
SGK	Social Security Institution
SEPA	Solar Energy Potential Atlas
DPT	State Planning Organization
NACE	Statistical Classification of Economic Activities in the European Community
SEA	Strategic Environmental Assessment
SBB	Strategy and Budget Department
SWOT	Strengths and Weaknesses, Opportunities and Threats
SDG	Sustainable Development Goals
SEAP	Sustainable Energy Action Plan
TDZ	Technology Development Zones
Mtep	Ton equivalent oil
TFV	Total Factor Efficiency
DMSDAP	Turkey Disaster Management Strategy Document and Action Plan
TDRP	Turkey Disaster Response Plan
TKİ	Turkish Coal Enterprises
TEDAŞ	Turkish Electricity Distribution Corporation
TEİAŞ	Turkish Electricity Transmission Corporation
EPDK	Turkish Energy Market Regulatory Authority

TEMA	Turkish Foundation for Combating Erosion, Afforestation and Conservation of Natural Assets
TTK	Turkish Hard Coal Authority
TÜSİAD	Turkish Industrialists and Businessmen Association
TÜİK	Turkish Statistical Institute
UVR	Ultraviolet Radiation
TOBB	Union of Chambers and Commodity Exchanges of Turkey
TZOB	Union of Chambers of Agriculture of Turkey
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
FAO	United Nations Food and Agriculture Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNIC	United Nations Information Centers
UNICEF	United Nations International Children's Emergency Fund
UNDRR	United Nations Office for Disaster Risk Reduction
UNISDR	United Nations Office for Disaster Risk Reduction
UNFPA	United Nations Population Fund
UNHCR	United Nations Refugee Agency
UNV	United Nations Volunteers Program
UN WOMEN	United Nations Women's Unit
USD	United States Dollar
USA	United States of America
UDS	Urban Development Strategy
H <sub>2</sub> O	Water/Water Vapor
WWF	Wildlife Conservation Foundation
WCED	World Commission on Environment and Development
WFP	World Food Program
WHO	World Health Organization
WHO	World Health Organization
WMO	World Meteorological Organization
WPP	World Population Prospects
WTO	World Trade Organisation
WTTC	World Travel and Tourism Council

# EXECUTIVE SUMMARY

## 1. Infrastructure-Construction Policy in Turkey and Climate Change Adaptation

*Assoc. Prof. Dr. A. Ufuk Şahin*

Today's world is experiencing a very rapid change and transformation process. While the world population was around 6 billion in 1999, it has approached 7.8 billion by 2020 in just twenty years (WPP, 2019). While overpopulation increases the pressure on the limited resources, human activities such as industry, global trade, agriculture and tourism in the increasingly global world has a negative impact on the environment we live in at a rate that humanity has not experienced before. In the last few decades, climate change, which is a direct result of these activities, has gradually entered the agenda of the world public opinion. It has become important to take measures against the possible effects of climate change, from individual to society, from policymakers to international coordination and cooperation. In this context, this study will simply review the causes of climate change and give a summary about the possible effects of climate change on the construction sector. In addition, brief information will be given about what has been done and the projects planned to be implemented in order to provide an idea about the works in our country.

## 2. Ecosystem Services Policy in Turkey and Climate Change Adaptation

*Prof. Dr. Süha Berberoğlu*

Ecosystem services make human life possible with benefits such as providing food and clean water, regulating the climate, supporting the continuity of agricultural products and the soil. Standardization of ecosystem services in international literature studies has been handled within the scope of Millennium Ecosystem Assessment (MEA).

The National Climate Change Strategy (2010-2020) (NCCS) and National Climate Change Action Plan (2011-2023) (NCCAP) form the basis of the plans and policies

regarding ecosystems and nature conservation included in the reports that we are obliged to submit to the United Nations Framework Convention on Climate Change Secretariat.

Ecosystem services has been one of the five main topics in Turkey's Climate Change Adaptation Strategy and Action Plan (2011-2023), which is the first policy document of on the development of Turkey's capacity to adapt to the impacts of the climate change. These areas of vulnerability to climate change in Turkey, which are supported with technical and scientific studies were and recognized by participatory processes are; i) water resources management, ii) agriculture sector and food security, iii) ecosystem services, biologic diversity and forestry, iv) natural disaster risk management and v) human health.

### **3. Health Policy in Turkey and Climate Change Adaptation**

*Prof. Dr. E. Didem Evcı Kiraz*

The year 2010 should be taken as the starting point for Turkey's climate and health policies. The process, which was initiated with the financial support of WHO in 2010, accelerated with the publication of the “National Program and Action Plan for Reducing the Adverse Effects of Climate Change on Health” in 2015 with the contribution of the Ministry of Health, WHO and stakeholder institutions (Ministry of Environment and Urbanization, Ministry of National Education, Ministry of Agriculture and Forestry, AFAD, Ministry of Energy and Natural Resources, universities and other relevant public institutions and organizations). The national plan includes the objectives of reducing the effects of extreme weather events on human health, increasing institutional capacity and cooperation, fighting waterborne and foodborne diseases, ensuring that vulnerable groups are not affected, providing education and raising awareness. Continuing the activities through ongoing the training courses, developing and implementing monitoring and evaluation methodology, integration with other systems and national and international sharing activities will be beneficial in reducing the negative effects of the climate change on health.

## **4. Transportation Policy in Turkey and Climate Change Adaptation**

*Prof. Dr. Cem Soruşbay*

Turkey's transportation policy has been designed to establish a sustainable transportation system that contributes to the competitive power and the improvement of the life quality of the society and provides safe, accessible, economical, comfortable, fast, environmentally friendly, uninterrupted, balanced and contemporary services. It is required to develop and implement strategies in the transportation sector to reduce the effects of the climate events and the level of vulnerability to these events, to increase resistance to emerging risks and to manage these risks. The works within this scope are within the framework of the measures taken for the transportation system infrastructure and the operation of the system, in addition, support is provided to the harmonization studies with the developments in vehicle technology such as electric vehicles. Within the scope of the 11th Development Plan, "Establishing appropriate infrastructure for new generation vehicles" is considered as an important climate change mitigation and adaptation plan that reduces emissions by ensuring efficient use of energy. The use of public transportation systems in urban transportation also ensures reduction of emissions per person.

One of the main policies followed in the transportation sector is to reduce the share of road freight and passenger transportation and to achieve a balance between transportation modes by shifting this capacity to railway and maritime transportation. In addition, it is aimed to increase the combined transportation.

The implementation of sustainable transportation approaches in urban areas and the arrangement of the infrastructure of the transportation system in a way to protect it from the risks posed by the climate change are also among the targets.

## **5. Climate Change Adaptation in Turkey and its Social Aspects**

*Prof. Dr. İhsan Çiçek*

Türkiye karmaşık iklim yapısı içinde, özellikle küresel ısınmaya bağlı olarak görülebilecek bir iklim değişikliğinden en fazla etkilenecek ülkelerden birisidir. Türkiye'nin farklı bölgeleri iklim değişikliğinden farklı biçimde ve değişik boyutlarda etkilenecektir. Bu bölümde, iklim değişikliğinin sosyal boyutu ele alınmıştır. İklim elemanlarında görülen aşırılıklar kuraklık, sel ve fırtına gibi iklim kaynaklı doğal afetlerin sıklığını ve şiddetini artırarak ciddi ekonomik kayıplar, halk sağlığı sorunları, göçler gibi önemli sosyal etkilere yol açmaktadır. İklim değişikliğinin halk sağlığı, tarım, enerji üretimi, turizm gibi iklime duyarlı sektörler etkilere ve bu sektörlerin ekonomi içindeki payı ve iklim değişikliğinin iklime duyarlı olmayan sektörler üzerindeki dolaylı etkileri nedenleriyle uyum çalışmaları gerektiren önemli sosyal sorunlara da neden olmaktadır. Eğitimin bu kısmında genel olarak iklim değişikliğini ekonomik etkileri, halk sağlığı sorunları, turizm, denizler, balıkçılık, tarım, kentsel alt yapı, kıyı alanları, enerji üretimi üzerindeki baskılarından bahsedilmiş, bu alanlarda uygulanabilecek uyum çalışmalarından örnekler verilmiştir.

## **6. National and International Actors of Climate Change Adaptation Context**

*Prof. Dr. Mehmet Somuncu*

The long-term climate data of the General Directorate of Meteorology and the results of scientific studies based on these data show that climate change is being experienced in Turkey. Concrete indicators of climate change such as increase in average temperature, precipitation variability, extreme weather events and the reflection of these indicators on the natural environment and economic and social life mean that the negative effects due to climate change gradually increase. For this reason, plans and actions to adapt to the impacts of climate change are very important.

Adaptation to climate change requires all relevant actors, especially national, regional, local public and private sector organizations, non-governmental organizations, to develop an integrated approach within the framework of adaptation to climate change, and to cooperate in establishing policies and adaptation governance.

At the present, there are increasing number of actors influencing climate change policy or governance in Turkey. These actors can be divided into three groups: government-state (public sector), government-non-state actors, and international organizations. In the Presidential System of Government, government-state actors include primarily the Presidency in charge of the executive affairs, and the Policy Boards and Ministries working directly under the President of the Republic; the legislative body of the Turkish Grand National Assembly, public institutions and organizations affiliated to or related to ministries and bureaucrats and experts working in these organizations. On the other hand, non-Government/state actors are the private sector, non-governmental organizations and professional organizations that qualify as public institutions, academia and media. It is necessary to identify international organizations as a third group. Because international organizations are affiliated to the United Nations or established by agreement and have an intergovernmental character, they are between the two groups mentioned due to their functions close to the other two main actor groups.

The authorized ministry in charge of combating climate change in Turkey is the Ministry of Environment and Urbanization. This ministry carries out the task of national coordination on issues related to climate change and it is the National Focal Point responsible for the United Nations Framework Convention on Climate Change Secretariat. Although the Ministry of Environment and Urbanization is the principle authorized ministry in charge of combating climate change in Turkey, some other ministries and public institutions and organizations are also among the active actors in this field due to the multi-dimensional and multi-sectoral nature of climate change.

International organizations have had a significant role and weight in the development of climate policies and climate adaptation governance in Turkey from the very beginning. Among these are the United Nations Development Program (UNDP), Regional Environment Center (REC), UN Global Environment Fund (GEF) and the European Union and the EU Turkey Delegation representing it. The weight of the private sector, civil society, academia and media from nongovernment/state actors in climate change adaptation governance is gradually increasing.

## **7. Tourism Policy in Turkey and Climate Change Adaptation**

*Prof. Dr. Mehmet Somuncu*

Due to the reason that tourism is mainly based on natural resources, Turkey is a country that will be affected most by the direct impact of climate change and that will be at risk. Coastal tourism being the primary type, other types of tourism such as winter sports tourism are also affected by climate change and this impact is expected to increase further in the future. Therefore, identification of risks arising from climate change in Turkey's tourism and development of measures for it, namely adapting the sector to climate change is a necessary and urgent requirement. Indeed, in 2015 and 2016, due to some unfavorable situations experienced, there had been a significant decline in the number of visitors and tourism revenues in Turkey. According to the data of 2016, the number of tourists who visited Turkey decreased by 30.2 million while the international tourism revenues decreased approximately by 10 billion USD, down to 18.7 billion USD (UNWTO, 2018). The Covid19 epidemic, which has spread all over the world since its beginning in 2020, has affected our country in terms of the tourism sector as well as the whole world. Thus, it is inevitable that the tourism sector, which is vastly affected by such temporary unfavorable situations, will face more permanent unfavorable situations due to climate change. For this reason, adaptation and mitigation efforts and actions against the effects of climate change have vital importance for the tourism sector in Turkey. Only in this way, the threats of climate change on the sector can be transformed into opportunities. Even though climate change is identified as a threat to the tourism sector in official

meetings, ministerial-level studies and policy documents such as Development Plans, and recommendations are made for the solution of this problem, it cannot be said that sufficient efforts have been made at the sector level yet.

## **8. Industrial Production Policy in Turkey and Adaptation to the Climate Change**

*Prof. Dr. Mehmet Somuncu*

As in many other sectors, climate change affects the industrial sector in a direct and indirect manner. Clearly, the industrial sector also contributes to this effect with its emissions. It is a fact that the effects caused by climate change will continue for decades to come and we have to deal with this challenge. Industrial policies play a determining role in the increase or decrease of these effects, as in all sectors.

Industry sector in Turkey, which is expected to be exposed to large-scale and widespread effects of climate change, must adapt to this effect. Many methods exist in the industrial sector for adaptation to the climate change. Some of these methods are primarily related to mitigation. Nonetheless, mitigation and adaptation are not concepts that are alternative to one another. On the contrary, these are two complementary elements in combating climate change. "Clean (Sustainable) Production", conceptualized by the United Nations Environment Program (UNEP), stands out as an important approach in order for the sector to adapt to climate change. According to the definition of UNEP, clean production is "reducing the risks on people and the environment by applying a holistic and preventive environmental strategy to the production processes, products and services in a continuous manner". Three basic components of clean (sustainable) production are reduction of waste at source and reduction of resource consumption, re-utilization and/or recycling, and product modifications. As many examples reveal, in addition to providing adaptation to the climate change for the businesses or the entire sector, the method of clean production is shown to provide many environmental, economic and social benefits. Another method is "Eco-Industrial Parks", the examples of which are increasing, especially in developing and emerging economies. In this practice, there are benefits similar to the ones in clean production method.

## **9. Energy Policy in Turkey and Climate Change Adaptation**

*Prof. Dr. Levent Aydın*

By emphasizing the main features of the goal-based energy policies in government programs and strategic plans, especially the Development Plans, Annual Programs and the New Economy Program (Medium Term Program), and the energy-related strategy documents and policy documents prepared under the coordination of the Ministry of Energy and Natural Resources, main policies regarding energy are underlined on the basis of the 11<sup>th</sup> Development Plan. The climate change policies that started with the 8th Development Plan and later on continued to be included in the 9th, 10th and 11<sup>th</sup> Development Plans highlight the basic structure and properties of Turkey's Climate Change Policies Plans. Finally, the importance of coordinated action is emphasized that may be relevant in the energy sector when taken in conjunction with Turkey's energy policies climate change and adaptation.

## **10. National Adaptation Plan**

*Assoc. Prof. Dr. Çiğdem Coşkun Hepcan*

The National Adaptation Plan, which is one of the necessary conditions for achieving the global adaptation goal, is prepared by a large team of planners, implementers, direct and indirect beneficiaries under the leadership of the central government on the basis of the country's climate vulnerability and priorities in line with the adaptation strategies and action plans.

The plan includes the effects of the climate change on the country, the climate vulnerabilities of the sectoral and thematic areas, the risks and the urgent needs (priorities) for reducing these risks, the actions that develop solutions and the timelines for the implementation of the actions. These plans, which contain mitigation and adaptation actions together, develop practical ways to create climate resilience and benefit in all sectors against climate risks. This document includes the basic planning process and stages of the national adaptation plan.

## **11. Means and Ways of Policymaking and Financial Aspects on the Adaptation Policy**

*Prof. Dr. İlkay Dellal*

According to the United Nations Framework Convention on Climate Change, all parties to the convention are obliged to take climate change into account in their decisions and policies. Therefore, implementing climate change adaptation policies and harmonizing these policies with national policies is an obligation due to international agreements in addition to helping to reduce the effects of climate change, managing risks, and revealing opportunities. While giving place to climate change adaptation policies in a country, it should also be integrated with all policies of the country. This requires an approach that incorporates climate change adaptation into both policy and investment, financing issues, planning, and decision-making processes.

Since climate change is a development problem, adaptation policies are closely related to development policies and development planning. Development-oriented studies also provide benefits in the management of climate change risks. For example, activities such as reducing poverty, providing adequate and balanced nutrition, increasing the level of education, improving infrastructure, improving health, etc. within the framework of a country's development policy will also reduce sensitivity/vulnerability to climate change. For this reason, vertical integration at all sectors and levels is important to achieve the goal expected from adaptation policies.

With vertical integration, the aim is to have a system that covers all sectors of the country and integrates with development plans and with all levels national to local. Coordination of all relevant institutions is required for this.

The first step of the process of creating adaptation policies is to analyze climate sensitivities/vulnerabilities. It is necessary to know what the effect of climate change on the development of the country is and how it will affect development goals. The second step is to determine how the issue of adaptation to climate change can be

included in the current policies, plans, and budgets in the country, and where and what are the entry points to these. The third step is to change existing policies, plans, budgets according to adaptation activities. The last step is in practice. At this stage, it is the definition of who will be responsible, what resources and capacity will be required.

## **12. Prioritization of Adaptation Responses**

*Prof. Dr. İlkay Dellal*

There can be many adaptation responses that are currently used and potentially used to mitigate the negative impacts of climate change. Implementing all of these adaptation responses is not possible due to reasons such as cost, time, capacity, different purposes of the country, region, and sector. At the same time, the mitigation potentials and implementation processes of each of the adaptation responses are different from each other. On the other hand, a sector's adaptation response can also provide benefits or challenges for other sectors. For these reasons, it is imperative for decision-makers to choose among adaptation responses. In the selection of which adaptation responses can be applied at the national, regional, local, sectoral level, prioritizing according to a specific method is the most important factor for obtaining and increasing the expected benefit. Prioritizing them in accordance with the goals and objectives while making choices will not only minimize the negative effects of climate change but also allow more rational use of limited resources.

Prioritizing adaptation responses is the process of paying attention to specific compliance responses based on agreed indicators or criteria. Its main purpose is to evaluate compliance responses within a certain system and to rank them according to their importance in line with national financing criteria and investment framework. A wide variety of tools or methods can be used to prioritize adaptation responses, from simple to highly detailed techniques. By using the appropriate one of these tools, prioritization of adaptation responses can be made within the scope of needs, constraints, goals, objectives, time, cost, capacity in the country, region, or local unit.

Some tools that can be used for prioritization, in general, are as follows (GCF 2016): SWOT Analysis, Benefit/cost analysis, Multiple Criteria Analysis, PEST Analysis, MCA4climate prioritization tool developed by UNEP, OECD-DAC criteria developed by OECD to evaluate development projects, Criteria Based Matrix (CBM). The instrument to be selected in prioritizing the adaptation responses to climate change is decided by considering national, regional, local conditions, limitations, goals, targets, capacities, availability of data, etc. Using the selected tool and participatory approach, problems, goals, decision-making criteria, risks are determined, options are identified, evaluated, analyzed, and as a result of these evaluations, it is decided which adaptation responses can be applied in order of importance.

### **13. Disaster Management Policy in Turkey and Climate Change Adaptation**

*Prof. Dr. Aslı Akay*

It was demonstrated by the United Nations Office for Disaster Risk Reduction (UNDRR) and the Belgium-based Disaster Epidemiology Research Center that 90% of the large-scale disasters recorded in the last two decades were caused by weather-related events, 606 thousand people lost their lives, 4.1 billion people were injured and left homeless or in need of assistance as a result of 6,457 floods, storms, drought, hot weather, and other weather events. Between 2008 and 2012, 144 million people had to migrate from their places of residence due to disasters. Disasters, many of which are exacerbated by climate change, with increasing frequency and intensity, significantly impede progress towards sustainable development and increase the risk and exposure of natural and human systems. Most importantly, by causing new threats such as climate change, in other words, 'new risks arise in development'. Having increasing experience of both disaster risk reduction and adaptation to climate change (ACC) has brought the increasing acceptance of these two areas and sharing two common goals, which are to reduce the vulnerability of societies and contribute to sustainable development.

Disaster management is a qualitative or quantitative approach applied to determine the nature and extent of the risk by analyzing potential hazards, evaluating exposure and vulnerability conditions. Disaster risk management analyzes the extent of the

disaster, its technical character, and the location, probability, frequency, victimization, and vulnerability issues of the disaster. Disaster risk reduction (DRR) reduces exposure to hazards and people's vulnerability and improves preparedness against adverse events and management of residential areas and the environment. In many international documents, disaster risk management and disaster risk reduction are identified as the most important elements of adaptation to climate change, and risk reduction tools, methods, and policies are considered as the basis for revealing the risks of climate change.

Focusing on the driving forces of disaster risk in the United Nations Sendai Framework Document on Reducing Disaster Risks (2015-2030) emphasized that poverty, climate change, rapid urbanization, environmental degradation, and unqualified building stocks affect sustainable development. Approaches to managing climate change impacts must also consider reducing vulnerability under varying levels of risk. Therefore, a bridge must be established between disaster risk management efforts that aim to reduce the vulnerability due to meteorological disasters and climate change adaptation efforts. The assessments made within the scope of disaster risk reduction and adaptation to climate change require studies at different governance levels (international-national-regional-local) on how the society will adapt and integrate with the changing climate. In this context, holistic management of disaster risk requires technical preventive measures to mitigate their effects before, during and after the meteorological disasters and actions including socio-economic development aspects designed to reduce vulnerability to hazards.

Among others, these include the following;

- ▶ Encouraging the integration of disaster risk reduction and climate change adaptation strategies to reduce the risks associated with current climate variability and future climate change,
- ▶ Taking joint decisions by ministries and other public institutions and organizations to ensure consistency in adaptation to climate change and disaster risk reduction that occur at the local or sectoral level,
- ▶ Improving the adaptation capacity to reduce vulnerability from climate

change and increase resilience,

- ▶ Defining and providing financial resources that aim to reach the balance between climate change adaptation and disaster risk reduction,
- ▶ Development of integrated risk transfer mechanisms for DDR (Disaster Risk Reduction) and ACC (Adaptation to Climate Change) activities.

## **14. Agricultural Policy in Turkey and Climate Change Adaptation**

*Prof. Dr. Zeynep Zaimoğlu*

The effects of climate change on the agricultural sector have made the sustainability of agriculture difficult. The agricultural policies implemented by the countries vary according to their natural resources and economic conditions.

Risks in the sector have increased due to the agricultural policies, which have gradually become more and more vulnerable. In our country, the population-dependent change of the number of people who make a living from agriculture and the employment in agriculture constitutes a negative curve. The production in agriculture is becoming difficult because approximately 38.56% of the 77.8 million hectares area of Turkey is suitable for agriculture, and this rate is decreasing daily. Agricultural policy that is implemented in recent years has aimed to protect arable lands. Surely, yield rates in the cultivated agricultural lands also affect vulnerability. For agriculture to be sustainable and production to be continuous, policies should be regulated, and goals should be set according to climate change.

In terms of agriculture in our country, it can be said that the gross domestic product figures vary and there are risk factors associated with the lack of progress compared to developed countries in both livestock and agriculture industries. The Ministry of Agriculture and Forestry added the consequences of climate change risk factors to its plan in 2018.

However, Turkey should develop its strategy against climate change by taking each variable risk factor into account and adjust its policies accordingly. Raising awareness

of Turkey's location advantage and using it will bring positive results.

## **15. Water Management Policy in Turkey and Climate Change Adaptation**

*Prof. Dr. Erdem Görgün*

Turkey has climate types and precipitation regimes of different characteristics due to its geographical diversity. This situation is one of the main components that shape Turkey's water policies. Therefore, in the coming years it is expected that approaches such as basin-based water management, water allocation and use of inter-basin water transfer according to the purpose of the management of Turkey's water resources will be in the forefront. As Turkey is located in the semi-arid climate region, it is of great importance to ensure the improvement of water quality, increasing the amount of available water and the sustainability of conservation and balance of usage.

Development policies in Turkey show progress towards sustainable development. While the needs of the increasing population and changing consumption habits affect the development process, it is important to take into account the pressure caused on the environment. In this context, the number of studies conducted in our country is increasing day by day. In addition to national-scale strategy, development and development plans, there are various action plans directly or indirectly related to water management in institutions and organizations that have authority and responsibility in water management. With the support of institutions and organizations on water management, raising awareness on climate change and examining the adaptation measures that can be taken are important in minimizing the effects of climate change today and in the future.

# INFRASTRUCTURE-CONSTRUCTION POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

*Assoc. Prof. Dr. A. Ufuk Şahin*



# 1. INTRODUCTION

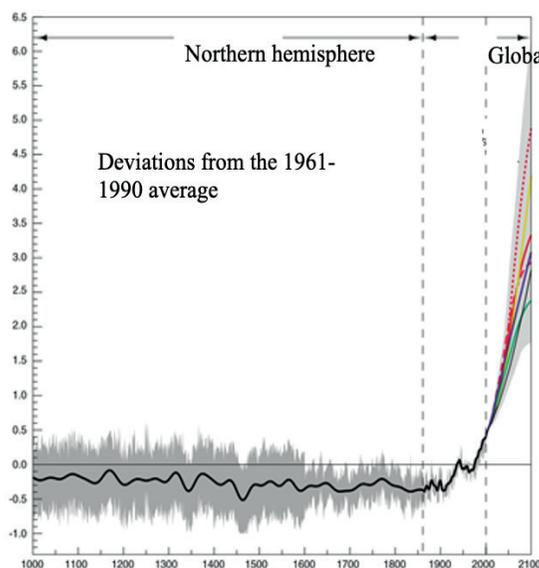
Today's world is experiencing a very rapid change and transformation process. While the world population was around 6 billion in 1999, it has approached 7,8 billion by 2020 in just two decades (WPP, 2019). While the increase of population puts pressure on the limited resources, human mobility such as industry, global trade, agriculture and tourism in the increasingly global world has a negative impact on the environment we live in at a rate that humanity has not experienced before. In the last few decades, climate change, which is a direct result of this dynamism, has gradually entered the agenda of the world public opinion. It has become important to take measures against the possible effects of climate change, from individual to society, from policy makers to international coordination and cooperation. In this context, this study will simply review the causes of climate change and give a summary about the possible effects of climate change on the construction sector. In addition, brief information will be given about what has been done and the projects planned to be done in order to provide an idea about the work in our country.



## 2. WHAT IS CLIMATE CHANGE?

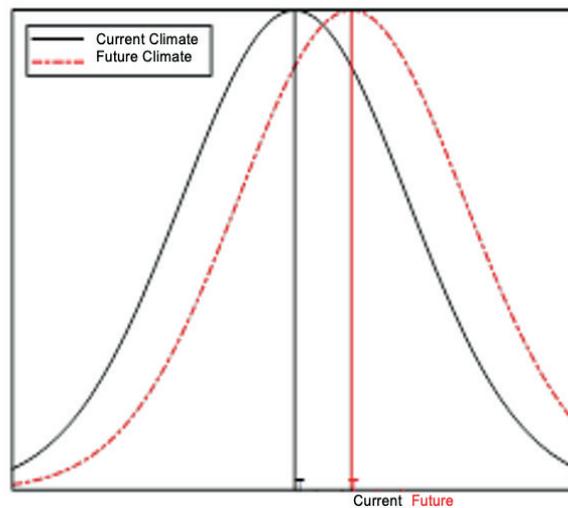
It is now undeniably accepted by the public that air quality has deteriorated due to human-induced activities, deforestation has increased, land and land-use has changed, freshwater resources are gradually decreasing, and natural life is confined to a narrow space. As the simplest result of these activities, the number of gases such as water vapor ( $H_2O$ ), carbon dioxide ( $CO_2$ ), methane ( $CH_4$ ) and nitrous oxide ( $N_2O$ ), which are called greenhouse gases, increase (Stainforth et al., 2005). Compared to the period before the industrial revolution, the amount of carbon dioxide ( $CO_2$ ) increased from 280 ppm in 1750 to 415 ppm in 2019 (Shieber, 2019). As a result of the increase in the number of greenhouse gases in the atmosphere, temperature values on the world are increasing. Figure 1 shows temperature increases according to various assumptions and scenarios. Today's average temperature values are about  $1^\circ C$  warmer than 100 years ago, higher than every 1000 years ago. The temperature estimates for 2100 will be 1,4 and  $5,8^\circ C$  higher than the values in 1990, the fastest temperature increases since the Ice Age 10000 years ago (IPCC, 2001).

**Figure 1:** Temperature change between 1000-2100 years (adapted from IPCC (2001))



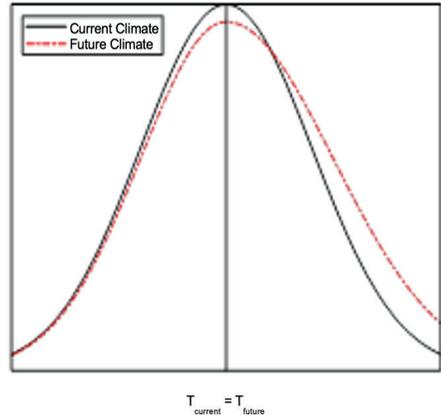
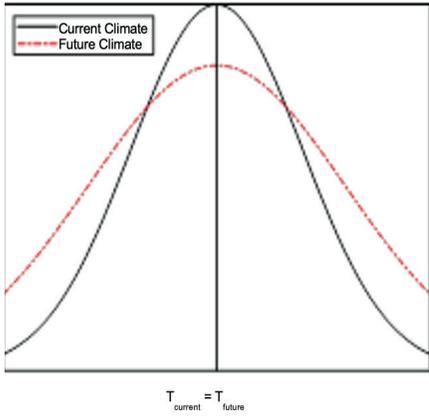
As a result of temperature increases, the water cycle is disrupted, rainfall character can change and cause climate change. Temperature distributions may change according to different climate change scenarios. Figure 2 shows a scenario where the temperature average distribution does not change, but only the average value increases, that is, the distribution curve shifts to the right. In this case, less cold air, more warmer air can be observed. If such a scenario occurs, how infrastructure design principles change the question should be discussed.

**Figure 2:** Scenario where the average distribution does not change (adapted from IPCC 2012).



Similarly, according to the scenario wherein the average temperature values do not change but the temperature distribution changes (Figure 3a and b), it is necessary for the expert to analyze how the infrastructure designs will be affected and the design paradigm will change.

**Figure 3:** Various climate scenarios a. Falling peak temperature value b. Changing temperature distribution curve



## 3. POSSIBLE IMPACTS OF CLIMATE CHANGE ON THE CONSTRUCTION SECTOR

As mentioned in the previous section, climate change scenarios will have various effects on infrastructure construction activities. Impacts on the construction sector can be examined under the general headings of Water Resources and Water Supply, Coasts and Port Structures, Transport, Transportation and Logistics, All kinds of structures, Cold / Hot Areas and Materials, Energy Supply and Structures, Labor/ security. For more comprehensive information on this subject, Olsen's (2015) study can be used.

### 3.1. Water Resources and Water Supply

The most likely result of temperature increases will be the increase in evaporation rate and amount, change in precipitation regime and amount when taken together with other factors such as intensive urbanization, deforestation, change in land use. For example, evaporation may increase while overall precipitation decreases in a particular area. This situation can create serious pressure on the water resources of that region. On the other hand, with the effect of urbanization, surface flows to increase and the feeding of groundwater resources may decrease. The water cycle can be disrupted by the direct and indirect effects of climate change. As a result, precipitation regimes may change. In recent years, the number of short-term but very heavy rains with supercell effect and urban floods has been increasing. Considering all these impacts, the design conditions of infrastructures such as dams, rainwater, drainage, water pipelines, flood dams and prevention structures and related regulations should be reviewed according to climate changes. Table 1 summarizes the possible effects of climate change on water resources.

**Table 1:** Climate change in terms of water resources

Reason	Possible Result	Sector Effect
<ul style="list-style-type: none"> <li>• Temperature increase</li> <li>• Changing precipitation rate, intensity, duration</li> </ul>	<ul style="list-style-type: none"> <li>• Increased evaporation</li> <li>• Change of precipitation character</li> <li>• Flood</li> <li>• Increased runoff in cities</li> <li>• Disruption of the water cycle</li> <li>• Pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Change of Basin Action / Protection Plans</li> <li>• Changing the design principles of stormwater lines</li> <li>• Change of dam dead space etc. design principles</li> <li>• Changing city infrastructure plans</li> <li>• Changing Flood Protection Plans</li> </ul>

### 3.2. Coasts and Port Structures

Some possible problems such as the increase in water level as a result of climatic parameters such as temperature increase, precipitation regime change, coastal degradation, coastal erosion, landslides, saltwater intrusion are important for the coasts and port structures summarized in Table 2. Structural and non-structural precautions should be taken to protect the coasts. In addition, according to climate projections, various measures can be taken on the basis of the regulation, if necessary, against sediment transport such as breakwaters, ports, bridge piers and scouring.

**Table 2:** Climate change in terms of Coasts and Ports

Reason	Possible Result	Sector Effect
<ul style="list-style-type: none"> <li>• Temperature increase</li> <li>• Changing precipitation rate, intensity, duration</li> </ul>	<ul style="list-style-type: none"> <li>• Increase in water level</li> <li>• Flood</li> <li>• Disruption of the coastal line</li> <li>• Erosion;</li> <li>• Landslides</li> <li>• Salinity problem</li> </ul>	<ul style="list-style-type: none"> <li>• Sediment transport and deposition calculations</li> <li>• Changing the design principles of harbor/breakwater structures</li> <li>• Coastal zone water resources protection plans</li> <li>• Changing Flood Protection Plans</li> </ul>

### 3.3. Transport, Transportation and Logistics

Table 3 summarizes the possible effects of climate change on the transport and logistics sector. For example, temperature increases can increase the thermal load on highways. In addition, heavy rainfall will cause drainage problems. As a result, the service life and quality of that road will be adversely affected. Increasing the frequency of adverse weather conditions will cause the flow of transportation and related commercial problems. The least impact of weather conditions on existing transportation will undoubtedly bring new infrastructure solutions and design principles.

**Table 3:** Climate change in terms of Transport, Transportation and Logistics

Reason	Possible Result	Sector Effect
<ul style="list-style-type: none"> <li>• Temperature increase</li> <li>• Changing precipitation rate, intensity, duration</li> <li>• Wind speed, strength</li> </ul>	<ul style="list-style-type: none"> <li>• Thermal Load</li> <li>• Flood</li> <li>• Erosion;</li> <li>• Landslides</li> <li>• Transportation disruption</li> <li>• Change of freeze-thaw cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Sediment transport and deposition calculations</li> <li>• Carving of bridge abutments</li> <li>• Foundation Problems</li> <li>• Drainage Issues</li> <li>• Road safety and maintenance/operation</li> <li>• Change of airport, railway and road design principles</li> </ul>

### 3.4. All kinds of structures

Climate change brings along changes in regional weather conditions and statistical distribution. For example, the change in thermal load, the change in the freeze-thaw cycle indicates that buildings such as steel and reinforced concrete in various climatic zones should be re-evaluated in terms of design, insulation, service quality and life (see. Table 4) In addition, with the effect of urbanization, the formation of inner-city heat islets triggers supercell formations.

**Table 4:** Climate change for all types of buildings

Reason	Possible Result	Sector Effect
<ul style="list-style-type: none"> <li>• Temperature increase</li> <li>• Changing precipitation rate, intensity, duration</li> <li>• Wind speed, strength</li> <li>• Atmospheric Conditions (air quality)</li> </ul>	<ul style="list-style-type: none"> <li>• Thermal Load</li> <li>• Wind Load</li> <li>• Formation of heat islets in cities</li> <li>• Change of freeze-thaw cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Thermal load effect on designs</li> <li>• Changing the design principles of steel structures</li> <li>• Strength problems</li> <li>• Corrosion</li> <li>• Insulation issues</li> <li>• Structure service life and quality</li> </ul>

### 3.5. Hot / Cold Zones and Material

Although there are no very cold /permafrost regions for our country, due to the high probability of the occurrence of very hot regions, the possible effects of climate change are given in Table 5, together with the information tried to be summarized before.

**Table 5:** Climate change in terms of hot / cold regions and materials

Reason	Possible Result	Sector Effect
<ul style="list-style-type: none"> <li>• Temperature increase</li> <li>• Extreme Atmospheric Conditions</li> <li>• Emission Gases (air quality)</li> </ul>	<ul style="list-style-type: none"> <li>• Thermal Load</li> <li>• Change of freeze-thaw cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Strength problems</li> <li>• Corrosion</li> <li>• Structure service life and quality</li> </ul>

### 3.6. Energy Supply and Structures

The designs, service life and quality of power generation facilities, including major infrastructure facilities, can also be affected by climate change. For example, while disaster situations such as heavy precipitation character, flood, etc. may affect the design of dam structures, factors such as prevailing wind direction and intensity, thermal load are important in terms of operation, maintenance and efficiency

of renewable energy facilities such as wind and solar. Table 6 shows how energy infrastructure facilities can be affected.

**Table 6:** Climate change in terms of Energy Supply and Structures

Reason	Possible Result	Sector Effect
<ul style="list-style-type: none"> <li>• Temperature increase</li> <li>• Extreme Atmospheric Conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Thermal Load</li> <li>• Change of freeze-thaw cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Strength problems</li> <li>• Corrosion</li> <li>• Structure service life and quality</li> </ul>

### 3.7. Labor / safety

Although it is not a direct result of climate change, migration and demographic change that may develop as a result of the consequences such as drought, famine etc. may adversely affect the workforce in the construction sector. In addition, weather can threaten working conditions and job security. Table 7 summarizes this situation.

**Table 6:** Climate change in terms of Labor / Safety

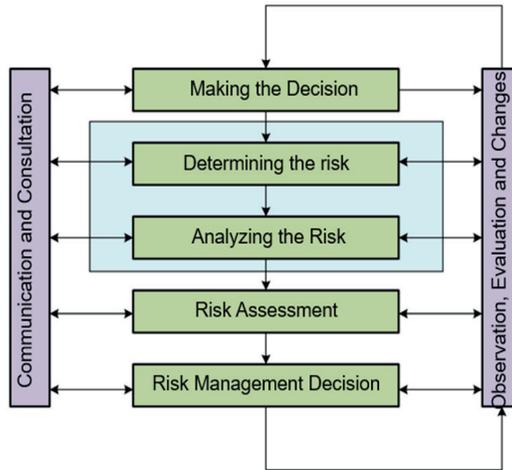
Reason	Possible Result	Sector Effect
<ul style="list-style-type: none"> <li>• Temperature increase</li> <li>• Extreme Atmospheric Conditions</li> <li>• Emission Gases (air quality)</li> </ul>	<ul style="list-style-type: none"> <li>• Migration</li> <li>• Famine</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy working environment</li> <li>• Carelessness and increased work accidents</li> <li>• Increasing income inequality</li> <li>• Loss of job security</li> <li>• Disruption of social justice</li> </ul>



## 4. CLIMATE CHANGE AND ENGINEERING APPROACHES

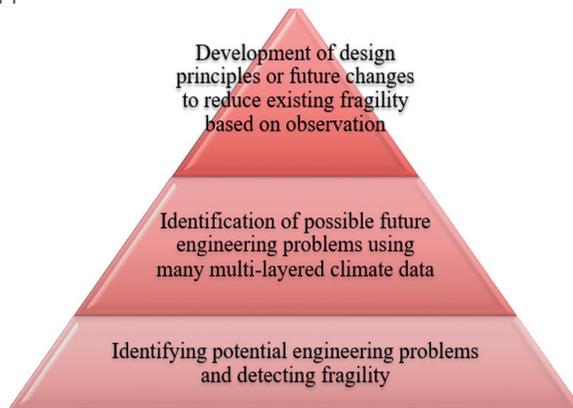
The engineering success and quality of an infrastructure facility depends on its long-lasting and sustainable relationship with the environment, meeting the possible effects of climate change, and meeting the needs of the future despite the regional and temporal uncertainty of climate change parameters. In the traditional sense, a structure is designed according to the Observational Method (GM) principle. GM is a continuous, manageable, holistic design process, manufacturing control, inspection and evaluation that can assist with the fabrication of the structure and subsequent predefined changes (UK CIRIA, 1999). Accordingly, an infrastructure should be designed according to the most probable climatic conditions. However, the most likely climatic conditions are highly controversial in climate change. In addition, action plans should be in place for predictable undesirable deviations from the most likely climatic conditions. Since many projects do not have such plans, GM's weakest link is the reaction to these deviations. On the other hand, unlike GM, Risk-Based Plan and Design (RTPT) are very beneficial for climate change. Risk is defined as the results of uncertain future events and the measure of the most likely occurrence. In this approach, the answers to the questions such as what could happen, what could go wrong, with what probability, if any, what would the results be, are sought. For example, when we consider the scenario involving the increase in temperature/emission values, RTPT needs to seek comprehensive answers such as what the impacts of this situation may be in the infrastructure and construction sector, are the current designs regulations inadequate, how often these conditions occur, how design should be done. Another important point here is how risk should be managed when uncertainty is so high. In accordance with the risk management scheme shown in Figure 4, determining the risk (e.g. the effect of temperature/emission increase on the residential production sector), analyzing the risk (possible outcome column in Tables 4 and 5), assessment of the risk (the possible outcome in Tables 4 and 5), change of design regulations and cost can be followed along with making the decisions and the interaction, communication, observation and evaluations with experts, contractors, politicians and non-governmental organizations.

**Figure 4:** Risk Management Scheme



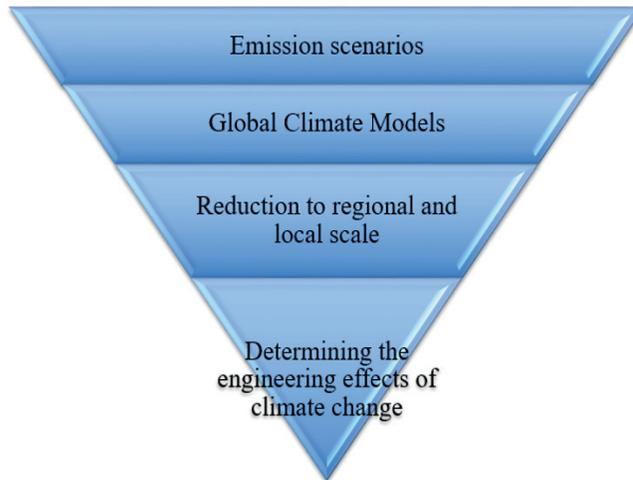
In any design, there are generally two dominant approaches. The first one, the Bottom-Up approach, is an approach focused on producing solutions according to the problem. Specific to climate change, a problem-solving approach that is increasingly specialized and includes issues such as identifying potential engineering problems and determining fragility, detecting possible future engineering problems by using many multi-layered climate data, developing design principles to reduce existing fragility or making future changes based on observations, is summarized in Figure 5. In fact, this approach can be compared to the change in earthquake regulations in the light of new information acquired after the earthquake.

**Figure 5:** Bottom-Up Approach



On the other hand, considering climate change and its more holistic aspects, the Top-Down approach, which includes stages such as emission scenarios, global climate models, reduction to regional and local scale, and determination of the engineering effects of climate change, is general and more inclusive (see Figure 6).

**Figure 6:** Top-Down Approach



## 5. STRATEGY ON CLIMATE CHANGE IN TURKEY, GOALS AND POLICIES

In the 11<sup>th</sup> Development Plan envisaged for the years 2019-2023, climate change and infrastructure targets are stated under various headings (11<sup>th</sup> Development Plan). In addition, the Climate Change Action Plan 2011-2023 prepared by the Ministry of Environment and Urbanization, has action plans prepared by various organizations (MEU 2011, RTCCAP 2011-2023). The 11<sup>th</sup> Development Plan is important in terms of determining the short and medium goals of our country, as it constitutes a basis and is prepared by comprehensive specialized committees. In the Development Plan, the following statements are included:

“714. International climate change negotiations will be carried out within the framework of the Intended National Contribution, with the principles of common but differentiated responsibilities and relative capabilities, combating climate change in sectors that cause greenhouse gas emissions within national conditions and increasing the capacity of the economy and society to adapt to climate change, this it will be possible to increase the resilience of the economy and society to climate risks.

“714.1. Studies will be carried out within the framework of the Intended National Contribution for emission control in buildings that cause greenhouse gas emissions and in the energy, industry, transportation, waste, agriculture and forestry sectors.

“714.2. Planning, implementation and capacity building studies, which include national and regional adaptation strategies, will be carried out to increase the capacity to adapt to the adverse effects of climate change.

“714.3. In order to adapt to climate change and take the necessary measures, needs will be determined at the regional and city scale and solutions will be determined, and Climate Change Action Plans will be prepared for 7 Regions, particularly the Black Sea Region.

“715. Air quality management practices will be activated to prevent air pollution caused by production, heating and traffic, and air quality will be improved by controlling emissions. ”

In the light of these goals, the legislation, of which only a simple summary is given below, may need to be updated according to climate change:

- ▶ Water Structures Inspection Services Regulation dated 12/05/2015
- ▶ Planned Areas Zoning Regulation dated 3/7/2017
- ▶ Regulation on Design, Calculation and Construction Principles of Steel Structures dated 1/9/2016
- ▶ Water Insulation in Buildings Regulation dated 27/10/2017
- ▶ Building Materials Regulation dated 10/7/2013
- ▶ Energy Performance in Buildings Regulation dated 5/12/2008



## 6. CONCLUSION

Climate change affects the construction/infrastructure sector in almost every aspect. Versatile research should be done to prevent the disruption of infrastructure services. Collaboration between stakeholders should be increased. Measurement, monitoring and forecasting results should be accessible to stakeholders and the public to reduce data uncertainty. Infrastructure legislation should be reviewed and adaptations made to include the effects of climate change.

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# ECOSYSTEM SERVICES POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

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# 1. INTRODUCTION

Ecosystem services make human life possible with its benefits such as providing food and clean water, regulating the climate, supporting the continuity of agricultural products and soil (Burkhard et al., 2012; Costanza et al., 2014).

The current use of the term ecosystem services was introduced by Paul and Anne Ehrlich in 1981 with the book titled "Extinction: The Causes and Consequences of the Disappearance of Species". Focusing on the causes and consequences of species extinction, this study underlined that the possibility of species extinction is a precursor to the extinction of the services provided by the ecosystem (Liu et al. 2010; Schröter, 2015).

While studies between 1960-1970 focused on ecosystem functions that serve human beings, studies covering the years 1970-1980 focused on the conservation of biodiversity and the ecological and economic consequences caused by human pressure on ecosystems. The most important step that enabled ecology and economics disciplines to come together on common ground was the effort to build a bridge that filled the interdisciplinary gap with the "Integrating Ecology and Economics" symposium in 1982. One of the most important outputs of this symposium is the publication of the "Ecological Economics" magazine in collaboration with ecologist Robert Costanza and economist Herman Daly (Voora & Venema, 2008).

In parallel with these developments, the United Nations (UN) established the World Commission on Environment and Development (WCED) in 1987 to determine the relationship between environment and global development. The report named "Our Common Future" prepared by the WCED commission has been presented to the public. This report, known as our common future and Brundtland report, determined the definition and scope of the sustainability principle. In order to increase the harmony between human and nature, it is aimed to ensure coordination between natural resources, economic, social, production, technology

and management systems. The report, which combines the development-centered approach of the 1960s with the environmentalist approach of the 1970s, is very important in terms of not only having an economic content but also addressing the development phenomenon with a wider framework and emphasizing the concept of intergenerational justice (Bozlağan, 2005: WCED, 1987). Costanza and Daly, in their article "Natural Capital and Sustainable Development" published with the union in 1992, evaluated how to close the gap arising from the resources used for natural capital, how to measure ecosystem services and the discount rate in the valuation of natural capital.

Studies on ecosystem products and services have increased after 1980. Many ecosystem services have been defined and categorized in these studies conducted independently from each other. Ecosystem services are included in different categories in different studies. The standardization of ecosystem services in international literature studies is handled within the scope of the Millennium Ecosystem Assessment (MEA). MEA aims to create a common terminology and platform at the global level by developing individual and regional studies on ecosystem services. This initiative was initiated in order to meet human needs, to evaluate the consequences of changing ecosystems in terms of human welfare and to determine the measures that can be taken to protect the ecosystem. MEA studies, which first started in 2000, are now supported by many governments, the private sector, environmental organizations and scientists (MEA, 2003). Accordingly, the ecosystem categories created by MEA are frequently used in international literature studies (Table 1).

## 2. ECOSYSTEM SERVICES

Ecosystem services enable human life, for example, by providing nutritious food and clean water, regulating disease and climate, supporting plant pollination and soil formation, and providing recreational, cultural and spiritual benefits. Despite their estimated value of \$ 125 trillion, these assets are not sufficiently disclosed in political and economic policy, which means there is insufficient investment in their protection and management.

Biodiversity determines the diversity within and between species and ecosystems. Changes in biodiversity can affect the supply of ecosystem services. Biodiversity should be preserved and managed sustainably as in ecosystem services (FAO, 2020).

Ecosystem services,

- ▶ It is an approach that supports sustainable development in environmental planning studies,
- ▶ and takes care of human well-being and does not ignore ecological concerns (MEA, 2005) (Figure 1).

**Figure 1:** Ecosystem products and services in different categories

<b>Daily et al. (1977)</b>		<b>Costanza et al. (1977)</b>	
<b>MEA (2003)</b>		<b>TEEB(2009)</b>	
<b>CICES(2013)</b>		<b>CICES(2013)</b>	
REGULATORY SERVICES	*Climate regulation *Disease regulation *Water regulation *Water treatment	REGULATORY SERVICES	*Air purification *Climate change regulation *Softening extreme events *Regulation of water flow *Waste treatment *Water treatment *Erosion control *Pollination *Biological control
SUPPORT SERVICES	*Soil formation *Nutrient cycle *Primary production	SUPPORT SERVICES	*Food *Water quality *Raw material *Genetic resources *Drug source *Ornamental plant source
SUPPLY SERVICES	*Food *Fresh water *Firewood *Fiber *Biochemical *Genetic resource	SUPPLY SERVICES	*Nutrition *Material *Biomass *Water (drinking) *Energy
CULTURAL SERVICES	*Recreation *Ecotourism *Aesthetic *Education *Cultural heritage	CULTURAL SERVICES	*Aesthetic *Recreation *Ecotourism *Cultural values
REGULATORY AND MAINTENANCE SERVICE		REGULATORY AND MAINTENANCE SERVICE	*Mass, gas, liquid flows through biota *Habitat gene pool protection *Disease, pest control *Soil formation *Water (chemical state of fresh and salt water) *Climate regulation
CULTURAL SERVICES		CULTURAL SERVICES	*Physical interaction experiences *Aesthetic *Heritage *Entertainment *Education *Science

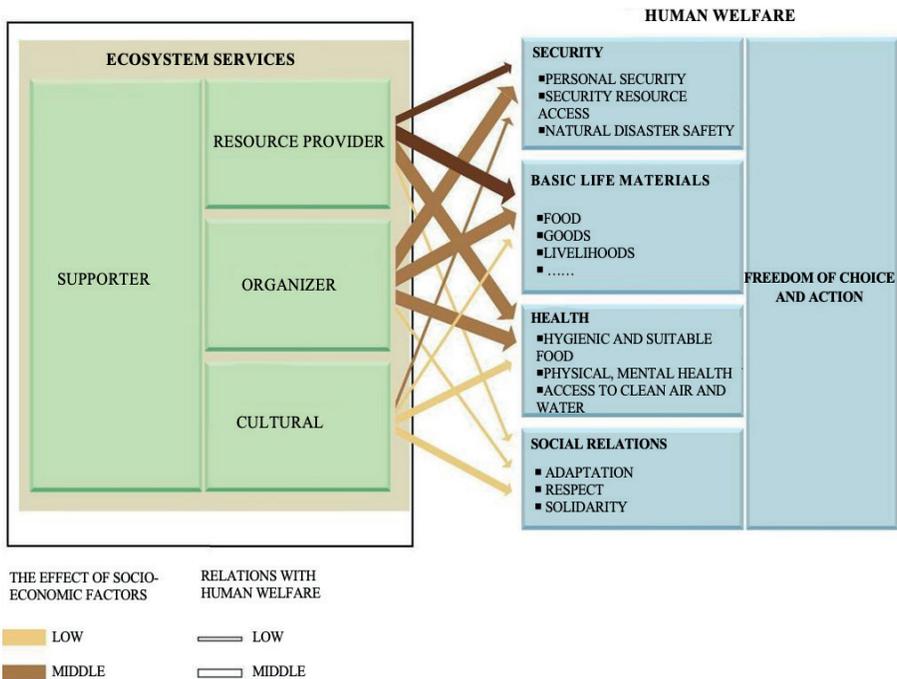
Benefits of Ecosystem Services;

- ▶ Water treatment and reducing soil pollutants,
- ▶ Regulating the climate,

- ▶ Carbon sequestration,
- ▶ Providing the food cycle,
- ▶ Food and fuel supply,
- ▶ Protection of habitat and biodiversity,
- ▶ Flood regulation,
- ▶ Providing structural material,
- ▶ Genetic resources and drug supply (FAO, 2020).

Ecosystems provide four types of services; Agriculture, forestry and fisheries affect all types of ecosystem services. According to the typology of The Economics of Ecosystems and Biodiversity-TEEB, the interaction between different production systems and ecosystem service types has been revealed.

**Figure 2:** The relationships of ecosystem services with human well-being



Resource: Millennium ecosystem assessment, 2005

## 2.1. Provisioning (Supply) services

Ecosystem services that describe the material or energy outputs from ecosystems. These include food, water, and other resources.

### Food:

The world is currently producing enough to feed a global population of 7 billion people. Today, the world produces 17% more food per person than 30 years ago, and the rate of production has increased faster than the population in the past two decades. With the intensification of agriculture, it has become critical to benefit from the benefits of ecosystem services for sustainable agriculture.

- ▶ Agricultural products, wild herbs, honey, etc.
- ▶ Livestock provides about a third of humanity's protein intake.
- ▶ The capture and culture of marine and freshwater fish adds significant amounts of animal protein to people's diets around the world.

### Raw materials:

- ▶ Biofuels and fibers from wood, wild or cultivated plant or animal species
- ▶ Livestock provides different types of raw materials such as bone (wool, mohair), leather used in feed and food industries.

### Clean water:

Ecosystems play a vital role in maintaining the flow and storage of fresh water.

- ▶ Agricultural products are heavily dependent on fresh water, as approximately 60% of the world's freshwater consumption is for irrigation uses.
- ▶ Livestock is an important user of fresh water resources. This water footprint comes mostly from the feed they consume. It is estimated that live animals use 15% of global agricultural water.

- ▶ Sustainable fisheries management and aquaculture can support the supply of fresh water from aquatic ecosystems.
- ▶ Forests help maintain healthy water ecosystems and provide reliable sources of clean fresh water. Forests not only filter and clean water, but they also help prevent soil erosion, reduce sedimentation in reservoirs, and reduce the risk of landslides, sludge runoff and flooding, all the problems that runoff can create.

### **Medicin resources:**

Natural ecosystems provide a variety of plants and fungi that offer effective treatments for many health problems. They are used to develop drugs in popular and traditional medicine.

- ▶ The meadows are home to a variety of medicinal plants.
- ▶ Various aquatic plants and animals are used in traditional medicine, such as seahorses, starfish, sea urchins and sea cucumbers. Algae are a rich source of beta carotene and other carotenoids widely used in pharmaceuticals.

## **2.2. Regulating services**

They are services that regulate ecosystems by regulating the quality of air and soil or by controlling flood and disease.

### **Local Climate Air Quality:**

Ecosystems affect local climate and air quality.

- ▶ Air pollutants have an impact on agricultural products, including annual and perennial species, because they can influence the processes that control or alter growth and reproduction in individual plants, thus affecting yield.
- ▶ Livestock can have a negative impact on local air quality, especially through ammonia (NH<sub>3</sub>) emissions from high-density livestock systems.
- ▶ Trees can affect air quality in the following ways: (i) converting carbon

dioxide into oxygen by photosynthesis; (ii) cutting particulate pollutants (dust, ash, pollen and smoke) and absorbing toxic gases such as ozone, sulfur dioxide and nitrogen, (iii) emission of various volatile organic compounds that contribute to ozone generation in cities (iv) lowering local air temperatures (v) reducing the extremes of building temperature in both summer and winter, and consequently reducing pollution emissions from power generation facilities.

### **Carbon sequestration and storage:**

Ecosystems regulate the global climate by storing greenhouse gases.

- ▶ Land use conversions and tillage have been an important source of greenhouse gas (GHG) into the atmosphere. It is estimated that they are responsible for about a third of greenhouse gas emissions. However, advanced farming practices help reduce climate change by reducing emissions from agriculture and other sources and by storing carbon in plant biomass and soils.
- ▶ Some of the greenhouse gas emissions from livestock are directly and indirectly related to land-use change affecting carbon stocks in soil and vegetation and their potential for sequestration.
- ▶ Oceans currently take about a third of the excess CO<sub>2</sub> released into the air, and about 93% of the carbon dioxide on earth is stored in the oceans.

### **Natural disasters:**

Ecosystems and living organisms buffer against natural disasters. They reduce damage from floods, storms, tsunamis, avalanches, landslides and drought.

- ▶ Increasing climate variability in recent years has led to drought problems in agricultural systems at all stages of growth and thus affecting crop yield.
- ▶ Livestock is affected more by events such as drought. In a world threatened by climate change, breeds resistant to drought, extreme heat, or tropical diseases are of great importance.

- ▶ Extreme weather events and natural disasters pose an increasing threat to the world's forests.

### **Waste water treatment:**

Ecosystems such as wetlands filter wastewater, decompose wastes through the biological activity of microorganisms, and eliminate harmful pathogens.

- ▶ Agricultural waste is a major source of water pollution. Farming systems can be designed to promote wastewater treatment through wetlands or buffer strips.
- ▶ Livestock produces waste water and can cause water pollution.
- ▶ Trees contribute greatly to wastewater treatment, thanks to their role in their root systems and nutrient cycles.

### **Prevention of erosion and protection of soil fertility:**

- ▶ Vegetation prevents soil erosion and ensures soil fertility through natural biological processes such as nitrogen fixation. Soil erosion is an important factor in the process of land degradation, loss of soil fertility and desertification. Efforts to restore the fertility of degraded soils should be combined with other measures affecting land conservation practices (particularly conservation agriculture, good agricultural practices and irrigation management, and integrated plant nutrient management).
- ▶ Animal excrement is an important food source in stripped grasslands and crop areas, especially in developing countries, and maintains soil fertility.
- ▶ It minimizes soil erosion along rivers, lakes and coastal areas.

### **Pollination:**

Insects and wind pollinate plants and trees essential for the development of fruit, vegetables and seeds. Animal pollination is an ecosystem service provided mainly by insects but also by some birds and bats.

- ▶ In agricultural ecosystems, pollinators are essential for orchard, horticulture and forage production, as well as for many root and fiber crops and seeds production. Pollinators such as bees, birds and bats affect 35% of the world's vegetative production and increase approximately 75% of the world's leading food products.
- ▶ Natural forests are an important habitat for pollinators that provide shelter and food.

### **Biological control:**

Activities of predators and parasites in moving ecosystems to control potential pest and disease vector populations.

- ▶ Agricultural production is based not only on products but also on biodiversity in agricultural ecosystems. Pests, diseases and weeds limit production.
- ▶ Animal diseases cause heavy economic losses both at the level of individual farmers and at the national or regional level.
- ▶ Naturally or sustainably managed forests are also a source of natural pest destroyers.

### **Regulation of Water Flow**

Water flow regulation is an essential service provided by land cover and configuration.

- ▶ Agriculture is a large water consumer and also has strong effects on water flow regulation.
- ▶ Grassland management is an important mechanism for controlling both floods and water flows.
- ▶ Forests affect the amount of water available and the timing of water distribution. Regulation of streamflow by forests is provided by the forest canopy, surface and underground processes of transpiration, evaporation and infiltration.



## 2.3. Supporting services

These are the services that preserve species diversity and genetic diversity for the production of all other ecosystem services, for example by providing habitats for plants and animals.

### **Habitat:**

Ecosystems provide habitats for plants and animals; they also maintain a variety of complex processes that support other ecosystem services.

- ▶ Semi-natural meadows are among the habitats with the highest levels of biodiversity. Comprehensive livestock management is the only way to protect these habitats.
- ▶ Major pressures on aquatic ecosystems are habitat degradation, pollution and overfishing.
- ▶ Tropical, temperate and boreal forests together offer a wide variety of habitats for plants, animals and microorganisms. Forests provide more than 10% of GDP in most of the poorest countries. Despite such a large role in the world economy, progress towards sustainable forest management is still limited and deforestation continues in many developing countries.

### **Protection of genetic diversity**

Genetic diversity (species populations diversity) separates different breeds and provides a gene pool for the cultivation of crops and commercial products and livestock.

- ▶ Natural ecosystems have important genetic resources that are of great importance due to their potential to provide beneficial traits to production systems, such as pest or disease resistance, improved yields or stability.
- ▶ Animal breeders need a large gene pool to develop their animals' characteristics under varying conditions.

- ▶ Forests are among the most important reservoirs of terrestrial biodiversity.

## 2.4. Cultural services

They are ecosystems used in the field of aesthetics and tourism for human health by using materials obtained from ecosystems or through ecosystems.

### **Recreation:**

Nature-based recreation opportunities play an important role in maintaining mental and physical health, such as hiking and sports in parks and urban green spaces. Farmland can host numerous recreation opportunities. Meadows and pastures are places where outdoor activities such as horse riding to cycling are performed. Water systems provide important recreational and health activities around the world. The forests can host a wide variety of sporting activities such as mountain biking.

### **Tourism:**

This cultural ecosystem service provides benefits to visitors and income-generating opportunities for nature tourism service providers (Farm tourism, forest tourism, etc.).

### **Art and culture:**

Animals, plants, and ecosystems inspire art, culture and design and contribute to the advancement of science.

### **Spiritual experience:**

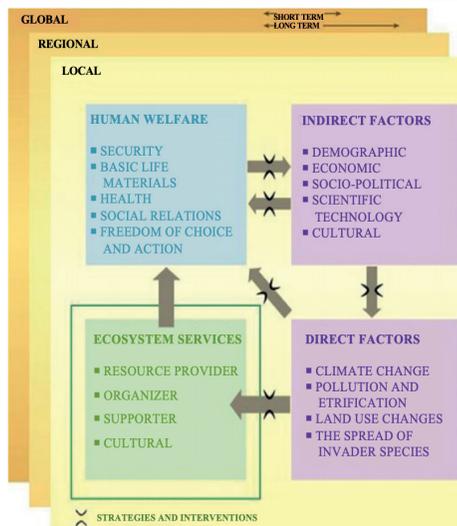
Nature is a common element in most major religions. Natural heritage is important for creating a spiritual sense of belonging, traditional knowledge, and a sense of belonging (FAO, 2020).

### 3. FACTORS DETERMINING AND AFFECTING THE ECOSYSTEM SERVICES

Natural and human-induced factors cause indirect and direct changes on the ecosystem. The categories of indirect change factors are demographic, economic, socio-political, scientific and technological, cultural and religious. Important direct drivers include climate change, land use change, invasive species and agro-ecological change. Collectively, these factors affect the production and consumption level of ecosystem services and the sustainability of production. These factors interact in complex ways in different locations to alter pressures on ecosystems and the use of ecosystem services (Figure 3) (MEA, 2005).

- ▶ According to the data of the UN population fund for 2011, the world population has reached 7 billion people today. The rapidly increasing population causes the depletion of natural resources and the destruction of ecosystems.

**Figure 3:** Factors that change ecosystems



Resource: Bennett et al., 2005

- ▶ The increase in economic activity changes the consumption structure and trends and affects the ecosystems and Ecosystem services. The increasing economic activity enables the spread of efficient technology and applications while increasing consumption.
- ▶ Socio-political factors direct the forces that affect decision-making processes and therefore play an indirect role in the change of ecosystems.
- ▶ Cultural and religious factors cause the change of ecosystems indirectly by people. Religious and cultural characteristics direct consumption behaviors, which are a major factor on environmental change.
- ▶ Developments in the field of science and technology can cause the use of new methods and practices in the production and consumption of ecosystem services and the change of ecosystems.
- ▶ Changes in air temperature and sea level resulting from climate change and similar changes in the climate system create adverse effects on ecosystems and services, resulting in unexpected results.
- ▶ Pollution and eutrophication are also directly changing both ecosystems and their services. Agricultural and industrial applications are the leading practices that cause pollution and eutrophication.
- ▶ The most important factor directly causing changes in ecosystems is land use changes. Changes in land cover cause the fragmentation of habitats and deterioration of the structure of ecosystems.
- ▶ The spread of invasive species is also among the factors that directly change ecosystems. In this context, the movement of species and organisms in ecosystems by humans causes the change of ecosystem services. The invasion of some ecosystems by alien species leads to the depletion of natural species and the change in the production of ecosystem services (MEA, 2005).

## Directly influencing factors

### Climate Change

Climate change occurs both naturally and with human effects.

Natural causes;

- ▶ Solar Radiation change
- ▶ Volcanic eruptions
- ▶ Ocean movements

Anthropogenic reasons;

- ▶ Carbon dioxide emission
- ▶ Fossil fuel burning
- ▶ Deforestation
- ▶ Agriculture
- ▶ Carbon emission

### Impacts of climate change

- ▶ Temperature increase
- ▶ Irregular precipitation regime
- ▶ Non-wood forest products
- ▶ Decline in food production
- ▶ Pressure on water resources
- ▶ Biodiversity decline

The evaluation of ecosystem services can be distinguished by four main approaches:

1. Biophysical methods (Biomass production)
2. Socio-cultural methods (PPGIS)
3. Economic methods (Benefit-cost analysis)
4. Quantitative methods by experts (Kasparinskis et al., 2018)

## 4. MODELING ECOSYSTEM SERVICES

Environmental System Models; multiple freshwater resource models already exist and are used at local (small basins), regional (basins and river networks), continental (large drainage basins) and global scales.

Biogeochemical models are used to predict key features such as energy, water, and nutrients in the biosphere, and productivity, carbon storage, and other functional aspects of ecosystems.

Land cover models provide information about land cover change; these models are often helpful in assessing the impact of decisions affecting land use (MEA, 2005) (Table 2).

**Table 2:** Global Scenario Projects overview

Global Scenario Projects	
Global Scenario Group (GSG)	Global scenarios traditional world, wild and grand transitions
Global Environmental Outlook 3 (GEO-3)	Regional similar to GSG
World Business Council on Sustainable Development (WBCSD)	Scenarios aimed at helping corporate members on business risks and opportunities for sustainable development
World Water Vision (WWV)	Three global water scenarios focusing on water supply and demand
IPCC Special Report on Emission Scenarios (SRES)	Greenhouse gas emission scenarios until 2100

*Resource: Millennium Ecosystem Assessment, 2005*

The Intergovernmental Panel on Climate Change-IPCC- The Intergovernmental Panel on Climate Change stated that human activities are the biggest impact on climate change in the 20th century.

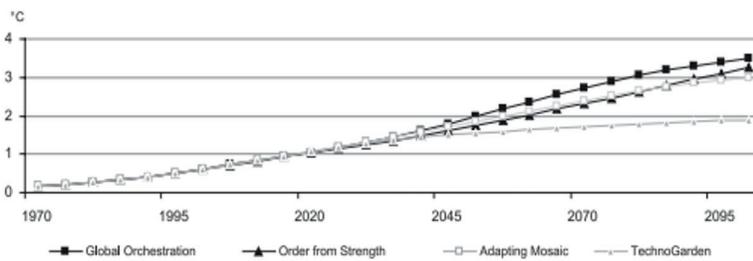


The report also indicated that climate change occurs due to

- ▶ Increasing fossil fuel products,
- ▶ Changes in land use,
- ▶ Other factors (such as changes in solar radiation).

He points out that the dominant factor in the increase in global average temperature is greenhouse gas emissions, while land use change is less dominant than the increase in fossil fuel use (Figure 4) (IPCC, 2019).

**Figure 4:** Change in global average surface temperature according to MEA scenarios 1970-2100



Resource: Alcamo et al., 2005

The most common studies on ecosystem products and services were carried out by Costanza (1997) based on 17 basic ecosystem services. In 1997, the total economic value of ecosystem products and services in the world was determined as 33 trillion USD yr-1 (1995USD ppp) and created a global map for this economic value. Costanza et al. (2014) updated this study conducted in 1997 and estimated the cost of ecosystem services owned by the world at 145 trillion USD yr-1 (2007 USD ppp). He emphasized that between 1997 and 2011, due to the land use change, there was an economic loss of 4.3-20.2 trillion USD yr-1 for ecosystem services.

Studies conducted in our country for ecosystem products and services: Valuation studies were carried out by the General Directorate of Nature Conservation and National Parks, Cost Benefit Analysis by the General Directorate of Forestry and Integration Possibilities by the General Directorate of Water Management (Balkız, 2015). In addition, theses and researches on ecosystem products and services have increased in our country since 2012 (Ersoy Mirci, 2017; Tezer et al., 2011; Albayrak, 2012; Pamukçu, 2015; Çokçalışkan, 2016; Erdoğan, 2016; Serengil et al., 2016; Tülek, 2017).

## 5. ACTIVITIES FOR ECOSYSTEM SERVICES IN TURKEY

The National Climate Change Strategy (2010-2020) (IDES) and National Climate Change Action Plan (2011-2023) (CCAP) constitute the basis of the plans and policies regarding ecosystems and nature conservation in the reports we are obliged to submit to the UNFCCC Secretariat. After the first national notification, IDES (2010-2020), the main policy document of our country on climate change, was prepared. After this strategy document, IDEP (2011-2023), which includes studies on greenhouse gas reduction and adaptation to climate change, was established (MEU, 2012). These plans demonstrate the strategies for ecosystem services, together with Turkey's climate change. Ecosystem services were one of the five main topics in Turkey's Climate Change Adaptation Strategy and Action Plan (2011-2023) which is the first policy document on the development of Turkey's capacity to adapt to the impacts of climate change. The areas of vulnerability from climate change in Turkey and areas where technical and scientific works are supported and are accepted as participatory processes: i) water resources management, ii) agriculture sector and food security, iii) ecosystem services, biodiversity and forestry, iv) natural disaster risk management and v) human health. The section on ecosystem services is summarized below.

### 5.1. Ecosystem Services, Biological Diversity and Forestry

Priority Goal 1. Integrating Climate Change Adaptation Approach into Ecosystem Services, Biodiversity and Forestry Policies

Since the most important factors determining an ecosystem type are temperature and precipitation regime, changes in climate cause changes in the structure and functions of ecosystems. Under climate change, protected areas gain importance in the following aspects:

- ▶ Reduction of emissions; Maintaining protected areas with ecosystems that provide carbon absorption, especially forests and peatlands, and declaring new areas,
- ▶ Climate change adaptation; ecosystem services, conservation of the distribution of species and ecosystems within protected areas,
- ▶ Resilience of ecosystems and species to climate change as a result of existing protected area network.

With legal regulations related to protected areas in the field of nature conservation activities in Turkey, 17 protection status has been established. Management plans or long-term development plans are made by different institutions in areas belonging to these statuses, based on different legal grounds.

Detailed studies are not sufficient on how the biodiversity values of protected areas in Turkey and the ecosystem services there provide will be affected. However, recently, studies have been initiated on the effects of climate change and where the risky areas will be. In this context, under the leadership of the Ministry of Forestry and Water Affairs, "Turkey's National Protected Areas and Climate Change Strategy Show" is in the preparation phase. In this strategy, creating a Turkey "protected areas system" in the context of protected areas and climate change, establishing policies regarding the planning and management of protected areas, increasing the researches, raising awareness and sharing information are included as priority issues. The strategy is handled in three main groups: forest, wetland and steppe and coastal ecosystems.

GDF Strategic Plan identified seven basic priority objectives for sustainable forest management in Turkey, some of which are directly related to climate change and ecosystem services. These are:

- ▶ Improving existing forests, increasing their productivity and expanding their areas;
- ▶ Making ecosystem-based and multi-purpose management plans in line with sustainable forest management principles of forests;

In short, the protection of forest areas, sustainable management and increasing forest areas, which play a key role in combating climate change, are primarily among the policies and strategies related to forestry. Especially, it is aimed to establish a "National Forest Monitoring System" in order to make all activities measurable, reportable and verifiable.

### **Goal 1.1. Reviewing existing strategies for adaptation to climate change impacts**

Existing strategies that indirectly deal with the effects of climate change on ecosystem services will be reviewed in terms of adaptation policies. In this framework, National Forestry Program (2004-2023) and OGM Strategic Plan (2010-2014) will be revised in the context of adaptation to the impacts of climate change. It will be ensured that adaptation to climate change is integrated and expanded into the existing planning in selected or priority protected areas, and regional strategies and plans will be prepared in accordance with the characteristics of the regions regarding adaptation to climate change in protected areas. Erosion and sediment control will be carried out permanently for the conservation and sustainability of the functions and activities of wetlands, which are one of the important sinks in ecosystems. It will be ensured that springs that feed all wetlands in Turkey are determined and planning works will be disseminated.

### **Priority Goal 2. Identifying and Monitoring the Effects of Climate Change on Biological Diversity and Ecosystem Services**

In situ conservation work in Turkey was initiated in the 1950s. The total area of protected areas has reached 4.6 million hectares, which corresponds to 6% of the country's surface area. Protected areas declared in Turkey in various status are as follows respectively: 41 National Parks; 42 Nature Parks; 31 Nature Protection Areas; 14 Special Environmental Protection Areas; 135 Wetlands of International Importance, climate change adaptation strategies should be taken into account in the functioning of biodiversity and ecosystems. Priority areas in conservation will be determined by matching the results of climate change model studies at national

scale with areas important in terms of biological diversity.

### **Goal 2.1. Detection and monitoring of climate change in terms of its effects on species in forest areas**

Forests are very important ecosystems and the continuation of goods and services provided by ecosystems is vital for Turkey in the context of adapting to the impacts of climate change. It will be ensured that more resources are allocated to projects on climate change and forest-pasture-agricultural ecosystems from the existing R&D finance resources of other institutions and organizations, especially the R&D support mechanisms of the Ministry of Forestry and Water Affairs.

### **Goal 2.2. Identifying the land use change caused by the effects of climate change in forest areas**

Within the framework of AKAKDO29, works have been launched under the coordination of OGM and with the support of TUBITAK towards increasing the data quality, developing the mathematical models to be used, developing forest management plans (the management plan) so as to include these models, and creating carbon management strategies towards delaying the climate change. In addition, forest management planning and implementation techniques will be developed to take hydrological function more into account in order to contribute to the sustainable management of water resources affected by climate change.

### **Goal 2.3. Health monitoring of forest ecosystems**

For the purposes of managing the forest ecosystems in Turkey in a climate-sensitive manner, the Ministry of Forestry and Water Affairs Forests General Directorate shall measure the effects of atmospheric pollution, climate change and other effects on the forests by the end of 2014 within the framework of activities at both national and international level.

### **Goal 2.4. Conducting research and development studies to identify and monitor the effects of climate change in protected areas**

Turkey is a country rich in biodiversity with three bio-geographical region. In addition, climate change adaptation strategy and actions to support the livelihood of local people in protected areas will be determined, cost-benefit analysis and cost-effectiveness studies will be conducted on these issues and livelihoods will be diversified in the light of these evaluations.

### **Goal 2.5. Taking into account climate change adaptation activities in the socio-economic development of forest villagers and supporting rural development in this way**

It is necessary to overcome these restricted benefits of local people in protected areas with alternative income generating activities or by diversifying income generating activities.

### **Goal 2.6. Identifying and monitoring the effects of climate change on mountain, steppe, inland water, marine coastal ecosystems and the ecosystem services they provide, and developing measures for adaptation to climate change**

In the protection of mountain, steppe, inland water and marine coastal ecosystems and within the framework of the ecosystem services they provide, the effects of climate change should be determined and monitored continuously. From this point, in order to ensure the sustainability of the resilience of these ecosystems to climate change, the effects of the user sectors that have direct negative effects on these ecosystems will be analyzed and evaluated. Also, in the ecosystem assessment studies of HEPPs planned on small rivers, it will be ensured that the effects of climate change as well as the ecosystem integrity and biological diversity of the region are taken into account. Sustainable integrated peatland management and rehabilitation pilot applications will be made.



## **Goal 2.7. Integrating climate change adaptation into the marine and coastal zone management framework**

Considering the effects of climate change, it is necessary to determine the changes to be made in the tourism model, products and the geographical use of the sector, and to create a new management model for coastal areas.

## **Goal 2.8. Protection of forests against fires**

Around 60% of the 12 million hectares of forest fire in Turkey is located in very sensitive areas for fire. According to IPCC, the climate change that could occur in the future could increase the frequency, field of impact and period of forest fires depending on the increase in the length and magnitude of hot and drought period in Turkey. Forest ecosystems in Turkey have structural characteristics that are open to forest fires. It will be ensured that risk preparedness and prevention issues required for forest fires caused by climate change are included in the scope of local or regional planning studies.

The actions within the scope of mitigation in the Climate Change National Action Plan mentioned above can be summarized as reducing deforestation and forest destruction, limiting land use changes, determining and increasing the amount of carbon stored in sinks. With regard to adaptation, actions related to nature protection have been given more place and ecosystem services, biodiversity and forestry have been discussed as a separate title in the action plan. In addition, it is observed that there are no actions to account for natural capital and ecosystem services and to consider them in investments in natural areas. One of the few studies was carried out for Bolu Regional Directorate of Forestry, which includes the provinces of Bolu and Düzce. Another study was the Mediterranean Forests Integrated Management Project carried out by the General Directorate of Forestry within the Ministry of Agriculture and Forestry with the support of the United Nations Development Program Country Office; it provides significant global and national / local benefits in the areas of carbon sequestration of forests and biodiversity as well as other natural resources

and ecosystem services. Within the scope of this project, studies were carried out on the creation, measurement, reporting and verification of carbon capture capacity, biodiversity and socioeconomic benefits with an integrated approach for five forest areas (450,000 hectares in total) in the Mediterranean. Another example was carried out in Turkey for Düzlerçamı Forest located in Antalya. Some ecosystem goods and services in Düzlerçamı Forest were determined and their economic values were calculated within the scope of the project of Improving the Production of Products and Services of Mediterranean Forest Ecosystems in the Context of Global Changes.

## 5.2. Urban Areas

Cities will become more fragile due to the increase in extreme events as a result of climate change. For this reason, the integration of ecosystem services approach to urban planning approach has become a necessity. In this context, the Integrated Urban Development Strategy and Action Plan (KENTGES/2010-2023), could be considered as an important step in Turkey as it guides the sustainable urbanization policies in 2010 with a participatory approach and handled the issues of climate change in cities in a wide scope as the first time in 2010 (KENTGES, 2010). In addition, within the framework of UN-HABITAT III / New Urban Agenda and under the scope of evaluations related to climate adaptation actions at local level, it was emphasized whether the data in the plans such as Provincial Environmental Order Plan is healthy and on taking into account many data types from carbon footprint to climate change data in the current status in the planning studies. However, it has been stated that the use of tools such as urban pollution maps and urban climate maps as ecological bases in the environmental plan and master development plan construction processes is of critical importance in terms of the sustainability of the natural systems in the city. Although Turkey has Climate Change Adaptation Strategy and Action Plan, there is no climate change plan prepared on the basis of provinces.

Local administrative units with public legal personality in Turkey are special provincial administrations, municipalities and metropolitan municipalities and the municipalities stand out as units in terms of the services for combating climate change in these classifications; and according to the results of REC-Turkey Municipal Survey, 65 % of the municipalities with relatively limited authorities and economic powers do not provide services towards struggling against change and they consider this issue as their responsibilities. (Regional Environmental Center, 2018). In Turkey, although the national climate strategy, policies and action plans include certain targets towards conversion of cities, it could be said that currently no real agenda has occurred in terms of climate action planning in cities. However, the number of municipalities engaged in voluntary work on climate change has been increasing recently. For example, as one of the first steps towards the activities of struggling against climate change by municipalities in Turkey, with "ICLEI-Climate Friendly Cities Campaign" coordinated by REC-Turkey, 14 municipalities including Alanya, Beyoğlu, Bodrum, Çankaya, Halkapınar, Kadıköy, Karadeniz Ereğli, Keçiören, Muğla , Nevşehir, Nilüfer, Sivas, Şişli and Yalova municipalities declared intentions for reflecting their activities related to climate change to city services and carried out certain projects in this scope. These studies mostly focused on waste management, energy efficiency and awareness raising; especially physical plans based on ecosystem services are still needed.

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# HEALTH POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

*Prof. Dr. Didem Evcil Kiraz*



# 1. INTRODUCTION

World Health Organization (WHO) “Environment and Health Ministers Meetings” held every five years (since 1989), “National Environment and Health Action Plan” (1999-2001), “Healthy Cities Project” (since 1993) activities dealt with climate change and health relation; such as malaria-vector borne diseases, UVR-environmental health, CO<sub>2</sub>-air pollution, healthy city planning-opening air corridors in city plans. As a member country of WHO Europe Region, Turkey has structured its national policies according to international priorities.

All related bodies and institutions were asked to prepare their action plans aimed at the effects of climate change such as Turkey National Climate Change Strategy (2010-2020), T.R. Climate Change Action Plan (2011-2023) and Turkey’s Climate Change Adaptation Strategy and Action Plan. Targets and actions for the health dimension were prepared by the Ministry of Health.

Environmental Health Department under Public Health General Directorate in the central organization of Ministry of Health conducts activities focused on health effects of climate change. Health Threats Early Warning and Response Department under the same general directorate attracts attention with its activities focused on risk assessment in the process of adaptation and vulnerability for epidemics, which is one of the health effects of climate change, and on field epidemiology.

In the Ministry of Health’s 2019-2023 Strategic Plan, the word “climate” occurred in two sections. In the environmental dimension of PESTLE Analysis, which the strategic plan is based on, it is stated that the effects of climate change on health will bring about the risk of appearance of vectors and increasing of epidemics caused by natural disasters. For this reason, the development of policies aimed at combatting vector, strengthening the infrastructure in order to prevent epidemics caused by natural disasters, increasing the knowledge and skills of health personnel on epidemic management are listed among the expected measures (T.R. Ministry of Health, 2019-2023). The other section where the word climate occurs is Purpose 4 risks section.

Purpose 4: To implement integrated health service model in health services

Goal H 4.4: To minimize the disease burden caused by contagious diseases

Risks:

- ▶ Difficulty in accessing risk groups regarding HIV/AIDS due to the reasons that the knowledge about HIV/AIDS infection is inadequate in the society in general and the provided services are not very well known
- ▶ Population movements
- ▶ Occurrence of climatic changes that may cause the vector populations of diseases to increase
- ▶ Rejection of vaccination becoming widespread in the society



## 2. TURKEY'S CLIMATE AND HEALTH POLICIES

The starting point of Turkey's climate and health policies must be taken as 2010. In the process that began in 2010, two preparation meetings were held in Ankara in 2011 and 2013 with the financial support of WHO. This activity was supported by WHO and stakeholder institutions (Ministry of Environment and Urbanization, Ministry of National Education, Ministry of Agriculture and Forestry, AFAD, Ministry of Energy and Natural Resources, universities and other government bodies and institutions).

All stakeholders were brought together by the Ministry of Health, Turkey Public Health Authority at the workshop organized in Ankara on 5-6 December 2013 and "National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan" activities were started. Program and Action Plan was approved on 21 January 2015. "National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan Opening Meeting" and National Program and Action Plan presentation were held on 10 April 2015.

On 12 January 2016 with the "National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan Conference of Parties" organized by the Ministry of Health, Turkey Public Health Authority opinions of the related bodies and institutions were taken alongside with those of the academicians and working schedule was prepared. Afterward on 5-6 April 2016, implementation commissions were established with the "National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan Workshop".

The contributions of the National Program and Action Plan to the field of climate change and health were expected to be under the following headings:

- ▶ Mitigating the effects of extreme weather events (extreme precipitation, extreme hot and cold weather, air pollution) and of natural disasters (flood, fire, etc.) that occur as a consequence on human health and social life
- ▶ Strengthening the institutional infrastructure for following up on the diseases that are seen and/or have increased in our country as a result of climate change and increasing the cooperation between institutions
- ▶ Ensuring water and food security, combating water- and food-borne diseases
- ▶ Carrying out necessary activities for the vulnerable groups not to be affected from adverse effects of climate change
- ▶ Mitigating the negative contributions of health institutions to the climate change
- ▶ Raising awareness of people for better protection from adverse effects of climate change on health
- ▶ Conducting monitoring and evaluation activities.

In line with the works of the commissions goals have been identified, strategies have been determined and activities have been listed. In addition to technical, bureaucratic and scientific developments it was seen that the time has come to provide information at national, regional, local, city and neighborhood scale, to raise awareness, to warn and to create general/special models that will provide an early response to warnings.

The answer to the question of “what can be done from now on” is as follows:

- ▶ To continue with the commission works
- ▶ Training
- ▶ Organizing regional introduction meetings, workshops, field works, media, visibility materials, etc.
- ▶ Ensuring the integration of the activities with the other “city, environment, health” activities
- ▶ Completing the activities on time
- ▶ Developing monitoring and assessment methodology (local, regional,

national), integration with other systems

- ▶ Turning the indicators into evidences, publishing them in evidence pools
- ▶ National and international sharing.

On 19 April 2016, “National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan Training Meeting” was organized in Bursa and the first step was taken for the operation of the Action Plan at local level. Selected health sector employees from provinces received the first training as trainers on the field of health effects of climate change on 13-14 September 2017 in Ankara and they were asked to convey the information they acquired in this training to the other health personnel in their provinces.

Ministry of Health’s activities related with the health effects of climate change were continued using various national platforms. “Enhancing Required Joint Efforts on Climate Action Project - İklimin” and “Training Project for Developing the Institutional Capacity on Adaptation to Climate Change – İklimi Duy”, which the Ministry of Environment and Urbanization is a beneficiary, can be given as examples of these. Ministry of Health plans to continue with new projects aimed at health effects of the climate within the scope of “2021-2027 Pre-Accession Assistance Tool (IPA) III”.



## 3. CLIMATE AND ADAPTATION IN HEALTH IN TURKEY

The human health section in Turkey's National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan (SB, 2015), Turkey's Climate Change Adaptation Strategy and Action Plan (2011-2023) (MEU, 2011) is compared with the recommendations section of 24th COP (WHO, 2018b) Special Report in Table 1.

**Table 1:** Türkiye'de İklim ve Sağlık İlişisini Değerlendirmek İçin Çerçeve Politika Belgeleri

National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan (2015-2019)	Climate Change Adaptation Strategy and Action Plan (2011-2023)	24 <sup>th</sup> Conference of Parties (COP24) WHO Special Report - Health and Climate Change (2018)
Purpose: Protection against adverse health effects caused by climate change and taking necessary health measures for disaster situations	Purpose 1: Determining the present and future effects and risks of climate change on human health	Purpose: Strengthening the power of Paris Agreement, which is the most powerful public health agreement of the century
Goal 1. Mitigating the effects of extreme weather events (extreme precipitation, extreme hot and cold weather, air pollution) and of natural disasters (flood, fire, etc.) that occur as a consequence on human health and social life.	Goal 1. Investigating the effects of extreme weather events on human health	Recommendation 1. Identifying and incentivizing the actions to decrease the carbon emission and air pollution in accordance with Paris Agreement decisions by taking into consideration the special commitments
Goal 2. Strengthening the institutional infrastructure for following up on the diseases that are seen and/or have increased in our country as a result of climate change and increasing the cooperation between institutions.	Goal 2. Investigating the relation between climate change, contagious diseases and health risks, monitoring and determining necessary measures	Recommendation 2. Incorporating all adaptation criteria related with health into economic and financial policies
Goal 3. Ensuring water and food security, combating water- and food-borne diseases.	Purpose 2: Developing the capacity to combat risks caused by climate change in the national health system	Recommendation 3. Taking health under guarantee

Goal 4. Carrying out necessary activities for the vulnerable groups not to be affected from adverse effects of climate change.	Goal 1. Establishing emergency intervention plans in risky regions and providing the necessary infrastructure	Recommendation 4. Eliminating previously existing investment obstacles for adaptation to climate change in the field of health
Goal 5. Mitigating the negative contributions of health institutions to the climate change.	Goal 2. Strengthening the capacity of health sector institutions against health risks caused by climate change	Recommendation 5. Increasing defensiveness of health sector in climate change activities
Goal 6. Raising awareness of people for better protection from adverse effects of climate change on health.		Recommendation 6. Local administrations, related sector preventing health in climate change approaches
Goal 7. Conducting monitoring and evaluation activities.		Recommendation 7. Establishing a system for monitoring and reporting the health results in climate change adaptation process regularly

“WHO Health and Climate Change Report - 2018” is the first regarding the presentation of an integrating future vision for all countries and it is a very important policy document (WHO, 2018a). Countries have been warned with a very serious language to act urgently and rapidly. Turkey has expressed its political determination with its policy documents, identified its stakeholders and is ready for implementation.

It needs to review the preparations for implementation and complete them rapidly. According to WHO report, implementation must focus on the process of adaptation to climate change. However, there are certain steps Turkey must take before the adaptation process.

- ▶ Training conducted since 2015 National Program for Mitigating the Adverse Effects of Climate Change on Health and Action Plan must be accelerated. Trained manpower capacity in the field of climate change and health must be increased. It must not be limited to the health sector only; other stakeholders must be included in the trainings; a common language must be formed on the health effects of climate change.
- ▶ It is a known fact that the vulnerable people who are considered sensitive

groups regarding health in the society will be affected by the climate change more rapidly and more severely. In a study conducted in USA, potential effects of climate change and variation on health were investigated. The group consisting of academicians, civil servants and private sector representatives reached the conclusion that improvements must be made in public health policies in order to be prepared against changing climate conditions and especially mitigate the impact on vulnerable groups (Patz et al., 2000). In this context, integrated programs can be developed in Turkey for providing information to vulnerable groups about frequently encountered events caused by climate change, arranging their places of living, warning them, directing them to areas where they can receive service and ensuring them to receive priority service due to events caused by climate change.

► The role of early warning systems to minimize the health effects of climate change is significant. In Turkey, there is a “Health Threats Early Warning and Response Department” under the Ministry of Health, Public Health General Directorate. The Ministry of Health has the necessary infrastructure to determine the early warning components related with health effects of the climate change and to take action. According to WHO report, it is required to reach the capacity to manage the data collection, analysis, evaluation, monitoring, early warning and stakeholder mobilization processes. In USA, in addition to changes in individual behaviors, it is recommended to make early warning systems, extreme temperature emergency action plans and management plans for temperature related diseases in the general public. The study conducted in Aydın, Turkey is an exemplary study in this regard (Diliüz Doğan & Evcı Kiraz, 2016).

► Emergency response mechanism must be developed. Accurate data and evidences are required to perform the emergency response on time and in a manner to reach the goal. A database is needed to identify the relation between climate change and health in Turkey. It is a priority to harmonize the databases presently in use such as ICD-10/11 and to train the users.

► The field of climate change and health must be declared a priority field for scientists and academicians. In this context, projects, scientific publications, meetings, innovations, R&D and investment supports must be implemented. Collected data, information must be published in various platforms that can be daccessed by the public, academy and the people, generation of new information and reports must be incentivized.

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# TRANSPORTATION POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

*Prof. Dr. Cem Soruřbay*



# 1. INTRODUCTION

The transportation sector is one of the most fundamental elements of the country's economy with highways, railways, airlines, and seaways.

During the early Republic period, priority was given to the railway and marine infrastructure until the 1950s, and important settlements and production centers were connected by the railway network. In this period (1950), road transportation had a share of 49,9% in passenger transportation due to its inadequate infrastructure, while the share was 42,2% by rail, 7,5% by seaway and 0,6% by airway. In freight transportation, the share was 17,1% by road, 55.1% by rail and 27,8 by sea (Ministry of Transport, 2014).

In the following years, due to the rapid development in highways and the stagnation in other modes of transport, road transport has gradually become dominant, with a share of 95% in passenger transport and 90% in freight transport.

With the railway transportation, which has started to gain importance again today, the share of highway in passenger transportation is around 90%, while the railway is at the level of 2%. In the 2023 targets, these values are aimed to reach the levels of 60% and 10%, respectively (Table 1.) Especially in long distance transportation, the need for railways in fast passenger and freight transportation is increasing. The share of rail passenger transport in European Union countries has a value of 13% in 1995 and 11% in 2008.

High-speed trains are considered the most suitable transportation method for traveling 600-800 km distances in the European Union countries, due to the time savings and convenience they provide. Airline, which provides temporal superiority in passenger and freight transportation in intercontinental long distances, and seaway, which provides economy in freight transportation, is the main option.

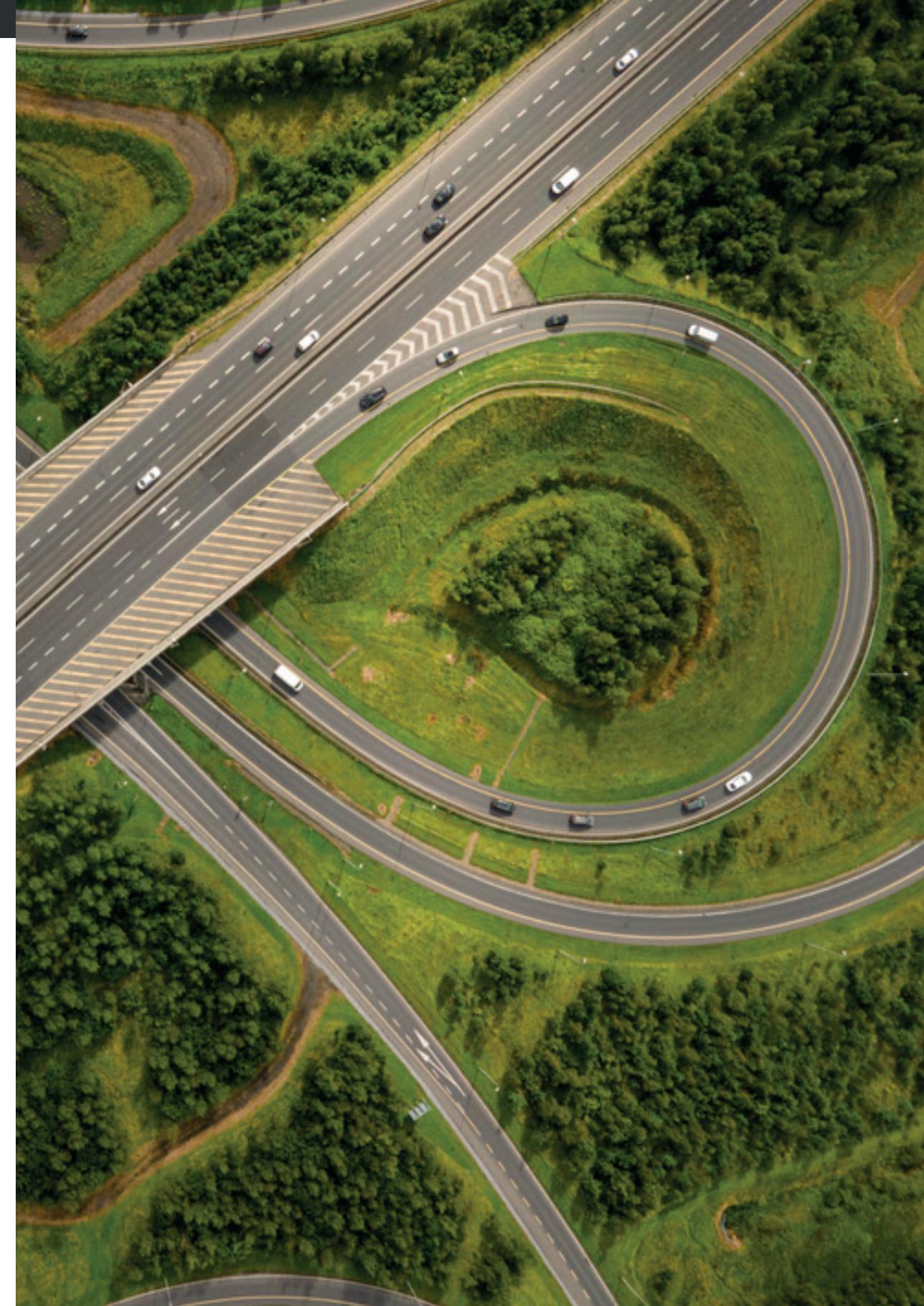
**Table 1:** Freight and Passenger Transport Rates by Transport Modes

	Current Status	2023 End Target
<b>Transport Shares Ton-Km (Domestic Freight)</b>		
Highway	80,63%	60%
Railway	4,76%	15%
Airline	0,44%	1%
Seaway	2,66%	10%
Pipelines	11,51%	14%
<b>Transport Shares Passenger-Km (Domestic Passenger)</b>		
Highway	89,59%	72%
Railway	2,22%	10%
Airline	7,82%	14%
Seaway	0,37%	4%

Resource: Ministry of Transportation, 2014

On the other hand, sustainable transportation policies are gaining importance by considering environmental problems and effects on climate change. For this reason, the use of environmentally friendly public transport systems in urban passenger transport is increasing. In long distances, efforts are made to increase the share of rail and maritime systems, which are also less harmful to the environment.

In this context, the vision of the Ministry of Transport for the Transport Sector is defined as "To create a sustainable transport system that provides safe, accessible, economical, comfortable, fast, environmentally friendly, uninterrupted, balanced, contemporary services that contribute to the competitiveness of our country and the improvement of the life quality of the society " Ministry of Transport, 2014).



## 2. GREENHOUSE GAS EMISSIONS

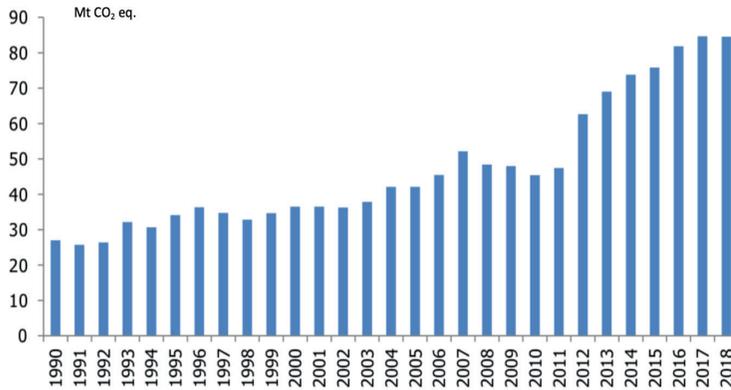
Increases in human-induced greenhouse gas production have caused climate change and its associated negative effects to gain increasing importance. Studies on the control of greenhouse gas emissions are still being carried out with global cooperation within the scope of the Kyoto Protocol and later the Paris Agreement. As of 24 May 2004, Turkey which participated as a party to the United Nations Climate Change Framework Convention carries out actions towards National Communication each year as part of this convention; and submits its Greenhouse Gas Emissions National Inventory prepared on sectoral basis to the United Nations Secretariat (Ministry of Transport et al., 2018).

Carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions for transportation sub-sectors reported in the National Communication Report are determined by taking into account the annual fuel consumption in different transport modes. In addition, CO, NO<sub>x</sub>, NMVOC and SO<sub>2</sub> emissions that are not direct greenhouse gases are included in the sector report.

Anthropogenic greenhouse gases arise from activities in energy production, waste management and agriculture, as well as energy consumption in industrial enterprises, housing and transportation sectors. As a result of such approaches as increasing efficiency, using alternative energy sources, saving energy, etc., significant reductions have been achieved over the years in these pollutants produced by sources outside the transportation sector. However, the number of vehicles per thousand people is increasing rapidly, especially in developing countries, as a result of the increase in population and improving living standards. There is a similar situation in our country. However, the fuel economy achieved as a result of the developments in vehicle technology and the resulting reduction in greenhouse gas emissions are not sufficient to compensate for the increase in the number of vehicles and the amount of use. Therefore, despite the measures taken over the years, greenhouse gas emissions from transportation have been increasing.

The increasing demand for transportation causes environmental problems such as air pollution and noise arising from the sector. Global greenhouse gas emissions from the transport sector increased by 31% between 1990 and 2003, the reference year. In the same period, the increase in OECD countries was 26%.

**Figure 1:** Change in Greenhouse Gas Emissions Arising from the Transportation Sector



Resource: TÜİK, 2020

Greenhouse gases from transportation sector have also been increasing over the years in Turkey (Figure 1). Considering the change of emissions according to different modes of transport, road transport has the highest value with 78 907 [Mt CO<sub>2</sub> equivalent] with 2018 data (Figure 2). This is followed by air transport (3 688 [Mt CO<sub>2</sub> equivalent]), maritime transport (931 [Mt CO<sub>2</sub> equivalent]) and rail transport (435 [Mt CO<sub>2</sub> equivalent]).

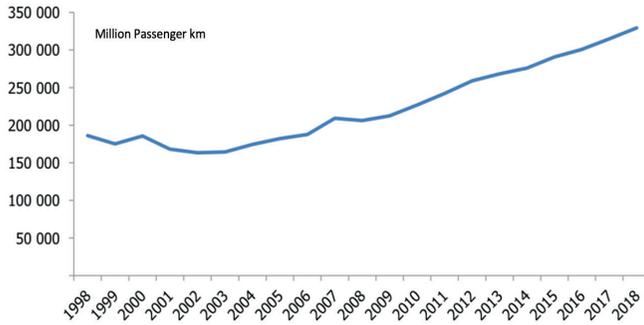
**Table 2:** Greenhouse Gas Emission Values According to Different Transport Modes.

Year	Total	Airline	Road	Railway	Seaway	Other
1990	26 969	923	24 777	721	509	39
1991	25 673	1 053	23 288	740	543	49
1992	26 366	1 118	23 871	685	638	54
1993	32 143	1 489	29 178	751	664	60
1994	30 640	1 764	27 419	768	623	65
1995	34 113	2 775	29 760	768	726	83
1996	36 271	3 048	31 628	799	699	97
1997	34 690	3 215	29 858	799	698	120
1998	32 782	3 311	27 881	740	726	124
1999	34 617	2 868	30 219	722	658	150
2000	36 465	3 099	31 850	713	623	180
2001	36 455	3 358	31 512	587	800	198
2002	36 234	2 503	32 084	612	822	213
2003	37 825	2 713	33 347	629	891	245
2004	42 048	4 859	35 090	629	1 228	242
2005	42 041	4 089	35 532	757	1 299	364
2006	45 424	4 512	38 370	761	1 464	317
2007	52 099	6 019	43 674	470	1 598	338
2008	48 166	5 218	40 559	499	1 543	348
2009	47 907	5 149	40 204	484	1 632	437
2010	45 392	2 862	39 941	517	1 682	390
2011	47 386	3 344	40 899	532	2 242	370
2012	62 525	3 727	56 310	492	1 614	381
2013	68 865	3 754	62 889	505	1 154	563
2014	73 559	4 090	66 967	562	1 348	593
2015	75 789	4 205	69 309	480	1 147	647
2016	81 841	4 281	75 595	374	970	621
2017	84 659	3 838	78 706	413	944	758
2018	84 502	3 688	78 907	435	931	542

Resource: TUIK, 2020

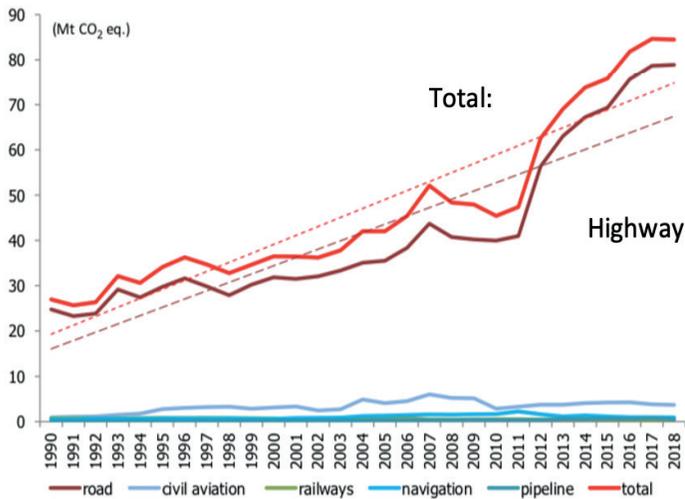
The change in the number of passengers (passenger-km) over the years in road transport is shown in Figure 2. Accordingly, the increase in greenhouse gas emission following the increasing demand is given in Figure 3. It is seen that a very important contribution to the greenhouse gas emissions from transportation, which has been increasing over the years, is due to road transport. Diesel fueled vehicles are particularly effective in this increase (Figure 4.).

**Figure 2:** Passenger-km Values in Road Transport.

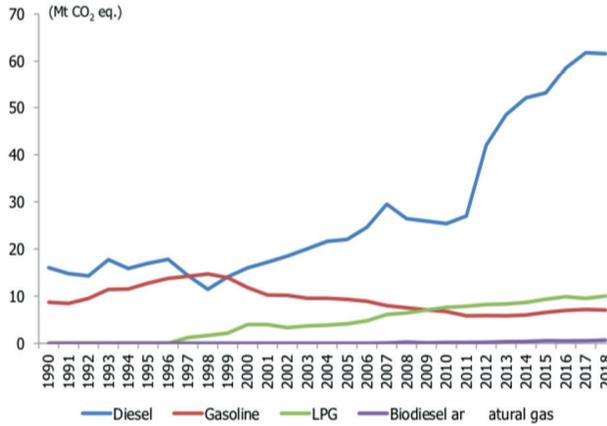


Resource: TUIK, 2020

**Figure 3:** Greenhouse Gas Emissions from Road Transport.

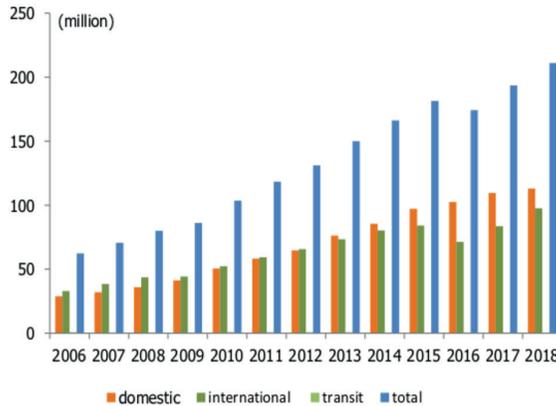


Resource: TUIK, 2020

**Figure 4:** Greenhouse Gas Emission Values by Fuel Type in Road Transport.

Resources : TUİK, 2020

Air transport is a developing mode of transport in our country and the number of airports has increased significantly. As a result, the increase in the number of passengers traveling on domestic flights can be seen in Figure 5.

**Figure 5:** Passenger-km Values in Road Transport

Resources: TUİK (2020)

Ulaştırma sektöründen kaynaklanan sera gazı emisyonları değerlendirildiğinde, karayolu ulaşımının etkin kaynak olduğu ve alınması gereken azaltım önlemlerinin özellikle bu sektöre yönelik olarak planlanmasının gerektiği görülmektedir.



## 3. TRANSPORT POLICIES

Fundamental purposes explained towards Transportation sector in the 11th Development Plan are defined as: "benefiting the most from the geographical advantages of Turkey and developing inter-modal (**intermodal**) and **multi-mode** (multimodal) applications for development; increasing the rail and maritime transport shares; fast, flexible, safe, reliable and integrated transport system, reducing logistics costs, facilitating trade and increasing the competitiveness of our country "(Strategy and Budget Directorate, 2019).

In our country, the transportation sector in passenger and freight transportation is still largely dependent on road transport. Despite the infrastructure investments and developments in railway and air transportation, the target values were not reached (Table 1.). On the other hand, in-city passenger and freight transportation is mostly carried out by road. The share of maritime transport is also low in cities located by the sea.

In the Development Plan, it is said " Railway infrastructure construction, maintenance, infrastructure access and allocation, network notification, safety management, regulation and supervision, train operation and the ownership, manufacture and maintenance of railway vehicles will be separated organizationally, an effective working mechanism will be established between the activities and the sector will be restructured. In this context, " Preparing secondary legislation for promoting private railway management and developing liberalization in railways " will be completed, " consumer-oriented demand management in rail passenger transport and modern train management will increase service quality; fast, safe, safe and comfortable railway transportation will be established ". As a result, it is planned to increase the efficiency of rail transportation in the 2019-2023 period.

Regarding maritime transport, it is aimed to " defining port service items and standardizing in all ports ", " Increasing energy efficiency in port operations,

minimizing environmental impacts and supporting Green Port practices to ensure sustainability".

" The bottlenecks in the highway network will be eliminated, accident black spots will be improved and a total of 2,872 km of divided roads will be built".

In general, an asset management system will be established based on the concept of preventive maintenance in transport modes infrastructures. The main goals are summarized in Table 3.

Development Plans are the main documents defining the policy framework for the transport sector in Turkey. In addition to the 11th Development Plan covering years 2019 - 2023, there are reports of relevant public institutions such as "Turkey Transportation and Communication Strategy, Vision 2023", "Turkey's Seventh National Notification", "Turkey Climate Change Strategy 2010 - 2023", "Turkey's Climate Change Adaptation Strategy and Action Plan", "Transport Master Plan Strategy".

**Table 3:** Transport Sector Goals Included in the 11<sup>th</sup> Development Plan.

	2018	2023
<b>Fast Train Line Length (km, Cumulative)</b>	1.213	5.595
<b>Share of Railroad Passenger Transport in Total (Terrestrial,%)</b>	1,3	3,8
<b>Share of Double-Track Railway Length in Total Main Line(%)</b>	12,4	26,3
<b>Share of Cargo Handled in Cabotage Line in Total Handling (%)</b>	12,9	18
<b>Total Number of Airport Passengers (Including Direct Transit) (Million)</b>	211	266
<b>Divided Road Length (Including Motorway) (km, Cumulative)</b>	26.6422	29.514
<b>Highway Length (km, Cumulative)</b>	2.842	3.779
<b>BSK Coated Road Network (km, Cumulative)</b>	25.215	31.478
<b>Improved Accident Black Spot</b>	70	75
<b>Number of People Losing Their Lives as a Result of Traffic Accidents</b>	6.675	4.900

**Resource:** 2018 data belong to the Ministry of Transport and Infrastructure and TURKSTAT. The data for 2023 are the Eleventh Development Plan estimates.

*Resource: Strategy and Budget Directorate (2019)*

In urban transportation, regulations will be prepared to regulate the procedures and principles regarding the examination and approval of urban rail system projects and the takeover of the rail system projects of the municipalities by the Ministry of Transport and Infrastructure, the rail system design guides will be updated, and the statistical data infrastructure will be established.

"In order to reduce traffic congestion, accidents and air pollution in cities, the use of public transportation systems instead of private vehicles will be encouraged in urban transportation".

## 4. MITIGATION OF GREENHOUSE GAS EMISSIONS

The most important issue in reducing greenhouse gas emissions, especially CO<sub>2</sub> emissions from the transportation sector, is the reduction of fuel consumption. In addition, the use of fuels with low carbon content will reduce CO<sub>2</sub> emissions. For this, energy must be used efficiently.

Fuels such as natural gas, LPG etc., which are an alternative to gasoline and diesel fuel will provide benefits in reducing emissions in the short term. In addition, the use of carbon-free hydrogen as fuel and electric vehicle propulsion systems will also reduce emissions. The amount of this reduction depends on the method used to generate hydrogen or electricity.

In Turkey, LPG has been started to be used since 1997 for highway transportation and it became possible to reduce greenhouse gas emissions by some amount. In addition, LPG and diesel fueled vehicles increased while the number of gasoline-powered vehicles decreased. Today, greenhouse gas emissions from diesel-fueled vehicles are in the first place. The share of light commercial vehicles and heavy vehicles is especially important in this.

With the tax incentive policy (incentive for scrap vehicles), old model-year vehicles with old technology in terms of fuel consumption and emissions were withdrawn from traffic. In the 2013-2014 period, approximately 400.000 vehicles over the age of 20 were withdrawn from the traffic, reducing CO<sub>2</sub> emissions and at the same time providing fuel economy.

Advances in vehicle and fuel technology, approaches such as efficient use of energy, etc. reduce greenhouse gas emissions. However, the increasing population of the country and the increase in the number of vehicles per capita, increasing annual travel times and travel distances ultimately increase the total emissions.

For this reason, public transport should be expanded in order to reduce the emissions per passenger in urban transportation. As a result of the rapid growth in cities, the distances per trip and the number of passengers traveling per day are also increasing. This also increases the demand for public transport systems and the impact of these systems on reducing greenhouse gas emissions per capita.

Managing traffic flow to reduce traffic congestion and shorten waiting times in urban traffic will also provide energy efficiency and emission reduction.

11. As stated in the Development Plan, " development of environmentally friendly modes of transport " and " encouragement of non-motorized modes of transport in urban transport ", " development of standards for pedestrian traffic on pedestrian roads and sidewalks ", " creating historical and cultural attraction points in city centers and pedestrian zones free of motor vehicles in shopping areas. ", " encouraging the use of bicycles ", " making bike lanes " will provide important benefits in this regard (Head of Strategy and Budget, 2019).

Therefore, it is necessary to rearrange travel habits and increase the short distance travels on foot and by bicycle (Fatherhood-Sutcliffe, 2010).

The "Regulation on Procedures and Principles for Increasing Energy Efficiency in Transport", published in the Official Gazette, dated 02.05.2019 defines short-term and long-term measures. Apart from the use of alternative fuels, studies on " planning smart transportation systems " will be effective in greenhouse gas reduction and adaptation studies (Official Gazette, 2019).

During the Paris Agreement, countries made commitments to reduce greenhouse gases for the post-2020 period. Turkey declared a mitigation from increase up to 21% under "Intended Nationally Determined Contribution " (INDC) foreseen to take place as of year 2030. In this context, measures will need to be in the transport sector (INDC Republic of Turkey, 2015).



## 5. ADAPTATION WORKS

In the transportation sector, strategies should be developed and implemented in order to reduce the effects of climate events and the level of vulnerability to these events, to increase resistance to risks and to manage risks (TC Ministry of Environment and Urbanization, 2011) The works within this scope are within the framework of the measures taken for the transportation system infrastructure and the operation of the system. However, in addition to this, support is provided to adaptation studies with the developments in vehicle technology.

Climate change causes increase in land and sea temperatures, change in precipitation amount and frequency, rise in sea levels, increase in coastal erosion risk, increase in natural disasters and these changes affect transportation sector in addition to some other sectors. While these negative effects can be seen globally, they make their effects felt even more prominently in some regions and cause negative effects in economic and social terms.

Adaptation efforts consist of measures within the scope of general country strategies, but mostly need to be addressed locally.

Improvement of highway infrastructure that will prevent the effects of precipitation and extreme temperatures, providing protection with tunnels, floating or raised roads in critical regions, building preventive walls to reduce the effects of excessive rainfall, putting into practice drainage systems and removing some roads from risk areas when necessary can be listed among the application examples. Especially the existing infrastructure in the risk zones such as stream beds, coastal areas etc. should also be redesigned.

Electric vehicles and autonomous and connected vehicles, which are becoming increasingly common today, benefit from the efficient use of energy and at the same time reduce emissions. " Establishing appropriate infrastructure for new generation

vehicles " has also been evaluated within the scope of 11th Development Plan. Studies can be initiated by selecting some trial areas on this subject (Strategy and Budget Directorate, 2019).

Airports, which have an important place in passenger and freight transportation in the country's economy, are first affected by extreme climatic conditions due to their fragile structures and air transport is interrupted. Therefore, restructuring of air transportation systems, design of runway and early warning systems to reduce the effects of extreme temperature changes, frost, etc., development of drainage systems, technological developments in electronic runway equipment, etc. and similar practices are required for adaptation studies.

Railway transportation is also becoming increasingly important in our country and in the world. In railway lines, rails are affected by extreme heat waves and deformation occurs. In addition, weather conditions, floods and overflows affect the rail system and railway bridges and pose a risk. Adaptation should be ensured by measures to be taken in these matters.

## 6. CONCLUSIONS

One of the main policies followed in the transportation sector is to reduce the share of road freight and passenger transportation and to achieve a balance between transportation modes by shifting this capacity to rail and maritime transport. In addition, it is aimed to increase the combined transportation.

The implementation of sustainable transportation approaches in urban areas and the arrangement of the infrastructure of the transportation system in a way to protect it from the risks posed by climate change are among the targets.

Various studies are carried out on the reduction of greenhouse gas emissions, but harmonization studies should also be coordinated in order for the results obtained from these to be effective and to benefit locally and in the short term.

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# CLIMATE CHANGE ADAPTATION IN TURKEY AND ITS SOCIAL ASPECTS

*Prof. Dr. İhsan Çiçek*



# 1. INTRODUCTION

The physical effects of climate change are shown locally all over the world. As the climate continues to change in the next 10 years and beyond, the regions affected by these conditions will increase in number and size. This increase will affect socioeconomic systems in five main areas. These; living-working conditions, food systems, property, infrastructure services and natural resources.

While the risk of exposure to deadly heatwaves in the areas where people live is low today, this is expected to affect 250-360 million people by 2030, with a possible increase of 9%. This rate could rise to 700 million-1.2 billion people in 2050, with an annual increase of 14%. Thus, the rapidly growing climate threats can affect employment, income and related sectors. For example; while the warming in the seas will reduce the number of fish caught, it will affect the lives of 650 to 800 million people who make a living.

The global socio-economic impacts of climate change can be enormous and directly affect people and physical and natural resources. According to the analysis made in 105 countries; all countries will experience an increase in these risk factors by 2030. For example; while there is a 10% loss in outdoor performance today due to extreme temperatures and humidity, this rate is expected to rise to the range of 15-20% in 2050.

Financial markets may need to update their risk definitions, taking into account their impact on resource allocation and insurance in regions affected by climate change. With a better understanding of climate-related risks, risk definitions can be changed, such as eliminating long-term borrowing, reducing insurance costs and decreasing maturity value. For example; flood disasters in Florida caused damage to homes as well as reduced housing values. Houses damaged by the flood in this region lost value by 15-30% compared to those that were not damaged. This means a loss of 30 to 80 billion dollars by 2050.

Countries and regions with low GDP rates are at greater risk because people in these regions are living on a greater proportion of natural resources, working outdoors, and climate conditions are closer to the physical endurance threshold. However, some countries may also benefit from climate change. For example; increasing temperatures in Canada could increase agricultural production.

The physical threats created by climate change require a much more systematic risk management that accelerates adaptation and decarbonization. In this direction, all basic business and policy decisions should be reviewed from a climate change perspective. Although this requires high costs and difficult decisions in regions affected by climate change, adaptation efforts can help manage these risks. In order to make the necessary preparations for adaptation studies such as breakwaters, shelters resistant to extreme temperatures or drought-resistant agricultural products, strong cooperation is needed for the whole process, especially investment decisions. However, climate science, while taking advantage of these adaptation opportunities, says that global warming can only be prevented by initialization greenhouse gas emissions. Turkey is one of the countries most affected by climate change in connection with global warming with its complex climate structure. But since naturally it is surrounded by sea on three sides, it has fragmented topography and due to its orographic characteristics, different regions of Turkey will be affected differently and in varying degrees by climate change (Alper and Anbar 2006). For example, arid and semi-arid regions, such as Southeast and Central Anatolia, which are more threatened by desertification, and semi-humid Aegean and Mediterranean regions with insufficient water will be more affected. The water resources in the arid and semi-arid areas, especially the state of the water resources in the cities, will add new problems and the need for freshwater will increase. In Turkey, while the average precipitation was 631 mm for long-term, the precipitation amount decreased by 15% in 1999, 7% in 2000 and 11.2% in 2019. In addition to the decrease in average precipitation, the deviation in the precipitation regime is also a matter of attention. These decreases in the amount of precipitation and deviations in the precipitation regime affect agricultural production negatively. In addition, if conditions causing drought to persist, greater water-related problems may occur in the coming years.

Protection of agricultural land has become one of the national security concerns in many countries. Poor use of agricultural lands, floods due to water management deficiencies, salinization, aridity, pollution due to excessive use of pesticides and fertilizers are the leading ones. Due to the indispensable importance of water in agriculture, the shortage of clean water has become the biggest resource constraint against agricultural production in many regions. As a matter of fact, it is observed that product losses in some important cereal production centers of our country reach 40-50%. In the semi-arid and semi-humid areas of Turkey such as Central Anatolia, South East Anatolia, Aegean and Mediterranean where there is risk of desertification, warnings are made that this could lead to negative impact in terms of agriculture, forestry and water resources. According to the researchers, climate zones could shift as in the earth's geological history, which can record hundreds of kilometers towards the poles to the equator, resulting in Turkey entering into the effects of the hot and dry climate that prevails in the Middle East and North Africa (URL-1).



## 2. ECONOMIC EFFECTS OF CLIMATE CHANGE

The first effects of climate change emerge with temperature increases and fluctuations in precipitation regime. The extremes in these climatic elements increase the frequency and severity of climate-related natural disasters such as droughts, floods and storms, leading to serious economic losses. As a matter of fact, approximately 87% of the natural disasters experienced during the 1980-2012 period are climate-related natural disasters. 44% of these natural disasters are storms; 41% is caused by floods and 15% by drought. The economic loss caused by these natural disasters in the same period is approximately 2.8 trillion dollars (Munich RE, 2014). When analyzed on an annual basis, it is seen that this figure corresponds to \$ 85 billion. It is predicted that these economic losses caused by climate change will be around 1 trillion dollars annually in the 2050s (Hallegatte et al. 2013).

Agriculture, tourism and energy sectors, which are important for economies, are heavily exposed to the effects of climate change. Among these sectors, agriculture and tourism are directly dependent on the climate and energy indirectly. Although a temperate climate change is expected to have an initial positive impact on agriculture and tourism in some regions, the net effect on a global scale will be negative. Undoubtedly, this will affect the employment level negatively. All these developments will create some effects on economic growth, which is an indicator of the success of economies. The economic impacts of climate change outlined above are given in detail in the following titles. In this context, the effects of climate change on sectors, labor productivity, employment and growth are discussed (Başoğlu 2014).

## 2.1. Sectoral Impacts

Considering that climate change will continue in the future, it is expected that some countries that are not affected by climate change or even benefit from this situation are expected to be adversely affected. Although there is no consensus on the mechanism that explains the effects of climate change on the economy in practice and theory, some indicators may play a leading role in determining the magnitude of these effects. Some of these are the share of climate sensitive sectors in the economy and the indirect effects of climate change on non-climate sensitive sectors (Başoğlu 2014).

### 2.1.1. Public Health

Change in the atmosphere conditions of Turkey, which is located in the Mediterranean Basin and increase in the frequency of extreme weather conditions and epidemic diseases as a result of increasing heat level, higher heat stress is expected to face the effects of such changes in commonly consumed foods nutritional value. It is necessary to underline the following five points regarding public health:

- ▶ 1. As a result of the fact that vectors (carriers), especially mosquitoes and ticks, can reproduce in new geographies, the transmission mechanisms of these vectors will strengthen.
- ▶ 2. Increase in drought and deterioration in the water cycle will make it difficult to protect water resources from the risk of epidemics, and water-borne diseases will increase as a result of problems in accessing clean water.
- ▶ 3. In some regions, as a result of the increase in the level of heat stress and air pollution, which will reach up to 4 °C, there will be an increase in temperature-related mortality and public health concerns will arise.
- ▶ 4. As a result of the increase in the amount of pollen in one cubic meter of air, the allergic problems of the general population will increase and the allergy periods will be prolonged.

- ▶ 5. According to the scenario in which the necessary steps are not taken regarding emission reduction and adaptation in deaths due to heat stress, an increase of 200 - 450 percent is predicted, although it varies according to different climate scenarios. Assuming that the average increase in annual maximum temperatures will reach 4 °C, heat stress deaths are expected to increase by 400 percent.

The number and scope of multidisciplinary research must increase to identify geographic areas and groups at risk. This requires the creation of more extensive and detailed data sets on epidemics and mortality rates. In this context, if more data is produced on variables related to heat stress, for example, it may be possible to establish more advanced early warning systems on a national scale to protect groups at risk such as children and the elderly (Gündoğan et al 2017).

Projections foresee that, in addition to public health effects of climate change, it will have negative impacts on the precipitation in Turkey.

### 2.1.2. Agriculture

An important part of agricultural production in Turkey is carried out dry farming methods, that is dependent on precipitation. Therefore, agricultural production is very vulnerable to changes in precipitation patterns and types due to climate change. In the analysis conducted in order to understand the impact on agricultural production of climate change in Turkey. The International Model for Policy Analysis of Agricultural Commodities and Trade/IMPACT data were used (Gündoğan et al 2017). The main findings of the analysis can be summarized as follows:

- ▶ 1. Climate change will have significant impact in the yield and productivity of major agricultural products in Turkey. It is predicted that the increase trends in maize and barley yields will stabilize from the beginning of the 2020s and the increase trend in wheat yield will stop from the beginning of the 2030s, and this

will have important repercussions in terms of food safety.

- ▶ 2. Even in scenarios with moderate progress in combating and adaptation to climate change, a decrease in maize and sugar beet yields is predicted.
- ▶ 3. By 2050, productivity losses of 5 percent in sugar beet production and 10 percent in maize production are possible.
- ▶ 4. In case that the emission mitigation and adaptation targets fall beyond the target of 1,5 - 2 °C, it is possible to say that there will occur higher losses in the crop yields, therefore in the agricultural product in Turkey.
- ▶ 5. Food prices are expected to rise, accompanied by the projected increase in population and food demand. This means that there may be more problems in terms of food safety (Gündoğan et al 2017).

### 2.1.3. Energy

The energy sector and our energy production / usage patterns are the most important factors that trigger human-induced climate change. On the other hand, we see that the energy sector is seriously affected by climate change. In this context, in addition to the transformation needed in the energy sector to combat climate change, questions about how the energy sector will be affected by climate change should be asked. Under the light of climate change and different socio-economic paths, the main findings of the analysis revealing the current research findings on the energy sector in Turkey include:

- ▶ Turkey is among the countries to be most affected by the negative impacts of climate change. The energy sector will also be exposed to direct and indirect effects on both the supply and demand sides.
- ▶ Hydroelectric potential is expected to decrease with projected decreases in river flows in southern parts of Europe. In case that the effect in question is lived in Turkey and the global temperature increase reaches to 3 °C, the size of fall will be much higher.
- ▶ While it is predicted that there will be an insignificant increase in the

potential in the North Aegean and Marmara regions, where the wind potential is relatively high, there are signs that there may be a decrease in the wind potential, especially in the Mediterranean and Southeastern Anatolia regions.

▶ As a result of climate change, it is revealed that the potential cooling water for energy production from thermal power plants may decrease with the increase of water temperatures in environments such as seas and rivers. It is estimated that this situation will lead to a decrease in the thermoelectric energy production capacity of the countries.

▶ Socioeconomic factors play a very important role in achieving climate change goals. In a future where energy efficiency is prioritized, economic value produced and final energy demand is relatively different from each other, advanced modernization is experienced with technology developing in energy use patterns, and international and regional integrations in energy are in question, it is predicted that the cost of achieving the goal of 1,5-2 °C is foreseen to be at a level of one third of the possibility of meeting the same targets in future where technologic development is slow and competition prevails over cooperation..

▶ Seeing the real cost of climate inaction, namely lack of activity on the side of Turkey depends on handling the energy policy from a wider perspective under the light of socioeconomic developments in the region and in the country and the climate policy alternatives (Gündoğan et al 2017).

#### 2.1.4. Tourism

Unlike many other sectors, the tourism sector is a sector that both affects the natural environment and also is affected from the environment it uses as a resource. Increase in temperature, rise in sea level and extreme weather events will directly affect mass tourism. Drought and desertification, forest fires, water scarcity, biodiversity losses, coastal erosion, diseases due to extreme weather events and vector-borne infectious diseases are also indirectly affected by the effects of climate change on tourism. Tourism movements in Turkey which are more on sea-sand-sun axis, are

concentrated in the Mediterranean and the Aegean Sea. It is stated in all the studies in the literature that the Mediterranean basin will be adversely affected by climate change. In addition to sea-sand-sun-axis mass tourism, winter tourism connected with snowfall also suffers from the negative effects of climate change. Under the context of sustainable tourism in Turkey, environmental protection, development of environmental awareness, the promotion of a positive contribution to the environment of tourist facilities and Environmentally Responsible Accommodations in order to encourage Document and Green Star certificate, have been implemented (Gündoğan et al 2017).

### 2.1.5. Total Impacts

As revealed in the sectoral evaluations, it is necessary to underline that there are many different effects in the analysis of the economic effects of climate change. It is a very difficult task to analyze and then put together the effects that move in different directions and are subject to different dynamics at many different levels and layers. This makes an integrated approach that addresses integrated indicators essential to assessing climate change impacts on overall economic activities. The relationship between climate change and general economic activities, which manifests itself with various driving factors, especially changes in temperatures, triggers significant changes on many indicators. Employee productivity, agricultural production, energy demand, infrastructure performance, public health developments are among these indicators. It is essential to understand how the changes in each sub-sector are reflected on the macro scale.

The macroeconomic analysis conducted within the scope of the study reveals the effects of changes in total factor productivity due to temperature changes, additional productivity and international price effects on the agricultural sector. The main findings of the analysis are as follows:

1. It is predicted that climate change will cause a decrease in national income compared to the reference scenario:

- ▶ The analysis predicts that if there is a 1,5-2,5 °C increase in temperatures during 2018-2050, if additional measures are not taken for adaptation and special environmental policies are not designed, there will be a decrease in GDP between 9.8 and 26.8 according to the reference scenario.
- ▶ Under a scenario where the temperature increase is higher and the necessary steps for adaptation to climate change and emission reduction are not taken, the decrease in national income will increase to 50% in 2050 according to the reference scenario. Under this scenario, we are likely to face an economic shrinkage between 2040 and 2050.

2. It is anticipated that there will be a decrease in registered employment and salaries as a result of the negative shock to the economic activities. It is estimated that the said decrease will affect especially low income regions and trigger migration to high income regions

- ▶ The "negative shock" to which economic activities will be exposed as a result of the effects of climate change will cause many employees to shift from formal labor markets to informal labor markets. The rate of decrease in salaries as a result of informal employment will be higher in low-income regions than in high-income regions. Limited opportunities to find employment, even with falling salaries, will trigger migration from low-income regions to high-income regions.
- ▶ The negative shock on economic activity causes a very strong decrease in the level of total employment in the low income region. Compared to the reference scenario, a decrease of up to 28% is predicted in the employment level.
- ▶ It is predicted that most of the remaining employment in low-income regions will be shifted off the record, and the rate of registered employment in these regions in 2050 will decrease from 40.3% in the reference scenario to 23.3%.

**3.** The global price increases in the agricultural sector and the decline in agricultural productivity will cause considerably higher increases in the prices of agricultural products compared to the price level of the whole economy. Under a scenario where the temperature increase reaches high levels and is progressing, and where the necessary steps are not taken for adaptation to climate change and emission reduction, the increase in food prices can reach 250% according to the reference scenario (Gündoğan et al 2017).

### 3. ADVERSE EFFECTS THAT MAY OCCUR DUE TO CLIMATE CHANGE IN NATURAL ECOSYSTEMS AND AGRICULTURAL AREAS

- ▶ Irregularity in stream flows, drying of lakes, decrease in the amount of freshwater, utility and irrigation water,
- ▶ Decrease in water resources due to the more use of groundwater resources due to droughts,
- ▶ With the effect of heavy thunderstorms, especially in the Eastern Black Sea and Mediterranean coasts, an increase in floods and overflows,
- ▶ Decrease in agricultural production due to damages such as drought, flood and overflow, hail, storm,
- ▶ Some agricultural areas becoming unusable due to desertification,
- ▶ More fertilizer and pesticide use due to decrease in agricultural land, yield losses and diseases,
- ▶ Due to the increase in sea levels and the decrease in the amount of water carried by the streams, the salty sea water reaching inland along the stream beds, salinization in agricultural areas,
- ▶ Damage to livestock as a result of a decrease in feed production and the damage to pastures from increased drought,
- ▶ Decrease in aquaculture production due to the decrease in inland waters due to drought and the warming of the seas,
- ▶ Increase in meat and food prices due to the decrease in production,
- ▶ Increasing fire, insect and fungal damage in forests and agricultural areas,
- ▶ Decrease in biological diversity and risk of extinction of some species,
- ▶ Some living species having to migrate but unable to migrate due to fragmented habitats
- ▶ Increase in wind and water erosion,
- ▶ Increase in the number of exotic species identified as invasive species in seas and lands



## 4. ADAPTATION ACTIVITIES

How climate change will affect water potential in basins, budget deficit A study was carried out by the Ministry of Forestry and Water Affairs under the name of “The Impact of Climate Change on Water Resources Project” in order to determine how the climate change will affect water potential in the basins and periods that are likely to cause budget deficit in watersheds (SYGM, 2016). In the aforementioned study, harmonization activities are grouped for the main 10 main sectors defined in Turkey (SYGM, 2016). In this section, the harmonization activities that emerged as a result of this study are summarized.

### 4.1. Agriculture, Food Security, Forest and Biodiversity

- ▶ Using low loss irrigation systems in agricultural areas.
- ▶ Use of purified and biologically safe waters in agricultural areas.
- ▶ Calculation of irrigation needs on product basis according to different climatic conditions.
- ▶ Encouraging innovations (new products, new production techniques, etc.) in product cultivation through incentive programs.
- ▶ Prevention of water loss in areas with drought risk and forest land.
- ▶ Considering urban or nearby natural forests as nature conservation areas.
- ▶ Medium term mapping of sensitive areas for summer forest fires.
- ▶ Further activation of protected areas (protective belts).
- ▶ Determination of criteria for the management of agricultural systems in order to adapt to climate change.
- ▶ Identifying long-term and low-cost climate change adaptation strategies for fruit trees, olive trees and vineyards.
- ▶ Central and local authorities to protect agricultural biological diversity despite changes in environmental conditions due to climate change.
- ▶ Development of methods for promoting soil fertility, soil structure and natural regulation mechanisms.

- ▶ For the adaptation of the livestock sector to climate change; Evaluation of needs such as reducing the storage rate of farms, changing grazing systems.
- ▶ Supporting scientific-based decision-making mechanisms for climate-adaptive transformation of forests (periodic monitoring, experimental pilot plots, forestry plant breeding, resource research, regional growth recommendations, research of new forest industry techniques (timber cutting, etc.), possible uses of timber in new climatic conditions, etc.).
- ▶ Establishing forest monitoring and tracking systems to measure ecosystems' responses to climate change.
- ▶ Mapping biodiversity sensitivity.
- ▶ Development of ecological monitoring networks.
- ▶ Assessing the impact on ecosystem products and services.
- ▶ Determination of the approximate biomass of regional species and forest ecosystems.
- ▶ Identifying agro-climatic areas under different climate change scenarios.
- ▶ Development of response scenarios of different plant species to different climatic conditions.
- ▶ Developing behavioral simulations of pathogen species under different climatic conditions.
- ▶ Risk maps for the most common parasitic species.

## 4.2. Infrastructure (Building, Transport and Energy)

- ▶ Taking necessary measures to reduce losses in water transmission networks.
- ▶ Making interior designs that allow the use of gray water
- ▶ Reducing the flood risk by making the necessary modifications in the sewerage systems.
- ▶ Re-evaluation of sea level rise projections for all transport facilities
- ▶ Development of vulnerability analysis method for transportation networks and structures (road, railway, harbor and river structures).
- ▶ Supporting transportation routes by improving maritime transport and

navigation (navigation), determining them according to oceanographic, hydrological and meteorological conditions on the high seas and coasts

### 4.3. Superstructures (Urban and Basin Planning, Building and Settlements)

- ▶ Development of building materials and properties according to separate climatic conditions for different regions and locations.
- ▶ Using thermal insulation systems to keep buildings cool in summer and warm in winter.
- ▶ Paying attention to general biodiversity and sensitive species in urban planning.
- ▶ Joint examination of urban planning and the risks and impacts of climate change.
- ▶ Considering the climatic events, existence of different adaptation requirements against the buildings on the slopes, expandable soil (clay, etc.), groundwater, flood risk and underground mining.
- ▶ Determination of the second generation damage of shrinkage-swelling in clay soil,
- ▶ Extending the use of bio and eco-structures.
- ▶ Reorganizing landscape planning in terms of adaptation to climate change.

### 4.4. Coastal Areas

- ▶ Evaluating the main effects of climate change at sea level together with the Coastal Risk Prevention Plan
- ▶ Evaluating the impact of climate change on sea floods and coastal areas
- ▶ Development of morpho-dynamic and ecological response models of coastal units according to different climatic conditions.
- ▶ Supporting existing coastal protection measures within the framework of adaptation activities.

- ▶ Calculation of the effects of sea level rise on coastal residential areas.
- ▶ Assessing flood risks and climate change impact together in large-scale hydrographic basins.
- ▶ Collecting data about changes in the shoreline with remotesensing during tide times.
- ▶ Monitoring of sediment transitions between river and marine systems.
- ▶ Mapping of coasts sensitive to average sea level rise according to various climate scenarios.
- ▶ Development of abandonment, retreat or conservation scenarios for different sea level rise scenarios.
- ▶ Identification of adaptation options for stabilization of coastal areas.
- ▶ Expansion of air monitoring systems to track tidal fluctuations and flood hazards.

## 4.5. Health

- ▶ Systematic monitoring and audits in order to guarantee human health while ensuring the recovery of water for various purposes.
- ▶ Increasing expertise on infectious diseases.
- ▶ Strengthening animal disease monitoring mechanisms.
- ▶ Strengthening plant disease monitoring mechanisms.
- ▶ Assessing the effects of climate change on health and mapping sensitive areas under different climatic conditions.
- ▶ Developing health policies in terms of advice and protection for health problems related to temperature and climate change.
- ▶ Informing the public about health and water-borne diseases, identifying risk groups.

## 4.6. Sea and fishing

- ▶ Preparation and implementation of the National Marine Strategy, taking into account climate change adaptation activities.

- ▶ Preservation of production capacity in fish stocks.
- ▶ Establishing protection areas to improve the resilience of fish stocks.
- ▶ Evaluation of pH and carbon balance in coastal and marine areas.
- ▶ Mapping maritime biodiversity sensitivity.
- ▶ Development of environmental protection measures for threatened aquatic species.
- ▶ Strengthening the interaction between fishing and tourism and creating an alternative source of income.
- ▶ Observing long-term sea level change and establishing a regular recording system.
- ▶ Development of aquatic cycle models for different climatic conditions.
- ▶ Identifying the effects of climate change on invasive species, native species and host species.

## 4.7. Tourism

- ▶ Conducting climate change impact assessment for the tourism sector.
- ▶ Identifying and mapping sensitive and critical regions according to different climate change scenarios.
- ▶ Walking, cultural tours, health holidays are expected to take their place among the existing alternative tourism activities,
- ▶ Providing continuity in tourism by developing different attractive tools.
- ▶ Identifying the potential impacts of climate change on cultural heritage and cultural tourism.

## 4.8. Industry, Commerce and Energy

- ▶ Activating water saving methods in trade and industrial production processes.
- ▶ Use of more effective cooling systems in power plants and stations.
- ▶ Establishment of crisis task units to make quick decisions in extreme weather events.

- ▶ Determining the additional energy need brought about by climate change on regional and sectoral basis.
- ▶ Structural design of facilities covered by major accident regulations to cope with more frequent and severe storms.
- ▶ Making annual and ten-year climate forecasts based on observations and models.
- ▶ Research of future socio-economic changes.
- ▶ Combining climate change adaptation goals with research programs.
- ▶ Supporting biodiversity and climate change research with future investments.
- ▶ Supporting hydrological and ecological modeling studies.
- ▶ Ensuring efficient use of observation, analysis and model resources.
- ▶ Continuing research and experimentation on the understanding of 'comfortable summer temperatures'.

## 4.9. Information, Education and Training

- ▶ Raising awareness and informing the society about the effects of climate change.
- ▶ Monitoring climate change and announcing its results to stakeholders in order to increase awareness and awareness of the necessity of adaptation measures.
- ▶ Raising awareness on the effects of climate change on public health preparing annual agricultural research programs on the effects of climate change and adaptation and ensuring accessibility via the internet.
- ▶ - Establishing an official website or portal with the content of 'adaptation to climate change'.
- ▶ Organizing a traveling exhibition on climate change and adaptation across the country.
- ▶ Conducting public climate change and adaptation activities.
- ▶ Introducing climate change adaptation principles and methodology in public institutions.
- ▶ Providing vocational training to society, environment and occupational

health experts, especially on issues related to sustainable development in climate change.

- ▶ Raising the awareness of the consumer thanks to the ecological certification (eco-certification) method.

## 4.10. Financing and Insurance

- ▶ Effectively managing the risks and opportunities that may occur with climate change in terms of investing by banks and insurance companies.
- ▶ Correct communication on the risks and opportunities of climate change, thanks to an effective communication and advanced training program in the field of investment.
- ▶ Protection of farmers with insurance mechanisms to be developed against climate change.
- ▶ Preventing foresters from being affected by disasters caused by climate change by improving the insurance system.
- ▶ Developing adaptation incentive mechanisms for citizens.
- ▶ Risk assessments in different insurance branches according to changing climate conditions.

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# NATIONAL AND INTERNATIONAL ACTORS OF CLIMATE CHANGE ADAPTATION CONTEXT

*Prof. Dr. Mehmet Somuncu*



# 1. INTRODUCTION

A large part of Turkey is located in a huge climate zone called the Mediterranean climate zone, formed in the western part of the continents in the sub-tropical zone. Therefore, Turkey is among the medium-high risk countries in terms of both current climate, climate change and variability, and future climate.

According to the observations and data of the General Directorate of Meteorology (MGM), while precipitation decreases in the summer months in Turkey, temperatures keep increasing. MGM took the period between 1971 and 2017 as the reference period and determined the annual average temperature value as 13,2 °C for the period between 1971 and 2000 and 13,5 °C for the period between 1980 and 2010 in Turkey (General Directorate of Meteorology, 2018). The average temperature became 14,9 °C in Turkey in 2020. This value is 1,4 °C above the normal of 1981-2010, which was 13,5 °C. Average temperatures of all seasons in 2020 were above 1981-2010 normals. With this result, 2020 has been the third hottest year since 1971 (General Directorate of Meteorology, 2021).

There have been positive temperature anomalies in the average temperatures in Turkey since 1994 (except 1997 and 2011). In general, there is an increasing trend affecting maximum and minimum temperatures across the country. According to the results of the study, while decreases were observed in the number of cold days, cool days and cool nights, the number of summer days, warm days, warm nights and tropical nights increased. Growth season length has increased except in already high coastal areas. This result shows that there is a significant increase in temperatures in Turkey (Erlat and Türkeş, 2017; Türkeş, 2019). However, there are two different models in precipitation changes. Although the average annual total precipitation decreases, the maximum daily rainfall is increasing.

Various climate index trends were identified in Turkey by using the data of 109 stations of MGM for the period between 1960 and 2010. According to MGM, while annual total precipitation in the north of Turkey increased, it tended to decrease in the Aegean, Mediterranean and Southeastern Anatolia regions, it has been observed that the maximum number of rainy days, the number of rainy days and the daily maximum rainfall was in an increasing trend at many stations outside the Aegean and Southeastern Anatolia regions. (Şensoy et al, 2008; 2013; General Directorate of Meteorology, 2015)

The effects of climate change are already being felt in Turkey. The most striking results are warmer winters, drier and hotter summers, changes in biodiversity, and the retreat of glaciers in the mountains. Climate change has an impact on terrestrial, marine and freshwater ecosystems and increases overall pressure on the environment. Social and economic losses caused by extreme events and disasters related to weather and climate increase with spatial and annual variability in Turkey. The nature, intensity and impact of extreme weather and climatic events and disasters are closely linked to varying exposure direction and vulnerability levels at spatial and temporal scales, as well as to economic, social, geographical, demographic, cultural, institutional and governance, environmental and ecological factors. Turkey's climate is expected to undergo significant changes in the next decade. Therefore, actions to adapt to the impacts of climate change are very important and must be adapted to the specific conditions in different regions of Turkey (Republic of Turkey Ministry of Environment and Urbanization. 2018).

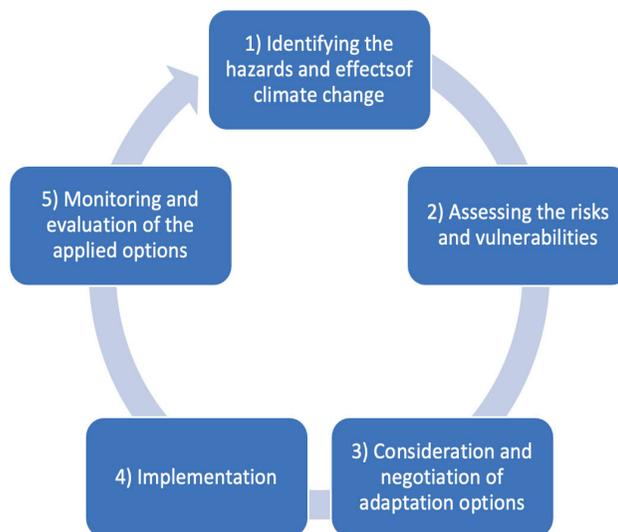
Climate action is undertaken by multiple actors at multiple governance levels, and for this reason, climate governance has been established as a multi-level governance process (Saniz de Murieta and Setzer, 2019). In this context, this report focuses on national and international actors in the context of adaptation to climate change.



## 2. ADAPTATION TO CLIMATE CHANGE

Adaptation is a process in which strategies are developed and implemented to mitigate, cope and take advantage of climate events. In other words, adaptation to climate change is the preparation process for actual or anticipated changes in climate averages and extremes. Adaptation to climate change is addressed in five cyclical stages (Figure 1). All these stages coincide with the responsibilities and interests of many actors and complicate the adaptation process. In addition, all stages of the adaptation cycle are based on a range of interpretations and values such as what constitutes a hazard, how to determine the vulnerability, what are acceptable interventions and the determinants of success. Therefore, these problems make adaptation both complicated and political. Adaptation is therefore an "intersecting" issue, and the process of identifying the most effective roles for various actors and the best policy tools to achieve specific goals is complex and includes various uncertainties (Bednar et al, 2018).

**Figure 1:** Adaptation to Climate Change Consists of Five Cyclical Stages



Source: Bednar et al., 2018.

Adapting to climate change as much as possible is a challenging goal that all countries that are parties to the United Nations Framework Convention on Climate Change (UNFCCC) want to achieve. The successful implementation of the implemented measures and related activities for adaptation to climate change is possible with the involvement of a wide range of stakeholders in the process. This requires multilateral, international, national, regional, local public and private sector organizations, non-governmental organizations (NGOs) and all relevant stakeholders to develop an integrated approach within the framework of adaptation to climate change, and to cooperate in the formulation of policies and adaptation governance. Therefore, stakeholders are located at the center of the adaptation process (Regional Environmental Center, 2015).

Climate policies can be defined as a field of policy that includes the reduction of greenhouse gas emissions that cause climate change, the development of financial tools and technologies required for this, and adaptation to the effects of climate change (Şahin, 2014). For this reason, adaptation to climate change is one of the basic components of climate policies at national or international level (Table 1). Actors play important roles in the formulation, implementation and monitoring of climate policies. Before going into the details of the actors and their roles, it would be useful to briefly distinguish between actors and stakeholders.

**Table 1:** Scope of Climate Policies

Field	Works
Monitoring the climate change and climate modeling	<ul style="list-style-type: none"> <li>- Scientific monitoring of climate change indicators (level of greenhouse gases in the atmosphere, temperature increase, precipitation changes, heat waves, extreme climatic events, etc.)</li> <li>- Identifying the social, economic and ecological impacts caused by climate change (water scarcity, drought, rising sea levels, effects on agriculture, fisheries, etc.)</li> <li>- Establishing climate models and developing projections regarding the future level of global warming, temperature and precipitation amounts, and the effects it will have on the climate and ecosystems</li> </ul>

Field	Works
Calculation and inventory of greenhouse gas emissions	<ul style="list-style-type: none"> <li>- Calculating the amount of greenhouse gas emissions to the atmosphere by countries, regions, cities and sectors and determining the carbon footprint</li> <li>- Monitoring and comparison of the greenhouse gas emissions of the countries by total, per capita and historical years</li> <li>- Taking the greenhouse gas inventory based on emission calculations, monitoring and reporting</li> <li>- Determining the standards for greenhouse gas measurement and providing training</li> </ul>
Economic model and projections	<ul style="list-style-type: none"> <li>- Models and projections regarding the effects of climate change on the economy of the country and the world and emission reduction potentials</li> <li>- Determining the carbon budget</li> </ul>
Reduction targets and policies	<ul style="list-style-type: none"> <li>- In the light of models and projections, determining global, national, local and sectoral targets for the reduction of greenhouse gas emissions. (which greenhouse gas will be reduced by which year according to which year, at what rate)</li> <li>- Development of policy recommendations and tools, low-carbon development strategies, road maps and action plans that will cause to reduce greenhouse gas emissions</li> <li>- Determining local policies that local governments should follow to reduce greenhouse gas emissions and adapt to the effects of climate change, low-carbon urban policies</li> <li>- Developing policies for phase-out of fossil fuels</li> <li>- Conservation and improvement of sinks such as forests, oceans and soil</li> </ul>
Adaptation policies	<ul style="list-style-type: none"> <li>- Identifying risks and vulnerabilities arising from climate change</li> <li>- Increasing the resilience and flexibility of ecosystems and societies against the effects of climate change</li> <li>- Protection of water resources, soil, seeds, aquatic life and all other ecosystems in order to adapt to the unavoidable effects of climate change; making the economic system, agricultural production, animal husbandry and fisheries sustainable</li> <li>- Establishing mechanisms (loss and damage) to compensate the losses and damages that developing countries face due to the effects of climate disasters.</li> </ul>
Technology policies	<ul style="list-style-type: none"> <li>- Identifying, evaluating and applying economic and financial instruments that will facilitate reduction</li> <li>- Carbon pricing (such as emission trade, carbon tax) studies</li> <li>- Flexibility mechanisms (carbon offset, CDM, etc.) and new market mechanisms (New Market Mechanisms)</li> <li>- Financial aid to underdeveloped and developing countries for policies that need to be implemented in mitigation and adaptation</li> <li>- Developing policies to reduce the possible negative effects of the implemented measures against climate change on developing countries (such as international trade barriers)</li> </ul>

Field	Works
Capacity building and awareness	<ul style="list-style-type: none"> <li>- Developing the capacities of all parties that determine and implement climate policies, as well as underdeveloped and developing countries in the international arena, and providing budget and technical facilities</li> <li>- Increasing social awareness and training on climate change</li> <li>- Preparation of the necessary legislation for the implementation of climate policies</li> <li>- Monitoring the implemented climate policies</li> </ul>
International policies	<ul style="list-style-type: none"> <li>- Conducting, monitoring and analyzing international negotiations within the scope of the UNFCCC</li> <li>- Bilateral and multilateral climate policies across countries</li> <li>- Climate change diplomacy</li> </ul>
Climate politics	<ul style="list-style-type: none"> <li>- Analyzing and evaluating climate change policies in the context of environmental policies, international relations and political science disciplines, and developing new policy solutions</li> </ul>

Source: Şahin, 2014.

In most of the definitions made in the literature, a stakeholder is defined to include all parties that affect a situation (organization, plan, policy, etc.) or are affected or are likely to be affected by this situation (Şahin, 2014). According to Bryson's definition (1995), a stakeholder is "any person, group or organization that has a claim on the organization's interest, resources, or outputs, or is affected by those outputs". According to another definition, a stakeholder is "people or small groups who have a voice in the strategic future of the organization and have the power to negotiate and change" (Eden & Ackermann, 1998). When this definition is adapted from the organizational literature to the policy-making process, all parties that affect or are affected by the policies should be involved (Şahin, 2014). However, the knowledge and interest of a significant portion of climate policy stakeholders on climate change may be very limited. Moreover, since climate change and the measures to be taken affect everyone, ultimately all citizens are stakeholders. For this reason, the sectors that affect or try to influence the policies constitute the actors. Actors include those who have knowledge, studies and efforts to influence policies on climate policies (Şahin, 2014). They can include governments, businesses, non-governmental organizations and communities and individuals. Policy actors try to influence the outcome of a policy process through direct or indirect action. For

example, a policy actor can be directly involved in defining policy objectives and evaluating possible means to achieve them. Alternatively, a policy actor could be a non-governmental organization trying to get local voices into policy decisions made at higher levels. Policy actors can also be those affected positively or negatively by a policy process. For this reason, the term policy 'actor' refers to a wide range of groups and individuals who are linked to their relationship to a policy process and its consequences (FAO, 2003).

Since the subject is Turkey's climate policies, including adaptation to climate change, the structure of multi-actor policy processes in Turkey should be investigated. The kind of policy-making process described herein corresponds to what is called governance in the literature (Şahin, 2014).



### 3. GOVERNANCE OF ADAPTATION TO CLIMATE CHANGE

In simple wording, the term "governance" refers to the institutions or processes that we collectively implement to solve common problems or other problems that need to be effectively managed. In terms of the global climate, of course it is a very important issue to keep humanity and a number of existing ecosystems, various species and natural resources in a "safe working area". In this regard, governance of climate adaptation involves the collective efforts of multiple social actors to address the problems associated with the impacts of climate change or to obtain the benefits (Huiteima et al., 2016).

Governance has recently become a widely used term in decision-making analysis in society. It is increasingly recognized that more actors outside the government are involved in the decision-making process, and this leads to a variety of mechanisms to steer actor behavior. In general, environmental decision-making and climate change mitigation and adaptation are naturally included in this transformation. Partnerships and actor networks are increasingly involved in the design and implementation of measures to mitigate climate change and to achieve adaptation to it.

Climate change adaptation governance issues have received increasing attention from both policy makers and researchers in recent years. However, there is still a great deal of uncertainty as to how governments aim to develop and implement adaptation policies. Because, as stated above, the main challenges in adaptation governance are how to better integrate adaptation policies horizontally across policy sectors; how to better integrate vertically at the authorization levels; how to deal with uncertainties and how to integrate information into adaptation policy decisions and non-government stakeholders' adaptation decisions (Bauer et al., 2011). Despite all these challenges, governance plays a key role in the transition to the implementation of adaptation strategies. Climate change adaptation governance is defined as the

structures, processes and interdependencies that determine how actors (from public administration, politics, science, business and civil society) decide, share power, exercise responsibility and ensure accountability for adaptation to climate change. Governance is concerned with the horizontal interaction of sectors and the vertical interaction of policy levels. It requires mandatory (formal) and voluntary (informal) cooperation among actors, across sectors and policy levels, and it is regionally specific and context sensitive.

Multilevel climate governance is a continuous process of discussion and negotiation involving various national and local governments, international organizations, private sector, NGOs and other social actors. Its purpose is to promote opportunities and take action to address climate change. These decision-making and discussion processes can be formal or informal, flexible and adaptable, and take place at various levels, including local, regional, national and international levels (Interreg Alpine Space, 2021).

## 4. ACTORS IN THE GOVERNANCE FOR ADAPTATION TO CLIMATE CHANGE IN TURKEY AND THEIR ROLES

The history of climate policies in Turkey goes back to the early 1990s, as in the rest of the world. One of the three environmental conventions opened for signature at the 1992 Rio Earth Summit, which is considered the most important turning point in international environmental policies, is the United Nations Framework Convention on Climate Change (UNFCCC). Climate policies have gradually increased their significance on the world agenda for more than a quarter of a century. It can be said that a regular international negotiation process has essentially started in 1995 when the first of the annual Conferences of the Parties (or climate summits) was held after the Convention entered into force in 1994, and it has taken its present form after 1997 when the Kyoto Protocol was opened for signature (Şahin, 2014). The twenty-sixth of the Conference of the Parties (COP 26), which continues uninterrupted every year, will be held in Glasgow, UK, on November 1-12, 2021.

Even though each of the 25 Conferences of the Parties held so far has its own important aspects, the most important Conference of the Parties in the last period is the 21<sup>st</sup> Conference of the Parties (COP 21) held in Paris in 2015. The importance of this conference is the adoption of the Paris Agreement, which forms the framework of the post-2020 climate change regime since the Kyoto Protocol will expire in 2020. The condition for the agreement to enter into force was that at least 55 parties making up 55% of the global greenhouse gas emissions should ratify the agreement. This condition was met on October 5, 2016 and the agreement became effective on November 4, 2016. Turkey signed the Paris Agreement with the representatives of 175 countries at the High-Level Signature Ceremony held in New York on April 22, 2016 and has not become a party yet.

The Paris Agreement aims to improve the implementation of the UNFCCC in the

context of sustainable development and eradication of poverty. The long-term goal of the agreement is to keep the global average temperature rise under 2 °C compared to the pre-industrial period; in addition, to continue the global efforts to keep this increase below 1,5 °C. Increasing adaptability and climate resilience to the adverse effects of climate change, providing development with low greenhouse gas emissions and not harming food production while realizing these are stated as another main goal. Finally, stabilizing the flow of finance on the path to low emission and climate resilient development is among the goals (UNFCCC, 2021).

In this entire process, Turkey followed international climate policies since the Second World Climate Conference convened in 1990. Considering that Turkey participated in the 2nd World Climate Conference held in 1990 and even signed the Declaration of Ministers, approved the UN General Assembly resolutions in the early 1990s, and participated in the intergovernmental Negotiating Committee (INC) activities covering the years 1991-1992, it is observed that it is formally involved in the process at the initial stage (Regional Climate Center, 2015). The establishment date of the Climate Change Coordination Board (CCCB) is the year 2001, which is the year when the 7th Conference of the Parties was held in Marrakech, where Turkey's position in the annexes was rearranged. The establishment of CCCB in line with the Prime Ministry communiqué issued this year, in which the relevant public institutions are represented at a high level, enabled the process to be carried out by public institutions with a wider participation and perspective. Therefore, Turkey's following of international climate policies before 2004 and its participation in this direction is limited to the public sector and it cannot be said to be multilateral (Şahin, 2014).

After Turkey became a party to the UNFCCC in 2004, which was opened for signature in 1992, climate change has received increasing interest in the public opinion and has begun to become a policy issue. The year 2004 is a period when Turkey has been conducting intense diplomacy in order to initiate accession negotiations with the European Union (EU), which is a very important actor in climate policies. Since it is not conceivable for a country that is a candidate to become a member of the EU cannot to be excluded from international climate negotiations, becoming a party to

the UNFCCC can be seen as a step taken in this direction (Şahin, 2014).

UNFCCC and Kyoto Protocol issue is examined under the Chapter 27 Environment title within the framework of Turkey's EU accession negotiations that began in 2005. Since both Turkey and the EU are parties to the UNFCCC, but there is no legislation within the Union for the UNFCCC, there is no direct discussion on climate change in the negotiations under the "Environment chapter". The only mandatory directive of the European Union that is to be implemented within the Union within the scope of UNFCCC is the Council Decision 93/389/EEC dated 24 June 1993, which requires monitoring of human-induced greenhouse gas emissions. However, the aforementioned decision was repealed by the Council and Parliament decision 280/2004 / EC dated 11 February 2004. Decision 280/2004 / EC associated the monitoring mechanism of greenhouse gas emissions within the Union with the Kyoto Protocol. As the European Union expects candidate countries to become a party to all international agreements to which the Union is a party, it was noted in the Progress Reports that Turkey is not a party to the Kyoto Protocol; however, in the Environmental Screening Report dated 22 June 2007, the European Commission expressed its expectations regarding the issue more concretely. In this context, the European Union expected Turkey to join the Kyoto Protocol, to develop a concrete national system for the annual preparation and timely presentation of the greenhouse gas emissions inventory, to set a target in the 1st obligation period and to start preparations for the post-2012 targets. It was stated that Turkey should also participate in the negotiations within the scope of Article 3.9 of the Kyoto Protocol as an observer and actively participate in these negotiations after joining the Kyoto Protocol. Finally, it was also stated in the Screening Report that Turkey should start preparations to establish an emissions trading system in accordance with the Emission Trade Directive (Regional Environment Center, 2015).

Turkey became a party to the Kyoto Protocol in 2009, which was adopted at the UNFCCC 3rd Conference of the Parties held in Kyoto in December 1997 and entered into force in 2005. Apart from the many public institution activities conducted by Turkey regarding the UNFCCC and the Kyoto Protocol, the leading climate change works carried out by the civil society were also performed especially during this period (Regional Environment Center, 2015). In the following years, projects carried

out for Turkey to fulfill its obligations arising from UNFCCC such as national notification and action plan and to increase capacity in the public sector have gained importance. A brief chronological summary of Turkey's work on climate change policies at international level is given in the table below (Table 2)

**Table 2:** Summary of Works Carried Out by Turkey on Climate Change Policies at International Level between Years 2001-2018

Tarih	Uluslararası Düzeydeki Çalışma/Eylem
October-November 2001	Turkey's "special conditions" were officially recognized at the Marrakech COP7 Conference. Turkey remained in the ANNEX 1 list of the Agreement and was removed from the ANNEX 2 list.
May 2004	Turkey became a party to the UN Framework Convention on Climate Change.
January 2007	Turkey's First National Communication on Climate Change was presented to UNFCCC Secretariat.
August 2009	Turkey became a party to the Kyoto Protocol.
Mayıs 2010	National Climate Change Strategy Document (2010-2020) was approved by YPK.
July 2011	The National Climate Change Action Plan (2011-2023) has been put into practice.
November 2011	Turkey's Climate Change Adaptation Strategy and Action Plan (2011-2023) has been put into practice.
June 2013	Turkey's Fifth National Communication on Climate Change of (two, three, four and fifth notifications were combined under a single heading) was submitted to the Convention Secretariat.
October 2015	Turkey officially submitted its Intended National Contribution (INDC) Report to the Convention Secretariat.
January 2016	The First and Second Biennial Reports were submitted to the Convention Secretariat.
March 2016	Turkey's Sixth National Communication on Climate Change was presented to the Convention Secretariat.
April 2016	Turkey signed the Paris Climate Agreement.
January 2018	The Third Biennial Report was submitted to the Convention Secretariat.
May 2018	Turkey officially notified the Convention Secretariat to leave the Annex 1 list of the Convention.
December 2018	Turkey's Seventh National Communication on Climate Change was presented to the Convention Secretariat.

Source: Talu and Kocaman, 2019

With the civil climate movement that began to form as of 2005, non-governmental organizations, especially environmental organizations, started to take part in the works on climate change in the following years, participation of actors from different segments in these studies increased, together with the level of interest and the number of actors in climate change issues. The private sector has also become a more active actor in the same years (Şahin, 2014). Therefore, although there are some restrictions on participation and debate in Turkey, there is a policy-making process including climate policies, in which the government and non-governmental parties are involved, As a result of the EU negotiation process and reforms in public administration, an understanding that corresponds to a governance approach has started to spread in Turkey, such as determining strategy and project meetings or joint project implementations involving the private sector, civil society and other segments. Both the public administration, which has the potential for change with the effect of global change and reforms, and the increasing role of the private sector and the growing climate movement make a more democratic and multilateral climate policy process possible (Şahin, 2014).

At the present, there are increasing number of actors influencing climate change policy or governance in Turkey. These actors can be divided into three groups: government-state (public sector), government-non-state actors, and international organizations (Şahin, 2014). In the Presidential System of Government, government-state actors include primarily the Presidency in charge of the executive affairs, and the Policy Boards and Ministries working directly under the President of the Republic; the legislative body of the Turkish Grand National Assembly, public institutions and organizations affiliated to or related to ministries and bureaucrats and experts working in these organizations. On the other hand, non-Government/state actors are the private sector, non-governmental organizations and professional organizations that qualify as public institutions, academia and media. It is necessary to identify international organizations as a third group. Because international organizations are affiliated to the United Nations or established by agreement and have an intergovernmental character, they are between the two groups mentioned due to their functions close to the other two main actor groups (Table 3). Citizens,

on the other hand, exercise their right to obtain information, to express their views and to participate through the media and/or non-governmental organizations and/or political parties and elections (Şahin, 2014).

**Table 3:** Classification of Actors and Major Actor Representation Groups

Classification of Actors	Actor Representation Groups
Government/State (Public Sector)	Public Institutions
International Organizations	International Organizations
Non-Government/State	NGO's Private Sector Academia Media

Source: Şahin, 2014.

## 4.1. Government/State (Public Sector)

Public institutions are the main actors that determine the policies. The Ministry of Environment and Urbanization is the Climate Change National Focal Point and acts as the national coordinator for all issues related to climate change. However, before Turkey became a party to the UNFCCC, institutional structuring was made and the Climate Change Coordination Board (CCCB) was established with the Prime Ministry Communiqué No. 2001/2. CCCB was restructured in 2013 and renamed Climate Change and Air Management Coordination Board (CCAMCB). CCAMCB members are listed in the table below.

**Table 4:** Members of the Climate Change and Air Management Coordination Board

Ministries and Affiliated Public Institutions	Private Sector Institutions
Ministry of Environment and Urbanization	Union of Chambers and Commodity Exchanges of Turkey (TOBB)
Ministry of Foreign Affairs	Turkish Industry and Business Association (TÜSIAD)

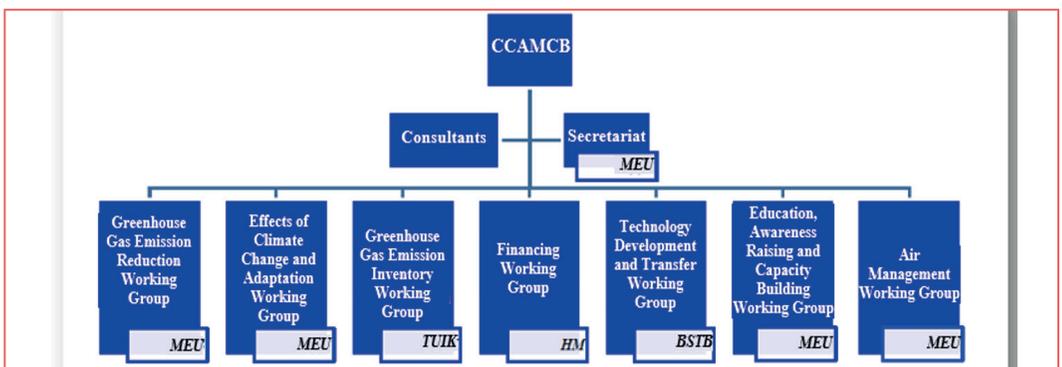
Ministries and Affiliated Public Institutions	Private Sector Institutions
Ministry of Interior	Independent Industrialists' and Businessmen's Association (MUSIAD)
Ministry of Health	
Ministry of National Education	
Ministry of Industry and Technology	
Ministry of Energy and Natural Resources	
Ministry of Treasury and Finance	
Ministry of Agriculture and Forestry	
Ministry of Transport and Infrastructure	

Source: URL-1

There are seven working groups established under the Climate Change and Air Management Coordination Board. These working groups are:

- ▶ Greenhouse Gas Emission Reduction Working Group
- ▶ Effects of Climate Change and Adaptation Working Group
- ▶ Greenhouse Gas Emission Inventory Working Group
- ▶ Financing Working Group
- ▶ Technology Development and Transfer Working Group
- ▶ Education, Awareness Raising and Capacity Building Working Group
- ▶ Air Management Working Group

**Figure 2:** Structure of the Climate Change and Air Management Coordination Board



Resource: URL-1

The authorized ministry in charge of combating climate change in Turkey is the Ministry of Environment and Urbanization. This ministry carries out the task of national coordination on issues related to climate change and it is the National Focal Point responsible for the United Nations Framework Convention on Climate Change Secretariat. In Article 103 of the Presidential Decree, the General Directorate of Environmental Management, one of the service units of the Ministry, has been directly tasked with the issue of climate change. The Climate Change and Adaptation Department under the General Directorate of Environmental Management is the unit directly responsible for the issue of climate change within the General Directorate. There are four branch directorates under the Climate Change and Adaptation Department to fulfill this task. They are:

- ▶ Climate Change Policies and International Negotiations Branch Office
- ▶ Local Climate Change Policies Branch Office
- ▶ Greenhouse Gas Emissions Monitoring Branch Office
- ▶ Protection of the Ozone Layer and Management of Fluorinated Gases Branch Office.

Duties of the Climate Change and Adaptation Department are as follows:

- ▶ To monitor and coordinate local, national and international efforts for combating climate change and protecting the ozone layer, to prepare legislation on necessary issues,
- ▶ To provide national coordination and fulfill the duties of national focal point within the scope of international organizations and conventions for combating climate change and protecting the ozone layer,
- ▶ To carry out legislative studies and other studies for the harmonization of the European Union acquis in the areas within its field of duty
- ▶ To prepare or have prepared national reports that our country is obliged to prepare within the scope of international organizations and conventions,
- ▶ To coordinate the Climate Change and Air Management Coordination Board,

- ▶ To ensure the national coordination of climate change mitigation efforts at the local (in cities and geographical regions), to organize/have organized capacity building activities for the preparation and implementation of climate change action plans at the local level, and to develop legislation,
- ▶ To monitor and evaluate national and international developments regarding the control, recovery, and disposal of substances that cause ozone depletion and greenhouse gases that are alternatives of these substances, to make and have them made to determine and implement policies and strategies,
- ▶ To monitor, control and report greenhouse gas emissions that cause climate change on a national scale,
- ▶ To conduct works on market-based mechanisms and economic instruments, especially the emission trading system, within the framework of climate change policies,
- ▶ To coordinate the studies aimed at monitoring and evaluating climate change adaptation policies,
- ▶ To conduct works on informing and raising awareness of the public,
- ▶ To prepare and implement national and international projects in the fields that fall within its field of duty,
- ▶ To perform other duties assigned by the administration.

"National Climate Change Strategy Document 2010-2023", "Republic of Turkey Climate Change Action Plan 2011-2023" and "Turkey's Climate Change Adaptation Strategy and Action Plan 2011-2023", which are the basic strategy documents on climate change, have been prepared under the coordination of the Ministry of Urbanization. Regarding climate change, there is also an Air Management Department within the General Directorate of Environmental Management.

Although the Ministry of Environment and Urbanization is the principle authorized ministry in charge of combating climate change in Turkey, some other ministries and public institutions and organizations are also among the active actors in this field due to their multi-dimensional and multi-sectoral nature of climate change. In this context, the Ministry of Agriculture and Forestry, the Ministry of Energy

and Natural Resources, the Ministry of Industry and Technology, the Ministry of Transport and Infrastructure, the Energy Markets Regulatory Authority, the Disaster and Emergency Management Directorate, the General Directorate of State Hydraulic Works and the General Directorate of Meteorology are the effective ministries and public institutions in climate change policy. State institutions with direct responsibilities for climate change adaptation are summarized in the table below (Table 5).

**Table 5:** Major State Institutions with Direct Responsibilities for Adaptation to Climate Change in Turkey

Ministries and Affiliated/Related Public Institutions	Related Units
Ministry of Environment and Urbanization	General Directorate of Environmental Management, Department of Climate Change, General Directorate of Environmental Impact Assessment, General Directorate of Permit and Inspection, General Directorate of Spatial Planning, General Directorate of European Union and Foreign Relations
Ministry of Agriculture and Forestry	General Directorate of Plant Production, General Directorate of Agricultural Reform, General Directorate of Combating Desertification and Erosion, General Directorate of Nature Conservation and National Parks, General Directorate of Water Management
Energy and Natural Resources Ministry	General Directorate of Energy Affairs, Department of Energy Efficiency and Environment
Ministry of Foreign Affairs	Directorate of the European Union
Ministry of Industry and Technology	General Directorate of Strategic Research and Productivity
Ministry of Transport and Infrastructure	General Directorate of European Union and Foreign Relations
Ministry of Health	General Directorate of Public Health
Ministry of Interior	Disaster and Emergency Management Directorate
Energy Markets Authority	
General Directorate of State Hydraulic Works	Department of Survey Planning and Allocations
Meteorology General Directorate	

Forestry General Directorate	Foreign Affairs, Education and Research Department
Turkish Statistical Institute (TURKSTAT)	Department of Environment and Sustainable Development Statistics
Turkish Water Institute	

*Source: Prepared by the author.*

The ministries, affiliated and related institutions summarized in the table are the institutions that are responsible for climate adaptation governance at the level of legal authority given to them and carry out studies on this subject.

As the legislative body, the Turkish Grand National Assembly has a decisive role in the enactment of laws and regulations and the approval of international agreements and conventions on climate change. In addition, it is actively involved in policy production through the parliament research commissions (Şahin, 2014).

Even though climate change is a global problem, it is felt at the local scale. Therefore, cities and municipalities must be at the forefront of adaptation. The wide range of duties and responsibilities of local governments as well as the multidimensionality of climate change necessitates the involvement of local governments in climate change policies (Talu and Kocaman, 2019). The local level and urban context are considered very important for climate change adaptation. Because, adaptation to climate change is primarily local and depends on municipal authorities, companies or individuals (Klein et al., 2017). This situation places municipalities in the public sector as an important actor at the forefront in climate governance at the local level. There are approximately 1400 municipalities with different statuses in Turkey (Table 6). On the other hand, combating climate change at local scale in Turkey can be considered at the initial stage. In recent years, some metropolitan municipalities have prepared local climate action plans. However, considering the number of metropolitan and provincial municipalities in Turkey, it is a fact that the number of municipalities with climate action plans is quite low. Some metropolitan municipalities have begun to work on this issue or have made progress in their studies (Table 7).

**Table 6:** Number of Municipalities in and Their Statuses

Administrative Status	Number
Metropolitan Municipality	30
Province Municipality	51
Metropolitan Township Municipality	519
Township Municipality	403
Small Town Municipality	387
Total Number of Municipalities	1390

Source: URL-2

**Table 7:** Climate Change Action Plan Works of Municipalities

Municipality	Status in the Climate Change Action Plan Work
İstanbul Metropolitan Municipality	İstanbul Climate Change Action Plan
Bursa Metropolitan Municipality	Bursa Metropolitan Municipality Climate Change Action Plan
Gaziantep Metropolitan Municipality	Gaziantep Climate Change Action Plan
Denizli Metropolitan Municipality	Denizli Climate Change Action Plan
Kocaeli Metropolitan Municipality	Kocaeli Greenhouse Gas Inventory Climate Change Action Plan
Trabzon Metropolitan Municipality	Trabzon Sustainable Energy Action and Climate Change Action Plan
Muğla Metropolitan Municipality	Muğla Province Climate Change and Sustainable Energy Action Plan
Kahramanmaraş Metropolitan Municipality	Kahramanmaraş Metropolitan Municipality and Kahramanmaraş Province Carbon Footprint Inventory
Kadıköy Municipality	Kadıköy Climate Action Plan
Antalya, Ankara, Balıkesir, Konya, Aydın Metropolitan Municipalities	(Works in progress)

Source: Prepared by the author.

While climate action plans at the local level are prepared by metropolitan municipalities, it is seen that local administrations at the provincial or township municipal level have signed the EU Covenant of Mayors for Climate & Energy (Table

8). The EU Mayors Convention for Climate and Energy was launched in Europe in 2008 to voluntarily bring together local governments committed to achieving and exceeding the EU climate and energy targets. The initiative currently brings together more than 9,000 local and regional authorities in 57 countries, leveraging the strengths of a worldwide multi-stakeholder movement and the technical and methodological support offered by private offices.

**Table 8:** Municipalities that signed The EU Covenant of Mayors for Climate & Energy

Municipality	Population	Year of Joining the Covenant	Municipality	Population	Year of Joining the Covenant
Bodrum (Muğla)	176000	2020	Mezitli (Mersin)	240204	2015
Konak (İzmir)	344678	2020	İzmir MM	4320519	2015
Yenişehir (Mersin)	266117	2020	Çankaya (Ankara)	914501	2015
Denizli MM	1037208	2020	Maltepe (İstanbul)	460955	2014
Yenimahalle (Ankara)	663580	2019	Nilüfer (Bursa)	350000	2014
Bolu	311810	2019	Tepebaşı (Eskişehir)	359303	2013
Çorlu (Tekirdağ)	262862	2019	Antalya MM	2043432	2013
Sakarya MM	1010700	2018	Kadıköy (İstanbul)	452302	2012
Gaziantep MM	1947244	2017	Seferihisar (İzmir)	35000	2011
Pendik (İstanbul)	720000	2017	Bornova (İzmir)	412275	2011
Bayındır (İzmir)	40216	2017	Eskişehir MM	887475	2011
Şişli (İstanbul)	272380	2017	Karşıyaka (İzmir)	348000	2011
Bağcılar (İstanbul)	762000	2016	Erdek (Balıkesir)	2663	2009
Bursa MM	2842547	2016			

The signatories of the Covenant affirm a shared vision for 2050. This vision is to accelerate the decarbonisation of their regions, to strengthen their capacity to adapt to the inevitable effects of climate change, and to allow their citizens access to safe, sustainable and affordable energy. The cities that have signed the Covenant are pledging to take action to support the implementation of the EU's 40% greenhouse gas reduction target by 2030 and the adoption of a common approach to climate change adaptation and mitigation. This situation is an indication that local governments in Turkey have taken more and more action in the combat against climate change in recent years compared to the past.

Chambers and foundations such as the Union of Chambers and Commodity Exchanges of Turkey (TOBB), Chamber of Environmental Engineers (TMMOB-ÇMO), Chamber of Meteorology Engineers (TMMOB-MMO), Turkish Technology Development Foundation (TTGV) are professional organizations and foundations like public institutions whose effectiveness is increasing progressively (Şahin, 2014).

## 4.2. International Organizations

The United Nations (UN) was established in the aftermath of World War II on 24 October 1945 by 51 countries, including Turkey, in order to realize the vision of protecting international peace and security, supporting sustainable development and ensuring human rights. The UN, which has currently 193 member countries, consists of 6 main organs including the General Assembly and the Security Council, as well as their sub-committees and auxiliary bodies, as well as the main committees and auxiliary bodies, and 15 agencies and 13 programs and funds, research institutes, joint programs, affiliated bodies and commissions and other organizations, jointly called United Nations Organizations (including the Bretton Woods organizations under the UN umbrella, namely the World Bank and IMF). In addition, there are also UN-affiliated organizations (such as the International Atomic Energy Agency [IAEA] and the World Trade Organization [WTO]), joint financial instruments (such as the Global Environment Fund [GEF]) and convention secretariats.

United Nations Framework Convention on Climate Change (UNFCCC) is one of these secretariats. Furthermore, the Intergovernmental Panel on Climate Change (IPCC), established by the World Meteorological Organization (WMO) and the UN Environment Program (UNEP) with the decision of the UN General Assembly, is one of the unique structures within the UN framework as the highest scientific organization on the subject. Therefore, the issue of climate change is among the international problems directly addressed under the organizational structure of the UN. In addition, many UN organizations, including WMO, UNEP, UN Development Program (UNDP), Food and Agriculture Organization (FAO), World Health Organization (WHO), World Bank and GEF, are working on climate change, making projects on the subject, publishing reports and following international negotiations (Şahin, 2014).

Fifteen organizations affiliated with the UN, namely Food and Agriculture Organization (FAO), The International Labor Organization (ILO), The International Organization for Migration (IOM), UN Women Unit (UN WOMEN), UN Development Program (UNDP), UN Population Fund (UNFPA), UN Refugee Agency (UNHCR), UN Information Centers (UNIC), United Nations International Children's Emergency Fund (UNICEF), United Nations Industrial Development Organization (UNIDO), United Nations Volunteers Program (UNV), World Food Program (WFP), World Health Organization (WHO) and, Bretton Woods organizations, namely the World Bank and IMF, have representatives and offices in Ankara, Turkey. The World Meteorological Organization (WMO) and the UN Environment Program (UNEP) do not have an office in Turkey. Relations with the UNFCCC are carried out through the focal points designated in the party countries and as stated above, the focal point in Turkey is the Ministry of Environment and Urbanization. For this reason, the priority UN agency for climate change in Turkey is UNDP, which is one of the most widely organized UN organizations with regional and country offices all over the world. GEF, the financial instrument of the UNFCCC, can be considered an important actor as one of the most important financiers of climate works in Turkey (Şahin, 2014).

International organizations have had a great role and weight in the development of climate policies and climate adaptation governance in Turkey from the very beginning. Among these are the United Nations Development Program (UNDP), Regional Environment Center (REC), UN Global Environment Fund (GEF) and the European Union and the EU Delegation to Turkey representing it.

After Turkey became a party to the UNFCCC in 2004, it submitted the First National Communication on Climate Change in 2007, which it is obliged to submit to the UNFCCC Secretariat within the scope of the Agreement, presented the Fifth National Communication on Climate Change in 2013 where the second, third, fourth and fifth notifications were presented together, the Sixth National Communication in 2016, and finally the Seventh National Communication and the 3rd Biennial Report to the United Nations Climate Change Secretariat in 2018. The United Nations Development Program (UNDP) has been working with various ministries in various projects, especially in the preparation of the National Climate Change Notifications and Climate Change Action Plan (CCAP), which have begun to be submitted to the UNFCCC Secretariat as of 2004, and also played an important role in Turkey's completion of its preparatory obligations under the Convention (Şahin, 2014).

The Regional Environment Center (REC) was established with an intergovernmental agreement and it has been a pioneer in raising the level of knowledge and awareness on climate change, developing capacity and preparing Turkish delegations for international negotiations, first in the public and civil society, and then in the private sector in Turkey since the same years. REC Turkey is also an important actor in the process of Turkey's becoming a party to the Kyoto Protocol. The UN Global Environment Fund (GEF), which is the financial instrument of the Convention, is one of the most important financial supporters of the works carried out in the public sector. GEF also has a Small Support Program that supports non-governmental organizations (Şahin, 2014).

The European Union is one of the important actors in Turkey's climate policies and climate adaptation governance. The period when Turkey started to formulate its

policies on climate change coincides with a period in which the EU accession process gained momentum. Therefore, the EU is an important driving force in Turkey's fight against climate change in this period. Besides the political impact of the ongoing negotiations with the EU, EU funds are extremely important (Şahin, 2014).

The EU works closely with national authorities in Turkey to ensure full harmonization of national legislation with the EU *acquis*. Turkey's accession negotiations on Chapter 27 (Environment) have been continuing since December 2009. The EU is providing financial assistance to Turkey in the field of environment and climate change, reflecting the structural funding programs designed for EU Member States, with seven-year multi-year operational programs under the Instrument for Pre-Accession Assistance (IPA). Six billion Euros worth of pre-accession financial aid has been allocated to Turkey since 2002. A portion of 15% of this allowance (approximately 1 billion Euros) has been allocated to the Environment sector. In the current period of IPA II (2014-2020), the EU is implementing the second seven-year multi-year program on Environment and Climate Action, and in addition to environmental management for climate change, sustainable development and disaster management, water, waste, chemicals, air quality and have provided 363 million 700 thousand Euros of funds for projects aiming to improve environmental protection in the areas of increasing natural management capacity (URL-4). For this reason, the EU Delegation in Ankara is also among the actors.

## 4.3. Non-Government/State Actors

### 4.3.1. Private Sector

One of the most important actors in combating climate change is undoubtedly the private sector. Unlike civil society, the private sector has a decisive role in the sense of being the implementer of climate policies. For this reason, almost all sectors in the field of industry and trade are affected by climate change as stakeholders and affect climate policies (Şahin, 2014).

The private sector is faced with the scientifically proven reality of global climate change. This situation affects the private sector directly and indirectly and brings risks and opportunities with it. Companies need to incorporate climate change combating and adaptation strategies in their planning and decision-making processes. All kinds of investments to be made today for emission reduction and adaptation will make the negative effects of climate change less felt in the company and society in the future (Regional Environment Center, 2014).

The private sector carries out its work on climate change mainly through professional organizations and networks. For example, the Climate Platform is a private sector network established by the Turkish Industrialists and Business People Association (TÜSİAD) and REC Turkey, with approximately 20 large companies as members. The platform was established among the senior executives of the companies, and thus it is concerned with raising the awareness of the business world on climate change, not just having relevant departments or reporting on relevant issues in the corporate structure and management level of companies. The Climate Platform aims to "support Turkey's transition to a low-carbon economy and increase its competitiveness", carries out studies by organizing various meetings and events for international summits and making publications. In addition, TOBB, TÜSİAD and MÜSİAD, which are large professional organizations representing the private sector, are also members of CCAMCB and actively participate in the activities. TÜSİAD participates in the UNFCCC Conference of the Parties and conveys the attitude of the Turkish business world towards combating climate change to the international stakeholders.

### 4.3.2. Civil Society

In Turkey, non-governmental organizations can be considered as an important actor group in knowledge and policy production and climate adaptation governance in combating climate change, which is structured in different ways as networks, platforms and social movements on climate change, international and Turkish environmental NGOs, think tanks and professional-specialist NGOs. For example, the Climate Network was established in 2012 jointly by Buğday Association for Supporting

Ecological Life, Nature Association, Nature Conservation Center, Eurosolar Turkey, Greenpeace Mediterranean, Kadıköyü Science, Culture and Art Friends Association, Turkey Fight Against Erosion, Turkey Foundation for Afforestation and Protection of Natural Assets (TEMA), WWF - Turkey (Foundation for the Protection of Natural Life), 350 Ankara, Yeşilist and Green Thought Association. The Climate Network aims to share our common concerns and recommendations for solutions with the society, public institutions and international institutions regarding the human-induced climate change, whose effects we experience with increasing frequency and intensity, and to carry out joint efforts to stop human-induced climate change before it reaches a point of no return (Climate Network, 2021). The non-governmental organizations and many associations, NGOs with the status of foundations in the mentioned network that cannot be counted here carry out studies on adaptation to climate change within the framework of their legal entities (For detailed information on this issue, see Şahin, 2014).

Greenpeace Mediterranean, World Wildlife Fund (WWF-Turkey) and European Climate Foundation (ECF), which are international environmental NGOs organized in Turkey, are important non-governmental organizations working on climate change. Istanbul Policy Center (IPC) within Sabancı University, Energy and Climate Change Foundation (ENIVA), Economic Policy Research Foundation of Turkey (TEPAV), Economy and Foreign Policy Research Center (EDAM), Heinrich Böll Stiftung Association Turkey Representation, Istanbul International Energy and Climate Center (IICEC) are think tanks that work on climate change (Şahin, 2014).

### 4.3.3. Academia

The academia, i.e. universities and research organizations, faculty members and experts are among the most important actors of climate policies. Because academia is the place where research on climate change is carried out and information is produced as a result of these researches. Although various disciplines such as Geography, Climate Science (Climatology), Meteorology, Environmental Engineering, Physics /Physics Engineering, Agricultural Engineering, Forest Engineering, which are directly related to the subject of climate, have existed for many years in Turkey,

it cannot be said that the issue of climate change is a common and an established field (Şahin, 2014). There is the possibility of encountering individual researches or publications on climate change before the 1990s in Turkey. However, researches and publications on climate change in academia have gained momentum since the 1990s and the early 2000s. Therefore, it can be said that the studies on climate change in academia have developed in parallel with the work of the government-state bodies on this issue.

The scientific studies, which we can say that Istanbul Technical University pioneered at the beginning, have become widespread in the academic platform in Turkey today. As a matter of fact, in the process that began with climate modeling studies within the framework of the activities of climate change in Turkey and in the world, academicians from many disciplines, including social sciences, carry out scientific studies in the fields of science and social sciences related to climate change, including adaptation. This situation shows that academia is an important actor in climate adaptation governance.

It can be said that scientific research projects on climate change and publications have increased in recent years. In addition, theses made in graduate programs are an indicator of this issue. In a study conducted to evaluate this issue, a survey was made specifically for the postgraduate theses archived in YÖK National Thesis Center. Graduate theses that include the keyword "Climate Change" in title, abstract, keyword and subject categories were searched in the survey. As a result of the findings, it was determined that there are 1395 theses in the archive; 1109 theses at the master's level and 286 theses at the doctorate level (İklim Haber, 2021).

With climate change studies being widespread in universities, Research and Application Centers have been established to conduct scientific research in the field of climate change. Boğaziçi University Climate Change and Policy Application and Research Center are the first Research and Application Center in this field, which was established in 2014. This was followed by the Climate Change Research and Application Centers established within Istanbul Technical University, Istanbul Medipol University and Iskenderun Technical University. In addition, Agriculture

and Climate Change Application and Research Center were established in Selçuk University. Research activities and projects on climate change are carried out, publications are made, conferences, panels, scientific meetings, etc. are organized in research and application centers at universities. In addition, graduate programs on climate change have been opened in some universities. TÜBİTAK provides project support to studies on climate change.

In addition to making purely merely academic studies on climate change, scientists and experts in the academia have been collaborating with national and international institutions/organizations in recent years and they are more frequently involved in projects within this scope.

#### 4.3.4. Media

In fact, media is the most important actor in bringing climate change to the public agenda. We can say that as a result of the increase in the number of stakeholders or actors dealing with climate change in Turkey, the increasing network of relations between these groups and the negative effects of climate change becoming visible and directly affecting human life, the issue has started to occupy a larger space in the media. In recent years, programs, articles and news on the causes and consequences of climate change have wider coverage in traditional printed and visual media. In addition to the websites that publish news on climate change on the digital platform, the number of websites is increasing with topics directly on climate science, climate policies and climate economy. This situation has an important role in increasing the level of social consciousness or awareness on combating climate change.



## 5. CONCLUSION

The long-term climate data of the General Directorate of Meteorology and the results of scientific studies based on these data show that climate change is being experienced in Turkey. Concrete indicators of climate change such as increase in average temperature, precipitation variability, extreme weather events and the reflection of these indicators on the natural environment and economic and social life mean that the negative effects due to climate change gradually increase. For this reason, plans and actions to adapt to the impacts of climate change are very important

Adaptation to climate change is a challenging goal that all countries that are parties to the United Nations Framework Convention on Climate Change (UNFCCC) want to achieve. The successful implementation of the implemented measures and related activities for adaptation to climate change is possible with the involvement of a wide range of stakeholders in the process.

At the present, there are increasing number of actors influencing climate change policy or governance in Turkey. These actors can be divided into three groups: government-state (public sector), government-non-state actors, and international organizations (Şahin, 2014). In the Presidential System of Government, government-state actors include primarily the Presidency in charge of the executive affairs, and the Policy Boards and Ministries working directly under the President of the Republic; the legislative body of the Turkish Grand National Assembly, public institutions and organizations affiliated to or related to ministries and bureaucrats and experts working in these organizations. On the other hand, non-Government/state actors are the private sector, non-governmental organizations and professional organizations that qualify as public institutions, academia and media. It is necessary to identify international organizations as a third group. Because international organizations are affiliated to the United Nations or established by agreement and have an intergovernmental character, they are between the two groups mentioned

due to their functions close to the other two main actor groups (Table 3). Citizens, on the other hand, exercise their right to obtain information, to express their views and to participate through the media and/or non-governmental organizations and/or political parties and elections (Şahin, 2014).

Public institutions are the main actors that determine the policies. The authorized ministry in charge of combating climate change in Turkey is the Ministry of Environment and Urbanization. This ministry carries out the task of national coordination on issues related to climate change and it is the National Focal Point responsible for the United Nations Framework Convention on Climate Change Secretariat. The General Directorate of Environmental Management, one of the service units of the Ministry, has been directly tasked with the issue of climate change. The Climate Change Coordination Board (CCCB), established with the Prime Ministry Communiqué in 2001, was restructured in 2013 and renamed Climate Change and Air Management Coordination Board (CCAMCB). The Climate Change and Air Management Coordination Board consists of members from ten ministries from the public sector and three institutions from the private sector and there are seven working groups established under this board.

Although the Ministry of Environment and Urbanization is the principle authorized ministry in charge of combating climate change in Turkey, some other ministries and public institutions and organizations are also among the active actors in this field due to the multi-dimensional and multi-sectoral nature of climate change. Combating climate change at local scale in Turkey can be considered at the initial stage. In recent years, some metropolitan municipalities have prepared local climate action plans.

International organizations have had a great role and weight in the development of climate policies and climate adaptation governance in Turkey from the very beginning. Among these are the United Nations Development Program (UNDP), Regional Environment Center (REC), UN Global Environment Fund (GEF) and the European Union and the EU Delegation to Turkey representing it.

The private sector, one of the non-government and non-state actors, carries out its work on climate change mainly through professional organizations and networks. Non-governmental organizations, which are structured in different ways as networks, platforms and social movements, think tanks and professional-specialist NGO's on climate change, constitute an important group of actors in the production of knowledge and policy in the fight against climate change and climate adaptation governance. Non-governmental organizations, which are structured in different ways as networks, platforms and social movements, think tanks and professional-specialist NGOs on climate change, constitute an important group of actors in the production of knowledge and policy in the fight against climate change and climate adaptation governance.

The academy, which is the place where research on climate change is carried out and information is produced as a result of these researches, namely universities and research institutions, faculty members and experts are among the most important actors of climate policies. Media is actually the most important actor in bringing climate change to the public agenda. Media has an important role in increasing social consciousness or awareness on combating climate change.

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# TOURISM POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

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# 1. INTRODUCTION

Tourism is one of the fastest growing economic sectors in the world and the main source of foreign currency for most developing countries. According to the data of the United Nations World Tourism Organization (UNWTO), despite the emergence of negativities that may affect tourism from time to time such as wars, economic problems, epidemics and political problems between countries, since 1950, the number of participants in international tourism and expenditures and investments for tourism increased continuously. Accordingly, the tourism industry has developed greatly.

While the number of people participating in international tourism was 25 million in 1950, this figure reached 1,4 billion in 2018. While international tourism expenditures were only 2 billion USD in 1950, it was 1,4 trillion USD in 2018. In addition, with international travel expenditures of 256 billion USD, international tourist expenditures reached 1,7 trillion USD or daily average 4,65 billion USD in 2018.

International tourist expenditures in 2018 accounted for 7% of world exports and 30% of world services export in the same year (UNWTO, 2019). While tourism revenues rank first in 60 countries in the world, it constitutes one of the top five export revenues in more than 150 countries. Tourism is also the main source of foreign exchange for a third of developing countries and half of the least developed countries (UNEP, 2011). This development in tourism has made the sector an important employment area. The tourism industry employs approximately 277 million people per year, directly or indirectly, around the world, and 1 person out of every 11 people working globally is employed in the tourism sector. It is estimated that the number of people participating in international tourism worldwide in 2030 will be 1.8 billion (UNWTO, 2015). These data are only macro level indicators reflecting the economic and social dimensions of international tourism.

The dimensions of domestic tourism that takes place within the borders of the countries in the world are even greater than international tourism. The number of people participating in domestic tourism as of 2014 is estimated to be 6 billion people (UNWTO, 2015). When the expenditures made in domestic tourism are added to the international tourism expenditures, it is indisputable that the economic size that will emerge will be much higher. The calculations made by the World Travel & Tourism Council (WTTC) confirm this situation. According to data from WTTC, travel and tourism contributed 8.9 trillion USD to global GDP in 2019. This figure accounts for 10.3% of global GDP. The sector has provided jobs directly and indirectly to 330 million people, which means that one in 10 jobs on a global scale belongs to the tourism sector (WTTC, 2020). According to the data and forecasts of both UNWTO and WTTC, depending on the development in tourism, the share of the sector in the world economy is expected to increase further shortly.

Three basic elements play an important role in the development of both domestic and international tourism. These are the so-called essential elements of tourism or tourism supply sources namely attractions, access and accommodation. Their adequacy and organization form the basis of the tourism development of a place or country (Özgüç, 2003).

The existence of such a picture economically makes tourism important. Tourism is considered as an important development tool, especially for developing countries. For example, countries such as Turkey, Greece, Thailand, Mexico and Egypt benefit from tourism in a good way as a tool of economic and social development.

According to data from World Tourism Organization, in 2018 Turkey was ranked sixth in the top 10 destinations in terms of international visitor arrivals and it received 45.7 million visitors in 2018, and the tourism income of the country is 25.2 billion USD (UNWTO, 2019). GDP share of incomes obtained from tourism in Turkey in 1980 is 0.6 % and the rate of tourism incomes to export is 11.2%. According to 2014 data, the share of tourism revenues in GNP was 4.3% and the ratio of tourism revenues to exports were 21.8% (TÜRSAB, 2018). According to the

data of 2015 the share of tourism in closing the deficit of foreign trade in Turkey is 49,73%. All these data are clear indicators that tourism, which started to develop since the beginning of the 1980s, has an important place in the economy of the country. Moreover, the economic data above are directly related to income from tourism. Taking into account the multiplying effect of tourism, it could be seen how an important place the tourism sector has in Turkey's economy and country development since it mobilizes many other business branches.

Climate change is a global human development problem that threatens the sustainability of ecosystems and causes serious economic and social difficulties for billions of people and nations around the world. Turkey is not an exception in this regard and as discussed above in part, Turkey is very sensitive to the effects of climate change (Ministry of Environment and Urban Planning Ministry, 2016b).

Tourism movements in Turkey are at sea-sand-sun axis and concentrated in the Mediterranean and Aegean coasts. In these regions, Antalya, Muğla, Aydın and İzmir provinces are important tourism centers. When the average temperatures of Antalya province, which is the tourism region of Turkey that receives the most of foreign visitors, are examined for years 1990- 2011 the increase trend could be clearly seen. The average annual temperature value for the period 1990-1999 was determined as 17,9 °C, and the average annual temperature value for the period 2000-2009 was determined as 19,4 °C. The average of the second 10-year period is 1,5 °C higher than the average of the first 10 years, and this value is quite high compared to the predictions made by the World Tourism Organization in 2003 (Republic of Turkey Ministry of Environment and Urbanization, 2016a).

According to the researches, in the 21st century, there will be a great increase in the number of days when the extreme temperatures over 40 °C are measured and tourism will not be fulfilling its characteristics function of resting and comforting as a result of extreme temperatures.



## 2. WHAT IS TOURISM POLICY?

The fact that tourism is an activity that is closely related to many economic fields, uses and creates resources, necessitates that it should be addressed within the scope of trade, agriculture and industrial policies. There is a necessity that various sectors that constitute the national economy should be handled at the "policy level". There is also a need for a tourism policy as for agricultural policy as well as industrialization policy. Tourism policy is the totality of the approaches, targets and measures taken by the administrations using various tools to develop, direct and control the tourism industry in a country.

Tourism policy is a dynamic process. A dynamic tourism policy is redefined according to changing situations and creates new conditions by improving existing conditions. The new conditions also form the principles and foundation of a new tourism policy.

### 3. GENERAL STRUCTURE AND TOURISM POLICY OF TURKISH TOURISM

Tourism in Turkey has for long years been an economic activity of using resources such as sea- sun- sand and natural beauties with a simple technology. It was expected that tourism would bring solutions to main problems of the country such as foreign exchange bottleneck and unemployment and with the big development demonstrated by the sector in the recent years, it has become one of the important elements of Turkish economy and therefore the development.

Effects of tourism in Turkey's economic, social and cultural were noticed after the 1940s and, from 1963 until the 1980s, partly tended to develop over time. Considering the positive effects of tourism on the country's economy, public sector planners have implemented policies that encourage tourism. Despite the fact that mass tourism is adopted as a policy in DPT's Five Yearly Development Plans and Annual Plans during 1960s and 1970s, the country did not realize physical investments towards mass tourism until 1980s. Hence tourism policy is regarded as unsuccessful for Turkey before 1980.

It is necessary to have rich tourism resources for tourism to develop in a country or region. The existence of natural, cultural and historical resources is a prerequisite for a healthy development of tourism. However, the existence of these resources alone is not enough for the development of tourism. The resources should be processed and turned into tourist attraction and presented to the tourist. The transformation of resources into attraction depends on the creation of physical infrastructure or the development of existing infrastructure. After the infrastructure is realized, the tourism industry, which is defined as the superstructure of tourism, processes the resources and transports them to the tourist. In this sense, post-1980 has been a turning point for Turkish tourism and the beginning of structural changes in tourism. The main reason for the structural change is the creation of the special

tourism infrastructure and appropriate tourism superstructure required for mass tourism in these years.

To evaluate the rich tourism potential that Turkey has, "Tourism Incentive Law" No. 2634 has been put into effect in 1982. With this law, it is aimed to increase tourism investments and eliminate negative factors preventing investments. With the new regulations on physical planning, land supply and infrastructure coordination, importance has been given to the construction of accommodation facilities in particular. By law, the allocation of public lands to investors for tourism investments, benefiting from the tourism development fund, low-interest and long-term tourism loans, foreign personnel employment, customs exemption, investment discount, incentive loans, tax discount, financing fund, incentive premiums are the main incentives provided to the tourism sector. Thanks to the promotion and marketing activities carried out with the incentives and supports provided within the scope of the same law, the sector has shown a great development, as a result, today tourism has become the second item after exports in terms of foreign exchange revenues. Thanks to the legal and economic regulations made after 1983, trends in Turkish tourism have increased rapidly and created an infrastructure for future periods. Towards the end of the 1990s, efforts were made to spread tourism to 12 months and efforts on this issue were supported.

In Turkey, particularly in the 1980-1990 period, the supply of tourism has developed very fast. Investments have increased in all parts of the sector, especially in accommodation, and tourism has turned into an economic activity where large-scale investments are made. In the course of ten years, there has been a change in the structure of the domestic tourism industry from small companies to large companies, from small investments to large-scale investments, from family companies to corporate companies, from individual enterprises to integrated enterprises. Relations and cooperation with foreign companies have increased in all sectors of the national tourism industry, and partnerships have been established with foreigners. Between 1980 and 1990, when the tourism sector in our country showed the fastest development, the number of beds reached from 56,000 to 173,000,

and the number of tourists coming to the country increased from 1.2 million to 5.3 million. Likewise, other sub-sectors of the tourism industry also experienced important developments, and the fact that Turkey was the "fashion country" in Western European countries and that the supply-demand balance occurring in the favor of supply, lead the development of Turkish tourism, which has become an important area of employment.

In recent years, the importance of tourism in the country's economy and the share of foreign exchange earned from tourism in exports and gross national product have increased. Economic data shows that tourism starts be an activity that affects Turkey's tourism economy. Tourism industry of Turkey, which could not enter into mass tourism market for years, is in a structural change since the beginning of 1990s. The change in structure is in the way the working conditions and conditions of the tourism industry comply with international standards.

Turkey's tourism image abroad is shaped as "Country of resting and vacation". In short, developments that can be summarized as the increase in accommodation investments; the transformation of travel agencies into tour operators; cooperation and company partnerships of domestic and foreign capital in tour operations; establishment of domestic charter and scheduled airlines; the transformation of country touristic product type into holiday products; shaping the image of the country as a holiday center, establishing a special tourism infrastructure at regional level; growth of investment scales; the emergence of integrated business in the domestic tourism industry, are indicative of a fundamental structural change in Turkey's tourism (Somuncu, 2006).

Tourism movements in Turkey are at the sea-sand-sun axis and concentrated in the Mediterranean and Aegean coasts. In these regions, Antalya, Muğla, Aydın and İzmir provinces are important tourism centers. Tourism, which takes place in the form of mass tourism, has a periodic structure. The tourism sector has a fragile structure against climate change in this state. Adaptation to climate change is of great importance for the sustainable development of the sector.

## 4. ADAPTATION TO CLIMATE CHANGE AND APPLICATIONS IN TOURISM POLICIES

Climate change adaptation can be defined briefly as the process of adaptation to current or expected climate conditions and impacts. In another definition, it is the process of strengthening, developing and implementing strategies in order to combat the effects of climate events (risks), to benefit and manage their effects. Adaptation has the potential to mitigate the impact of climate change. In the next 30 years, climate change is inevitable, as the reduction of greenhouse gas emissions will only have a small effect on greenhouse gas stocks. Adaptation is therefore a key policy response and the international community must find ways to support the adaptation process, especially in countries where the impact will be large. Policies that promote cohesion will be closely related to development in general, for example in terms of diversification of opportunities, but some specific investments will likely be made in terms of infrastructure, product range and other areas. However, as stated above, adaptation to climate change is not an easy process and it has difficulties in terms of high human and economic costs. Adaptation is a challenging process, as climate change affects different parts of the world differently. Adaptation and mitigation are not alternatives to each other and are two basic complementary elements in combating climate change. As a matter of fact, mitigation comprises the activities that aim at directly or indirectly mitigating the greenhouse gas emissions by avoiding or keeping greenhouse gas emissions or increasing the "sinks" such as forests. Such activities may require, for example, changes in behavior patterns or technology development and spread. Adaptation is defined as arrangements in human and natural systems that mitigate harm or take advantage of beneficial opportunities in response to actual or expected climate stimuli or effects. Therefore, in order to be successful in combating climate change, both must be done together. Adaptation can be achieved by societies, institutions, individuals, governments. Economic, social or environmental drivers are motivated in many ways, such as social activities, market activities, local or global interventions (Boğaziçi University Climate Policy

Application and Research Center, 2020).

Climate change adaptation studies in our country are coordinated at the national level by the Ministry of Environment and Urbanization. There are strategy documents and action plans that are in force and prepared by the relevant ministry regarding adaptation studies. These are:

- ▶ Turkey Climate Change Strategy 2010-2023,
- ▶ Turkey Republic of climate change action plan 2011 - 2023,
- ▶ Turkey's Climate Change Adaptation Strategy and Action Plan.

Therefore, these strategies and action plans are the fundamental documents of harmonization in the tourism sector in Turkey's fight against climate change and should be addressed in this context (Republic of Turkey Ministry of Environment and Urban Development, 2016; 2016b).

There are also directive and binding studies, decisions and policy documents regarding the adaptation of the tourism sector to climate change. These are:

- ▶ Development plans
- ▶ Tourism councils
- ▶ Turkey's Tourism Strategy (2023) and Turkey Tourism Strategy and Action Plan 2007-2013.

## 4.1. Development Plans

In the plans prior to the Eleventh Development Plan covering the period of 2019-2023, concepts such as "sustainable tourism" and "environmentally sensitive" tourism were targeted and included in the tourism sector, while the issue of climate change was included in the eleventh plan for the first time in detail. Under the title of "Tourism" in the Eleventh Development Plan, "the "objectives" section states that "diversifying and developing tourism in line with changing consumer trends and technological

developments, extending the duration of the season, increasing the service quality and attracting more visitors to our country, increasing the accommodation period and non-accommodation expenses, realizing the transformation and protection in the sector within the framework of each destination-specific and focused understanding and thus contributing to economic and social development by considering the balance of protection and use, are the main objectives. (Republic of Turkey Presidency, 2019). In the Policy and Measures section, seven items are directly or indirectly related to climate change. These articles are:

- ▶ "Specific to each destination and within the frame of focused understanding; the development and management of tourism, including investment planning, will be handled holistically, taking into account the planning hierarchy; sustainable tourism practices will be developed with an environmentally friendly and responsible approach.
- ▶ Destination-based strategy, master plan and physical plans will be prepared and projects will be carried out.
- ▶ Integrated management and planning of the coastal areas will be made, taking into account the preservation-use balance in an integrated manner with the demands of the tourism sector.
- ▶ Bearing capacities of tourism areas will be determined by considering the balance of protection usage and the areas will be managed accordingly.
- ▶ Drinking water, sewage, solid waste disposal and waste water treatment infrastructure investments will be made in tourism regions.
- ▶ Within the framework of sustainable tourism understanding; legislative arrangements will be made to increase the number of environmentally friendly tourism facilities and to improve their qualifications.
- ▶ Studies will be conducted to determine the effects of climate change on the tourism sector. " (Republic of Turkey Presidency, 2019).

The ministry that is primarily responsible for the tourism sector is the Ministry of Culture and Tourism. For this reason, the issues of climate change and adaptation to climate change are included in the studies of the Ministry of Culture and Tourism below.



## 4.2. Tourism Councils

In order to determine the tourism strategies of Turkey, three tourism councils were held, first being 1998, second in 2002 and the last in 2017. In the report published as a result of the study conducted by the Environment-Planning-Infrastructure Commission of the Third Tourism Council held in 2017, environmental issues were widely covered and remarkable recommendations were made on the adaptation of the sector to climate change (Republic of Turkey Ministry of Culture and Tourism, 2017). These recommendations are included in the report as follows:

- ▶ “... Due to the fact that the tourism sector is a sector that is affected by and affects the climate change, when an evaluation is made from both sides:
- ▶ 13. Conducting studies under different scenarios regarding possible income and job losses, seasonal and destination shifts in our country that may be caused by global warming in the tourism sector within the scope of adaptation to climate change,
- ▶ 14. Replanning the tourism seasons taking into account the number of days when the temperature will exceed 40 °C in the south and west regions of Turkey according to Tourism Climate Index, replanning the tourism sector
- ▶ 15. Reviewing the approach to coastal planning based on the fact that coastal structures will be affected by the rise of sea level,
- ▶ 16. Considering the effects of climate change in the "Winter Tourism Strategy Document" prepared by the Ministry of Culture and Tourism, with reference to the point that investments in winter tourism will be negatively affected by global warming,
- ▶ 17. Increasing planning and implementation methods for reducing greenhouse gas emissions caused by the main components of the tourism sector,
- ▶ 18. The criteria of auditing and certification systems such as green star, green key, blue flag, blue card for minimizing the environmental impacts of accommodation facilities are reviewed and disseminated and encouraged to cover all facilities,

- ▶ 19. Encouraging the use of high-speed trains for short-distance transportation needs,
- ▶ 20. Development of a management system in which air traffic and operations will be optimized should be ensured.
- ▶ 21. The use of renewable energy resources and energy efficiency practices of tourism facilities should be encouraged.
- ▶ 22. The threats that climate change will pose on the historical and cultural heritage, which are important for tourism, should be determined and measures should be designed against them.
- ▶ 23. Facilities that reduce greenhouse gas emissions that cause climate change should be rewarded.
- ▶ 24. Necessary arrangements should be made to ensure that attention is paid to the threat of tourism activities on sinks in all kinds of planning decisions, determination of tourism areas and projects. " (TR Ministry of Culture and Tourism, 2017).

The Third Tourism Council Action Plan was published in March 2018 (Republic of Turkey Ministry of Culture and Tourism , 2020). There is no action and no decision to take action regarding the recommendations on the adaptation of the tourism sector to climate change, which includes the results of the studies conducted by the Environment-Planning-Infrastructure Commission and which are included in the Final Report and quoted from the report above.

### 4.3. Turkey's Tourism Strategy (2023) and Turkey Tourism Strategy and Action Plan 2007-2013

In Turkey, tourism is mainly based on marine and coastal resources. It takes place in the form of mass tourism, and tourism is concentrated on the Mediterranean and Aegean coasts and has a periodic structure. This structure of the segmented approach to tourism planning resulting from tourism in Turkey, lead to the appearance of environmental problems such as unplanned urbanization/construction beside and

in the surrounding of coasts and insufficient infrastructure. This situation constantly increases the pressure on environmental resources depending on the development in tourism.

In order to change this negative structure positively, in 2007, the Ministry of Culture and Tourism prepared "Turkey's Tourism Strategy 2023" and "Turkey Tourism Strategy and Action Plan 2007-2013". The Strategy and Action Plan was approved by the High Planning Council Decision No. 2007/4 dated 28.2.2007 and entered into force after being published in the Official Gazette No. 26450 dated 02.03.2007 (Ministry of Culture and Tourism, 2007).

Turkey Tourism Strategy covers within its scope an integrated policy, strategy and practice-oriented approach. In addition to coastal tourism, our country has unique opportunities in terms of tourism types such as alternative tourism (health and thermal tourism, winter sports, mountain and nature tourism, highland tourism, rural and ecotourism, congress and fair tourism, cruise and yacht tourism, golf tourism, etc.) However, this potential cannot be used rationally. Turkey's Tourism Strategy and Action Plan 2023 2013 aim to use the natural, cultural, historical and geographical values of our country in a balance of preservation and use and to increase the share of our country in tourism by developing tourism alternatives.

Instead of planning these tourism resources on a point scale, it is seen as a more correct approach to introduce these values and determine the criteria of use, by considering tourism corridors, tourism regions, tourism cities and ecotourism regions along the development axes. Thus, the attraction of regions with tourism potential will be increased with other alternative tourism types. In addition to reducing seasonality in tourism and spreading tourism throughout the year, this situation will also reduce regional agglomeration and allow tourism to develop at the country level. At the same time, it will help development and eliminate regional imbalances by enabling wider audiences to get a share from tourism. Most importantly, since the development of tourism will be holistic and planning based, it is predicted that the pressure and damage on the natural and cultural resources in

the Mediterranean and Aegean coastal areas will decrease. Another important point related to the goals of the Strategy and Action Plan is to reduce the risks that will arise due to climate change, especially in the Mediterranean coastal zone, with the emergence of new tourism types and new destinations.

#### 4.4. 2019-2023 Strategic Plan of the Ministry of Culture and Tourism

2019-2023 Strategic Plan of the Ministry of Culture and Tourism was completed in 2018. In the PESTLE Analysis made in the plan under the topic of determinations (factors/ problems) under "Global warming and climate change", under the title "environment" the issue of "global warming and climate change" was considered as "threat" and in the same way, in SWOT analysis, it was also considered as "threat" (Republic of Turkey Ministry of Culture and Tourism, 2018). While evaluating that the issue of climate change is a threat for Turkish tourism sector in the strategic plan, it could be seen that no place was assigned for any strategy, action plan and/ or political assessment on adaptation to climate change.

#### 4.5. Eco Labels and Environmentally Sensitive Certificate Systems

Within the context of sustainable tourism in Turkey, various steps have been taken for the purposes of environmental protection, development of environmental awareness, the promotion of positive contribution of tourism facilities to the environment. In this context, the Communiqué no 2008/3 on Granting Environment Friendly Accommodation Facility Certificate to Tourism Management Certified Accommodation Facilities on the classification for environmentally friendly accommodation enterprises entered into force in 2008.

According to the communique, among the facilities exceeding the minimum score determined for the type and class, the stars showing the classes on the plaques of the accommodation facilities with the star symbol will be arranged in green and on the

plaque, "Environment Friendly Facility " will be written. The number of facilities holding Ministry of Culture and Tourism's tourism operation certificate with Green Star certificate, which was 126 in 2014, increased to 460 as of 2018 and the bed capacity of these facilities increased to 293.625. These figures clearly show the interest of accommodation facilities in Green Star. In recent years, it has been observed that cogeneration and trigeneration energy systems have become widespread, especially in accommodation facilities with Green Star Certificate.

One of the eco-labels used for accommodation facilities and touristic places in our country is the "Green Key Award". The Green Key Award has 7 main goals. The first dimension of these is environmental protection. Accordingly, it is the protection of the environment with measures such as energy and water savings, use of environmentally friendly cleaning materials and waste management by reducing the negative effects of the tourism business on the environment. The "economic management" goal, which is an economic target, envisages a reduction in costs as a result of reducing consumption in issues such as electricity, water, fuel, cleaning material waste. This situation is again seen as an important factor in protecting the environment and especially energy saving and adaptation to climate change. As a matter of fact, the share of accommodation facilities in the tourism sector, which is responsible for 5% of greenhouse gas emissions in the atmosphere, is 21% (Somuncu, 2016). As of 2018, the number of facilities in Turkey with Accommodation Tourism Operations Certificate is 3847 and the bed capacity of these facilities is 959.055. The number of Municipal Certified Facilities is 7596 and the bed capacity of these facilities is 506.127. Thus, considering that there are 11.443 facilities and around 1.5 million bed capacity in Turkey, and the uses of these facilities such as energy, water, fuel etc. and the wastes generated as a result of these uses, the importance of the subject will be better understood.

The Green Key Award is given by the Green Key National Jury for a year and applications are renewed every year. The facilities that receive the Green Key Award in our country are primarily audited, and the facilities that meet the criteria are given flags, plaques and certificates. Later, audits are carried out at least once

during the year. The rewards of facilities that do not meet the criteria are taken back without waiting for the end of the year. As of 2018, there are Green Key Awards in 94 facilities in our country. Within the scope of this program, which is implemented in 57 countries in the international arena, there are more than 2900 Green Key Award Winning Facilities. Turkey ranks 9th among 57 countries. Green Key Award organization is carried out by the Foundation for Environmental Education (FEE), a member of the Turkey Environment Education Foundation (TÜRÇEV).

Blue Flag is an international environmental award given to qualified beaches and marinas meeting the required standards. It is a symbol of a clean, well-maintained, equipped, safe and therefore civilized, sustainable environment. It represents a good environmental management with the necessary equipment that attaches importance to environmental education and information in addition to clean sea water for beaches. Although sea water analysis is not required for marinas, other criteria are similar.

The Blue Flag is of particular importance in terms of tourism with its international character. Because it is easy for people to plan to go to a beach that has an international guarantee and whose characteristics they know when going to a new place for holiday. 'Blue Flag' therefore it is a powerful tool. 463 beaches and 22 marinas and 15 yachtes have Blue Flag in Turkey as of 2019.

## 4.6. Using Environmental Management Tools to Adapt to the Effects of Climate Change (EIA)

It is important to use environmental management and planning tools in the integration of climate change adaptation efforts at the project level. Here, Environmental Impact Assessment (EIA) works, one of the environmental management tools, can be considered as a possible entry point. As in Turkey, the EIA in investment proposals in many countries is subject to regulations. Therefore, the EIA can form a framework to identify routine issues related to climate change at the project level.

Essentially, an important deficiency in including issues related to climate change adaptation in EIA practices is that EIAs aim to determine the effects of projects on the environment rather than the effects of change in the environment on projects. The first stage of an EIA is to identify activities that are likely to have significant impacts on the environment. Therefore, “environmentally harmless” activities are unfortunately not considered, even if they may be affected by the consequences of climate change. Combining climate risk analysis and adaptation to climate change with EIA processes will require determining the sensitivity of the project screening process to climate change and determining the impact level or potential of the project from climate change, and expanding the project to include all of these (Ministry of Environment and Urbanization, 2011).

Some of the infrastructure and superstructure investments in the tourism sector are subject to EIA within the framework of the Environmental Law and EIA Regulation. This means that especially the construction and operation phases of large-scale tourism investments in terms of adaptation to climate change are subject to permission and control with an environmental management tool within the legal framework.



## 5. CONCLUSION

Because tourism is mainly based on natural resources, Turkey will be most affected by the direct impact of climate change and is a country that is at risk. Winter sports tourism, especially coastal tourism, etc. are affected by climate change and this impact is expected to increase further in the future. Therefore, identification of risks arising from climate change in Turkey's tourism and development of measures for this, namely the sector to adapt to climate change, is a necessary and urgent situation. Indeed, depending on the problems caused by the cyclical situation in 2015 and in 2016 there have been significant declines in the number of visitors and tourism revenues coming to Turkey. According to the data of 2016 the number of tourists coming to Turkey decreased by 30.2 million and international tourism income by USD 10 billion, reaching to 18.7 billion USD (UNWTO, 2018). The Covid19 pandemic, which has spread all over the world since the beginning of 2020, has affected the whole world, as well as our country in the tourism sector. Data on this situation will be available in the coming months. It is inevitable that the tourism sector, which is so affected by temporary negativities, will face more permanent negativities due to climate change. Therefore, the mitigation and adaptation efforts and works against climate change are highly important for the tourism sector in Turkey. Only in this way can the threats of climate change on the sector be turned into opportunities. However, as outlined above, even though climate change has been identified as a threat to the tourism sector in the official meetings, ministry level studies and policy documents such as the Development Plan, and suggestions are made for the solution of this problem, it cannot be said that sufficient efforts have been made at the sector level yet.

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# INDUSTRIAL PRODUCTION POLICY IN TURKEY AND ADAPTATION TO THE CLIMATE CHANGE

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# 1. INTRODUCTION

Scientific evidence and facts reveal that we are faced with the effects of climate change and that people will have to deal with this challenge for decades to come. According to the Intergovernmental Panel on Climate Change (IPCC), the atmosphere and oceans have warmed, the amount of snow and ice has decreased, the global average sea level has risen, and greenhouse gas concentrations have increased (IPCC, 2014). In 2019, the World Meteorological Organization (WMO) reported with data that 2015-2018 was a record four warm years, ocean temperatures were at a record high, Arctic and Antarctic sea ice was well below average, and extreme weather events affected life. As a result of the increase in anthropogenic greenhouse gas emissions from the Industrial Revolution era to the present, warming will continue over the next centuries, and associated effects such as temperature rise, glacial melting, precipitation shifts, sea level rise and extreme weather events will continue to affect natural and human systems. 2019 Global Assessment of Biodiversity and Ecosystem Services, published by Biodiversity and Ecosystem Services (IPBES) and the Intergovernmental Science-Policy Platform (IPBES), reports that climate change is a growing risk that affects nature from genes to ecosystems (UNFCCC, 2019).

Both WMO and IPCC make it clear, together with other experts and organizations, that even small increases in warming have significant consequences in terms of their impact and adaptability. When these findings go hand in hand with the fact that developing countries, particularly the least developed countries and small developing island states, are struggling to cope with the effects of climate change that are destroying their ecosystems and economies and threatening to destroy their hard-won development gains, the importance of the issue will be understood better. Although adaptation to climate change is an urgent and compulsory action for the whole world, it is not easy to achieve this. Because the activation of adaptation planning and support through finance, technology and capacity building, and the successful implementation of adaptation measures often require substantial investment and technical support. This situation can also be expressed as adaptation

capacity. Lack of financial resources and capacity to support adaptation initiatives and projects is a common problem for many developing countries, and especially the least developed countries, hindering the planning, integration, implementation and learning of adaptation efforts (UNFCCC, 2018). For example, especially in relation to financial needs, the 2016 UNEP Adaptation Finance Gap Report states that by 2030, adaptation costs could range from \$ 140 to \$ 300 billion a year, and by 2050, these costs would be \$ 280 to \$ 500 billion per year. Using current levels of adaptation funding as a benchmark, the report shows that adaptation costs can lead to a dramatic increase in the adaptation finance gap, which is already a significant challenge for developing countries today (UNFCCC, 2019).

Since most of the greenhouse gas emissions that trigger climate change in the world are caused by energy and industrial activities, industrial policy and climate change policy are inevitably intertwined. According to the figures provided by the IPCC, 25% of the total global emissions are caused by electricity and heat generation, 21% by industry, 14% by transportation and 10% by other activities related to energy (Bavbek, 2016). According to the World Bank's data for 2017, the industrial sector (including construction) accounts for 25.4 of GDP (The World Bank, 2020). While the manufacturing and production sectors are the main driving forces for the economies of the world, the complex network of supply chains on which these sectors are based present enormous economic, social and environmental risks that must be addressed together (World Economic Forum, 2020).

Historically, most of the world's greenhouse gas emissions have originated from industrialized countries. However, as the developing countries have undergone a rapid industrialization process in the last decades, the responsibility of these countries in causing climate change has increased significantly. The two countries producing the most greenhouse gas emissions in the world are China in first place and USA in second place. In 2012, the share of developing countries in total emissions in the world was 59%, while the share of all developed countries was 41%.

In 2018, China, the United States, India, the EU28, Russia and Japan were the world's largest emitters of CO<sub>2</sub>. These countries account for 51% of the world's population and 80% of global GDP. These countries emitted 67,5% of global fossil fuel consumption and total global fossil CO<sub>2</sub> in 2018 (Crippa et al., 2019).

Today, China is the world's largest emitter of CO<sub>2</sub>, with more than a quarter of its emissions. The USA (15%) follows this; AB-28 (10%); India (7%); and Russia (5%) have these emission rates (Our World in Data, 2020).

As a result, many developing countries around the world are currently pursuing policies aimed at low-carbon growth, and developing world countries will need to make additional mitigation efforts to limit global temperature increases to safe levels. This requirement raises questions about the compatibility of development policies with climate policies, as these countries also have important development obligations to address. According to the International Energy Agency, about 1,2 billion people in the world still do not have access to electricity, and about 2,7 billion people still use traditional biomass resources for cooking. The main challenge that new industrial policies will face will be to realize environmentally sustainable growth paths without harming the development needs of the countries where they are implemented.

With each passing year, adaptation action is becoming more urgent than ever. Climate change impacts and disasters are expanding around the world, affecting often the most vulnerable communities and ecosystems. Along with rapid and comprehensive emission reductions in all sectors and countries, ambitious and effective adaptation action has the potential to pave the way for resilience and prosperity (Bavbek, 2016).



## 2. GENERAL STRUCTURE OF INDUSTRIAL PRODUCTION IN TURKEY

Turkey's economy, which is mainly state-led investment in the first period of the Republic on the board from a hybrid model, giving weight to the private sector in 1950, has evolved into a model that prioritized the development. Turkey, which has implemented import replacement policies closed to outside before 1980, started to launch outward-oriented policies that promote exports in the period after 1980. As of the 1990s, private sector investments were prioritized with a model in which globalization and free market economy were strengthened. GDP which was US \$ 69 billion in 1980, reached to US \$ 151 billion in 1990, 273 billion in 2000, and 766 billion USD in 2018.

In the period after 1980, Turkey gave importance to economic and trade integration with the industrial countries of the world. In addition to the Customs Union Agreement signed with the European Union, it has a total of 20 free trade agreements in force which Turkey is a party. According to data from the World Bank in 2017, Turkey which has 1,05% share of world GDP ranks 17<sup>th</sup> in the world GDP ranking. In terms of purchasing power parity, it ranks 13<sup>th</sup>.

One of the most important components of our country's economy is the manufacturing industry. The share of added value of production industry in Turkey in the GDP was 13% in 1960, with a trend of increase. This increase continued with short-term fluctuations and reached its historical peak of 24.2% in 1998. In the last 20 years, it could be seen that the production industry had an important share in the range of 15-20% of in Turkish GDP. In 2018, the share of industry in GDP was 22.2% and the share of manufacturing industry was 19.1% (Republic of Turkey Ministry of Development, 2018; Republic of Turkey Ministry of Industry and Technology, 2019).

Turkey is the world's 16th largest economy in terms of total value-added production in manufacturing industry. However, Turkey ranks 46 in the world in terms of manufacturing value added per capita. This situation, caused by the inability to proceed to advanced stages in the industrialization process, points to a large potential for our country to increase production volume and productivity in the manufacturing industry (Ministry of Development, 2018).

Sectors which were in the forefront in terms of production volume and production increase rate in Turkey in the last decade were as follows: manufacture of other transport means, installation and repair of machinery and equipment, computers, manufacture of electronic and optical products, manufacture of basic pharmaceutical products and pharmaceutical preparations, motor vehicles, trailer and semi-trailer. These sectors are among the high, medium-high and medium-low technology class in terms of technology infrastructure. When the R&D investments in the same period are analyzed, it is seen that investments were made especially in the sectors in the medium-high technology class. In the last decade, when the industry's capacity utilization rate is analyzed according to the share in the total production and number of employees, it could be seen that readymade clothing and textile production, food production and furniture production sectors, in which Turkey is traditionally strong, are the sectors included in middle-low technology and low technology classification (Republic of Turkey Ministry of Development, 2018).

Industry greatly affects national economic growth. According to the Statistical Classification of Economic Activities (NACE) in the European Community Rev.2, the manufacturing industry has a turnover share of 85.4% in the industry sector. The basic metal industry (13.6%), food industry products (12.9%), motor vehicle, trailer and semi-trailer manufacturing (10%) and the textile industry (7.9%) represent the largest contribution to the manufacturing industry turnover (TURKSTAT, 2020b); (Table 1).

**Table 1:** Key indicators of the industrial sector in Turkey, 2018

	Number of businesses	Number of people working	Turnover (TL)
Mining and quarrying	5 069	134 142	56 175 855 128
Manufacturing industry	395 816	4 115 608	2 205 283 851 814
Electricity, gas, steam and air conditioning supply	5 346	114 087	280 297 121 721
Water supply; sewage, waste management and remediation	4 255	80 090	39 759 492 752

Source: TURKSTAT, 2020a

Small and Medium Sized Enterprises (SMEs) constitute 99.8% of the total number of enterprises in the industrial sector. According to 2013 data; 75.8% of total employment in the sector, 59.2% of exports and 39.9% of imports are carried out by SMEs (Ministry of Environment and Urbanization, 2016a).

According to TURKSTAT General Trade System data for 2019, exports of the manufacturing industry were 171.23 billion dollars and imports were 162.14 billion dollars. The ratio of exports to imports in the manufacturing industry increased from 90.6% in 2018 to 105.6% in 2019. The Production Index and employment continue the general increasing trend of 2002-2018. According to 2019 UNIDO "Competitive Industrial Performance Index" data, Turkey was ranked 28 in 150 countries (Presidency of Strategy and Budget Department of the Republic of Turkey, 2020).

### 3. REASON OF ADAPTATION TO CLIMATE CHANGE IN INDUSTRIAL SECTOR

When climate change and the policies and measures determined within this framework are evaluated, it is seen that one of the most important issues for industrialists is the reduction of greenhouse gas emissions that cause climate change. In addition to greenhouse gas emissions from combustion, which are more prominent in energy-intensive sectors, various production processes are also greenhouse gas sources. Therefore, reducing greenhouse gas emissions (and energy consumption) in unit production in industry both forms a part of the measures against climate change and supports the process of fulfilling the obligations in this field.

Adaptation to climate change is the process of strengthening and implementing strategies to combat the effects of climate events, to benefit from and manage this change. Therefore, adaptation in industry makes it a priority to take measures against factors that are expected to arise due to climate change and that will directly affect production and competitiveness negatively. In particular, the expected reduction in production inputs (water, raw materials, energy, etc.) (and therefore an increase in costs) is a serious risk for the industrialist (UNIDO Eco-Efficiency (Cleaner Production) Program, 2020). The current and possible effects of climate change on the industrial sector are summarized below.

- ▶ Possible changes in the availability of raw materials and intermediates due to changes in temperature and precipitation could affect the entire value chain.
- ▶ Potential increase in extreme events and extreme weather conditions can cause major damage to operational infrastructure and production (risk of liquidity shortage for businesses and insurance companies).
- ▶ Impacts on intra-company logistics resulting from the escalation of extreme events and their adverse effects on the transport and storage infrastructure.
- ▶ Higher temperatures and heat waves will increase the demand for

refrigeration for the storage and transportation of various products.

- ▶ Changes in consumer behavior will occur due to increased temperatures and longer hot periods at these temperatures.
- ▶ Reduced availability of cooling water during heatwaves and droughts may prevent intensive cooling production
- ▶ Regional differences in water availability may occur due to changes in precipitation and seasonal distribution.
- ▶ Higher temperatures and heatwaves will adversely affect working conditions. This situation will create risks for decrease in productivity and occupational health and safety.

The industrial sector, which is expected to be exposed to the impact of climate change on such a large scale and widely, needs to adapt to this impact.

As explained above, according to IPCC data, the industrial sector is responsible for 21% of global greenhouse gas emissions (IPCC, 2014). However, this ratio expresses the emissions directly produced by the sector. However, the industrial sector covers a series of processes from raw material supply to production and then to the marketing of the finished product and in this process, it is in contact with a number of sub-sectors, especially main sectors such as energy, construction, transportation and agriculture. Therefore, considering this situation, the mitigation and adaptation in the industrial sector should be addressed at a wider and inter-sectoral level.

Greenhouse gas emissions in Turkey, has increased significantly in the last ten years and by 49% since 2005, and by 135% since 1990, reaching to 500 MtCO<sub>2</sub> level in 2016. The most important reasons for this increase are strong economic growth, population growth and increasing reliance on carbon-intensive fuels. Even though emissions per capita increased in the same period, this rate is still below the OECD average. However, the emission intensity has decreased with the accelerated renewable energy studies and the increase in energy efficiency (OECD, 2019).

Mainly transportation (+ 95%), industry (+ 80%) and energy (+ 60%) emission rates have increased over the last decade in many sectors.

Whereas the greenhouse gas emissions from industrial processes and product use were 22,94 Mt CO<sub>2</sub> equivalent in 1990, they increased to 62,4 Mt CO<sub>2</sub> equivalent in 2016 and contributed to total value of the anthropogenic emissions in Turkey by 12,6%. In 2016, the mineral industry and metal industry have the biggest share with 67,2% and 18,3 in the emissions of Industrial Processes and Product Utilization Sector. Industrial Processes and Utilization Sector is responsible from 13,6% of the total CO<sub>2</sub> emissions and from the single F-gas emission source. 87,5% of the greenhouse emissions of Industrial Processes and Product Utilization Sector is CO<sub>2</sub> emissions. In 2016, the main sources of emissions are mine production with 76,8% (cement production 65,4%) and metal production with 20,9% (metal and steel production 20,4%). Cement production, iron and steel production have 7,2% and 2,3%, respectively, in total national greenhouse gas emissions (Republic of Turkey Ministry of Environment and Urbanization, 2018).

Total emissions from industrial process and product use increased by 172,7% between 1990 and 2016 (from 22,9 Mt CO<sub>2</sub> equivalent to 62,4 Mt CO<sub>2</sub> equivalent) and increased by 4,8% between 2015 and 2016. Long-term increases in sectoral emissions are mainly due to the increase in emissions related to the mining industry, mainly cement production and metal industry, and mainly iron and steel production. The increase in emissions in these sectors is due to industrial growth and increased demand for construction materials (Republic of Turkey Ministry of Environment and Urbanization, 2018).

Considering the share of industrial sector in economy and its interaction with other sectors in Turkey, it is clear that there is a need for sector's adaptation to climate change and for policies and practices in this regard.



## 4. INDUSTRIAL PRODUCTION POLICIES IN TURKEY AND ADAPTATION TO CLIMATE CHANGE

Policies and measures for energy consumption in the manufacturing industry, which contributes an average of 20% to GDP, are generally towards increasing energy efficiency and the share of renewable resources in the industry. With the policies that have been enacted recently, it is envisaged to provide gains in terms of low-carbon economy by focusing on innovation and advanced technology products and sectors related to climate change, maximizing productivity in existing sectors and especially in the field of renewable technology through green technologies.

First of all, it is essential to support innovative SMEs in terms of products, services and business models with fast-growing or potentially growing enterprises. In this context, policies have been published to develop R&D, innovation and export capacities of SMEs and to support SMEs to operate more organized both among themselves and with large enterprises, universities and research centers, and to support their clustering and it was planned to increase efficiency with priority transformation programs in production and energy. (Ministry of Environment and Urbanization, 2016a).

The Ministry of Environment and Urbanization (MoEU) is responsible for the coordination of local and international activities related to climate change mitigation, adaptation and implementation issues (finance, technology development and transfer, capacity building). The Ministry also chairs the Climate Change and Air Management Coordination Board (CCAMCB), which convenes for specific purposes to determine policies and strategies regarding climate change. Public institutions and private organizations, observers of non-member public institutions/private organizations, academic environment, non-governmental organizations (NGOs) and professional organizations come together in CCAMCB. CCAMCB has

seven technical working groups responsible for the development of policies related to climate change. Among its other activities, CCAMCB ensures the fulfillment of international obligations in the context of monitoring and reporting on greenhouse gases. This board is the most important body on climate change, but there are other important boards such as the Economic Coordination Board (OECD, 2019).

## 4.1. Industrial Production Policies and Adaptation to Climate Change in Development Plans

The basis of Turkey's policy towards climate change has been taken by the Eighth Five-Year Development Plan. In 2000, the Climate Change Specialization Commission Report was published within the scope of the Eighth Five-Year Development Plan. With the Ninth, Tenth and Eleventh Development Plans prepared in the following, objectives for the development of the process have been added.

In the Eighth Five-Year Development Plan covering the period of 2001-2005, it is stated that the process of becoming a party to the United Nations Framework Convention on Climate Change (UNFCCC) will be carried out, and it is also stated that regulations will be made on energy efficiency for greenhouse gas reduction. In the Ninth Development Plan (2007-2013) a further step was taken in the fight against climate change as foreseen in the plan, and "National Climate Change Action Plan" has been prepared that demonstrates greenhouse gas mitigation policies and measures in accordance with Turkey's own conditions. In the Tenth Development Plan (2014-2018), it is stated that the concept "Green growth" was taken as basis in order to achieve sustainable development goals (Republic of Turkey Ministry of Environment and Urbanization, 2018).

10th Development Plan covering the period 2014-2018, is an important document where the concept of "Green Growth" was introduced into government policies in various fields such as energy, industry, agriculture, transportation, construction, services and urbanization. National Climate Change Strategy, National Climate

Change Action Plan and 10<sup>th</sup> Development Plan provides a basis for all common and sectoral climate change policies and measures.

When the general policies in the industry are analyzed within the framework of the 11<sup>th</sup> Development Plan published in 2019 and will be implemented between 2019-2023, the main objective is expressed as to realize the transformation in the manufacturing industry, to move to a high value-added structure and to increase the share of high technology sectors. For this purpose, the main focuses of the transformation in the manufacturing industry are; innovation and firm skills, effective participation of regions in production, inter-sectoral integration, green technology and production, and foreign market diversity. In the 11<sup>th</sup> Development Plan period, it is aimed to develop competitiveness and increase efficiency at all levels, including individual, firm, sector and government levels, ensure stable and strong growth, sustainable current account balance and increase the employment. Besides, it is aimed at increasing the total factor efficiency of the industry (TFV) over the long term average (Republic of Turkey Ministry of Industry and Technology, 2019). In the 11<sup>th</sup> Development Plan, in line with these goals and objectives, the following policies, which are thought to have an impact on climate change adaptation efforts, are explained. These are:

- ▶ Eleventh Development Plan targets are determined within the framework of a stable growth model based on export which focuses on efficiency and in which the industrial sector undertakes a primary role.
- ▶ Due to the steps to be taken to increase the manufacturing industry-oriented competitiveness and productivity and to develop technology capacity, an annual average growth of 5.7 percent was experienced in the industry and a significant change in the sectoral composition of production, and it is aimed to increase the share of the industry in GDP to 24.2 percent.
- ▶ Focusing on productivity and innovation, fixed capital investments are predicted to increase by an average of 5.3 percent during the Plan period.
- ▶ Within the framework of steps towards increasing technological capacity, strengthening institutional capacity and developing human capital, TFV is

expected to increase by an average of 0.3 percent annually during the Plan period and its contribution to growth will reach 13.9 percent at the end of the period.

- ▶ In the 11<sup>th</sup> Development Plan period, it is aimed to develop competitiveness and increase efficiency at all levels, including individual, firm, sector and government levels, ensure stable and strong growth, sustainable current account balance and increase the employment.
- ▶ Throughout the plan period, it is aimed to increase technology, innovation, product quality and productivity in priority manufacturing industry sectors, to transform industrial capacity to become more competitive and to increase high value-added production.
- ▶ By increasing the qualified human resources under the horizontal area of sustainability providing policies, the country's sustainable production capacity will be developed with the contributions it provides to the high productivity rates and investment environment of the workforce; investments made in R&D and innovation and critical technology areas will increase the productivity of companies and entrepreneurs by increasing their research and innovation capacities through institutional structures, interfaces and supports.
- ▶ A production structure suitable for economies of scale will be created in the manufacturing industry, and the obstacles to the growth of SMEs will be removed.
- ▶ In order to improve the institutional capacities of the private sector and professional organizations, a pool of qualified experts will be created, businesses and professional organizations that receive qualified expertise services from this pool will be supported.
- ▶ Model Factory (SME Competence Center) Consultancy Support Program will be initiated in order to increase the productivity of SMEs and contribute to their digital transformation.
- ▶ By restructuring the support of Development Agencies, priority will be given to issues such as institutionalization, innovation management, customer relationship management, corporate resource planning, e-commerce, digital transformation, foreign trade and lean production, clean production, energy efficiency and industrial symbiosis.
- ▶ Policy making and implementation processes for the manufacturing industry will be made more effective, and a strategic framework for the sustainability of

the sectors will be established.

- ▶ A "National Industry Data Master Plan" will be prepared regarding the scope, collection method and analysis of data to be collected at sector and firm level in order to make data-based analysis and plans regarding the manufacturing industry and to monitor companies operating in this field regularly.
- ▶ Productivity Development Maps will be created.
- ▶ Productivity Composite Index values will be published.
- ▶ Specialized courts will be established in areas such as environment, zoning and energy; studies will be carried out to ensure that some cases such as commercial, intellectual and industrial rights can be heard in specialized courts in provincial centers.
- ▶ Considering the development levels of the districts within the province, investment subjects that will benefit from regional supports within the scope of the existing incentive system will be redesigned in accordance with the clustering approach.
- ▶ Services provided in industrial and technology zones (OIZ, SIS, Industrial Zones, Technology Development Zones, Free Zones) will be improved, and these zones will be enabled to contribute more effectively to the competitiveness and productivity of the industry.
- ▶ In the establishment of industrial and technology zones, taking into account the priority sectors and development areas of the Plan, their number, capacity, kindergarten and transportation facilities, cooperation and integration with each other will be increased for current and future needs.
- ▶ Long-term land and building rental and acquisition models in organized industrial zones (OIZ) will be developed and made functional.
- ▶ Innovation Centers will be established in OIZs to support companies in business development, public support, project preparation, cooperation with universities, lean production, efficiency, technology management, clustering and digitalization.
- ▶ Improvements will be made in the spatial construction of new OIZs and in the transformation of existing ones towards the needs of landscaping and social equipment.
- ▶ Impact assessment of industrial and technology zones will be conducted and innovative practices will be developed.
- ▶ In the establishment of industrial and technology zones, priority will be

given to sectoral and thematic areas and efforts will be made to differentiate supports in these regions.

- ▶ The "Producing Cities Program" will be developed to support the institutionalization, marketing, innovation and transportation infrastructures in order for cities, which are a focus of production and export, to move up the value chains in medium-high technology products and to integrate them with global value chains, and to increase the employment of qualified workforce by increasing the quality of life in these cities.
- ▶ Education-sector cooperation protocols will be made in order to strengthen the education-employment-production relationship.
- ▶ The number and diversity of vocational and technical high schools in OIZs will be increased and their technological equipment will be strengthened.
- ▶ In order to popularize intermodal transport and increase the competitiveness of the industry, petro-chemical facilities, manufacturing facilities for the automotive industry and junction lines and logistics centers that will serve important load centers, especially ports, OIZs and mining sites, will be completed, and the share of railways in freight transport will be increased.
- ▶ The share of railways in land freight transport will be increased from 5.15 percent to 10 percent.
- ▶ A total 294 km long connection line will be built for 38 OIZs, private industrial zones, ports and free zones and 36 production facilities.
- ▶ The standards of existing and ongoing logistics centers, especially in Çukurova, Western Black Sea and Marmara regions, will be raised to focus on priority sectors, and new freight and logistics centers will be planned on railway corridors where freight demand is high.
- ▶ In order to increase the traffic density in the existing railway network and to get a larger share from freight transportation, the bottlenecks in main lines will be eliminated, single-line railways determined depending on the traffic density will be made double-track, signalization and electrification investments will be completed.
- ▶ Modernization and infrastructure improvement works on railways will continue, 2,657 km of electricity and 2,654 km of signal investment will be made on existing lines.
- ▶ Energy efficiency will be increased in the manufacturing industry.
- ▶ A support mechanism will be established to replace inefficient electric

motors used in industry with efficient ones.

- ▶ Cogeneration systems will be made widespread in large industrial facilities using heat.
- ▶ Energy efficiency projects will be supported with competitions in order to introduce and disseminate exemplary energy efficiency practices, and the establishment of legislation and technical infrastructure for implementation will be ensured.
- ▶ Heat market legislation will be drafted to spread energy-efficient district heating and cooling systems throughout the country and to enable heat trade.
- ▶ Projects with high savings potential will be supported by improving efficiency-enhancing project implementation processes.
- ▶ OIZs will be supported to prepare and present their Efficiency Action Plans by completing the Energy Management Unit and ISO 50001 Energy Management System establishment. (Republic of Turkey Ministry of Industry and Technology, 2019). "

Turkey has policies and policy documents related to climate change in addition to National Development Plans. The National Climate Change Strategy (UİDS), covering the period 2010-2023, leads the policies regarding climate change. In addition to short, medium and long-term targets for reducing the effects of climate change, it has also set targets for adaptation, finance and technology development. The National Climate Change Strategy approved by the High Planning Council in 2010 was developed in consultation with public institutions, private organizations, NGOs and universities under the coordination of the MoEU. Its application is supervised by CCAMCB. Following the Ninth National Development Plan and National Climate Change Strategy, measures and activities for different institutions were determined with the National Climate Change Action Plan (2011-2023) (UİDEP) (OECD, 2019).

Turkey Climate Change Strategy 2010-2023, Republic of Turkey Climate Change Action Plan 2011-2023, Turkey's Climate Change Adaptation Strategy and Action Plan 2011-2023, are the basic documents on Turkey's fight against climate change and adaptation efforts in the industrial sector should be addressed in this context (Republic of Turkey Ministry of Environment and Urban Development, 2016a; 2016b).

The institution that coordinates and directs the industrial production policies in Turkey at the national level is the Ministry of Industry and Technology. In addition, it should be noted that the private sector and various organizations representing the sector are also active in this regard. There are leading and binding industrial and technology strategies at the national level regarding the adaptation of the industrial sector to climate change. The last of these strategies was published in 2019 and covers the 2019-2023 period.

## 4.2. Industrial Production Policies and Adaptation to Climate Change in the 2023 Industry and Technology Strategy of the Ministry of Industry and Technology

The 2023 Industry and Technology Strategy of the Ministry of Industry and Technology was published in 2019. In the strategy report, there is a target on "adaptation to climate change" and a section on how to achieve this target. But in the Digital Transformation and Industry Move and Infrastructure Sections, there are strategic goals that will affect climate change adaptation efforts. Important of these goals are listed below.

### **"Pre-Competitive Cooperation and Industry and Technology Areas**

The needs of companies for infrastructure and management systems such as fast data communication, industrial cloud and data center have increased with digitalization. Due to the high cost, instead of making single investments starting from the R&D process, it is necessary to produce common solutions for Organized Industrial Zones (OIZ) and Technology Development Zones (TDZ).

- ▶ The planning of OIZs and TDZs will be made together with the settlement, transportation, cultural and social planning of the cities they are located in. In addition, these regions will be made an attraction center for employees, entrepreneurs and students.
- ▶ With the "Innovation Centers" to be established in OIZs, it will be ensured that SMEs play an active role in innovation and technology development.
- ▶ The supplier industry will be encouraged to make R&D investments before competition by forming a cluster.

- ▶ The determination of the green production approach in our industrial policies and practices will be increased. In this direction, in order to reduce the environmental impact of industrial production, technology-intensive modernization of infrastructure and enterprises, especially in OIZs, and new investments based on cleaner production will continue to be supported.
- ▶ Industrial Registry Information System will be developed in order to establish "Economically Valuable Waste Monitoring System" within the scope of Circular Economy.
- ▶ Industrial symbiosis emerges as an approach that supports entrepreneurship and regional development with its potential to create new business areas, as well as innovation activities. Within the framework of "Development Project of the Green OIZ Framework for Turkey", activities for the dissemination of industrial symbiosis area within the framework of Turkey will be carried out in cooperation with the Ministry of Environment and Urbanization, relevant stakeholders such as OIZs and Industrial Regions.
- ▶ For the vertical integration of companies in OIZs and TDZs, a mechanism will be developed for central planning and configuration of fast data communication, industrial cloud, industrial data center, efficient energy use and cyber security needs.
- ▶ The legal entities of OIZs and TDZs will be reviewed according to their management model, pre-competitive cooperation elements, and transformed into a platform that offers common smart management solutions and services in areas such as export, innovation, design, technology transfer, institutionalization for companies operating here.
- ▶ It is aimed to establish and support strategic clusters such as defense and aviation, electric cars, petrochemicals and communication technologies.
- ▶ All kinds of infrastructure, services and legal processes needed in industrial areas will be monitored by the Ministry of Industry and Technology and developments will be monitored.
- ▶ While problems related to fragmented structure of industrial areas in Turkey will be remedied on one hand, on the other hand, the share of planned industrial areas in the total will be increased.
- ▶ Importance will be attached to the completion of OIZ infrastructure projects and SIS infrastructure and superstructure projects included in the investment programs. Governance mechanisms will also be strengthened for the effective

use of idle investment areas in existing industrial zones.

- ▶ It is planned to use the Industrial Zone model more effectively in increasing the planned industrial areas. Currently 15 Industrial Zones have been declared. When these industrial zones are completed, investments are estimated to reach US \$ 30 billion. In this way, it is expected that an annual contribution of USD 8,5 billion will be made to reduce the current account deficit and 82 thousand jobs will be provided.

- ▶ Establishment of new private industrial zones will be encouraged with incentives such as financial support.

- ▶ Places that are suitable to be turned into industrial areas such as the parts of current industrial areas and 4th class and marginal agricultural lands will be evaluated and Turkey Industrial Areas Inventory will be prepared and announced. The inventory issued will be kept up-to-date and the incentive mechanism for land and buildings available to the industrialist will be presented to the investor through a platform.

- ▶ Cooperation will be made with the Ministry of Environment and Urbanization in order to use the environmental contribution revenues in financing the investments of industrialists for the development of environmental protection and waste management systems and practices.

- ▶ All business and transactions (EIA report etc.) carried out by all industrialists before the public, including industrial zones, will be monitored by the Ministry of Industry and Technology.

- ▶ Efforts will be made for the involvement of the Ministry of Industry and Technology in the reconciliation processes regarding the financial and legal liabilities that will arise against the industrialists as a result of 'Occupational Health and Safety' audits, environmental audits or tax audits.

- ▶ It will be ensured that the Ministry of Environment and Urbanization and municipalities determine the industrial zones or industrial areas in coordination with the Ministry of Industry and Technology. TDZs will play an important role in achieving the focal technology targets to be set in the technology roadmap;

- ▶ Specialized TDZs will be supported to form and develop new products, to represent in international networks and to attract investment funds to their regions.

- ▶ Opening of infrastructure, test center, laboratory and design workshops for common use in TDZs will be supported.

- Organizing activities, competitions and events that strengthen the synergy between TDZs will be supported. (TR Ministry of Industry and Technology, 2019)”.

In addition to the strategies and targets specified above on industry production policies and adaptation to climate change in the Development Plans and 2023 Industry and Technology Strategy, various projects are being implemented by relevant Ministries in order to support policies, measures and strategy documents in the industrial sector. These projects are summarized below (Republic of Turkey Ministry of Environment and Urbanization, 2018).

**Table 2:** Projects Implemented to Support Policies and Measures in the Industry Sector

Project name	Explanation	Time	Budget and Funding Resources	Implementing Institution
Developing National Green OIZ Framework for Turkey	The goals of the project are; identifying green competitiveness opportunities in Organized Industrial Zones (OIZs), making a series of recommendations, transforming existing traditional OIZs into Green OIZs and establishing new Green OIZs and developing a roadmap and comprehensive national framework on Green OIZs.	2017-	World Bank Group	Ministry of Industry and Technology
Türkiye'deki KOBİ'ler için Global Cleantech İnovasyon Programı (GCIP-Türkiye)	Temiz Enerji Teknolojisi Yenilik Yarışması ve Girişimcilik Hızlandırıcı Programı ile Türkiye'deki KOBİ'lerde temiz enerji teknolojisi yeniliklerinin ve yenilikçi temiz enerji teknolojisi girişimciliğinin teşvik edilmesi.	2014-2018	990,000 USD	STB, TUBITAK, ÇŞB, ETKB, Kalkınma Bakanlığı, KOSGEB, TTGV ve UNIDO

Project name	Explanation	Time	Budget and Funding Resources	Implementing Institution
<p>Project for Determination of Resource Efficiency Potential in Industry</p>	<p>This project aimed at developing a methodology for analysing the potential savings that could be obtained with effective and sustainable use of raw material, energy and water in the sector, regional level and production industry level in Turkey. This study focuses on five industrial sectors selected through various studies and estimating this potential in quantitative and monetary terms. These sectors are classified in Nace Rev.2 and comprises (10) Manufacturing of food products, (13) Manufacturing of textiles, (20) Manufacturing of chemicals and chemical products, (23) Manufacturing of other non-metallic mineral products, and (24) Manufacturing of basic metal and fabrication metal products. To achieve this goal, resource efficiency potential is estimated for raw material in monetary terms and in five sectors and in monetary and qualitative terms for both energy and water in Turkish production industry. Estimated potential is disseminated to Turkey's manufacturing industry and is distributed to the regions. In addition, investments with a payback period of less than one year or more were identified to achieve the estimated resource efficiency potential. In addition, following the quantitative and monetary resource efficiency estimates, the factors affecting resource efficiency positively and negatively in five selected sectors were examined. In addition, an analysis was made for environmental impacts. At the same time, this study aimed to present the manufacturers on resource efficiency for policy-making processes to interested parties. Another goal is to contribute to the competitiveness and reduction of pressures on natural resources through higher awareness and more sustainable resource use.</p>	<p>2014-2017</p>	<p>(GEF-UNIDO) - 200,000 USD (TUBITAK) - 2,750,000 USD in-kind contribution (STB, KOSGEB, MENR, MoEU, TTGV, Private Sector)</p>	<p>Ministry of Industry and Technology (STB)</p>

Project name	Explanation	Time	Budget and Funding Resources	Implementing Institution
Technical Assistance Project for Capacity Building and Transfer on F-gases	The aim of the project is to contribute to global efforts to prevent climate change and to develop capacity and legislation to reduce anthropogenic greenhouse gas emissions in order to comply with EU climate policy legislation, F-gases, to increase national capacity to prepare climate change in preventive activities.	2017-2020	1.984.415,00 EUR	Ministry of Environment and Urbanization.
Establishing Technical and Administrative Infrastructure to Improve National Life Cycle (LCA) Assessment Database	The goal of the project: To support sustainable development in Turkish industry for the establishment of administrative and technical infrastructure for the development of the National LCA Database as the basis for national LCA studies.	2017-	The Scientific and Technological Research Council of Turkey (TUBITAK)	Ministry of Industry and Technology (STB)
Determining Cleaner Production Opportunities and Applicability in Industry (SANTEM) Project	The aim of the project: to formulate policies and strategies and to prepare relevant legislation for cleaner production and integrated pollution prevention. Main objective of the SANTEM Project is to examine the status of the iron and steel industry, sectoral needs, cleaner production potential, the regulatory and incentive mechanisms and to assess the applicability of various cleaner production opportunities in Turkey.	2016-2017	The Scientific and Technological Research Council of Turkey (TUBITAK)	Ministry of Environment and Urbanization.

Source: Republic of Turkey Ministry of Environment and Urbanization, 2018

**Table 3:** Policies and Measures According to the Reduction Scenario in the Industry Sector

Name of the policy or measure / mitigation activity	The purpose and / or activity affected	Greenhouse gases affected	Instrument type	Status and starting year of application	Implementing institutions and organizations
National Eco-Efficiency Program	Promoting eco-efficiency by raising awareness, increasing cooperation between institutions and businesses, building capacity, providing technical and financial support to businesses.	All gases	Regulatory economic other	Implemented (2015-2018)	Ministry of Industry and Technology
Financial Support Program for Energy Efficiency Projects in the Manufacturing Industry (VAP)	Increasing energy efficiency in industrial enterprises by providing financial support to projects designed to increase energy efficiency.	CO <sub>2</sub>	Regulatory economic	Implemented (Since 2011)	Ministry of Energy and Natural Resources
Promoting the use of renewable electricity in industry	To promote renewable energy production and its use in the manufacturing industry	CO <sub>2</sub>	Regulatory economic	Implemented (Since 2015)	Ministry of Energy and Natural Resources
Energy Sector Research and Development Projects Support Program (ENAR)	Promoting sustainable energy policies, security of supply, local energy technologies and industrial products and systems	All gases	Economic, other	Implemented (Since 2010)	Ministry of Energy and Natural Resources
Supporting the Sustainable Energy Project Applications of SMEs	Supporting SMEs implementing sustainable energy projects that reduce greenhouse gas emissions	All gases	Economic, other	Implemented (Since 2015)	SME Development and Support Administration (KOSGEB)
Tax based on greenhouse gas emissions	Promoting low carbon emission vehicles by applying various tax levels to vehicles with different greenhouse gas emission levels	All gases	Economic	Implemented (Since 2016)	Ministry of Science, Industry and Technology, Ministry of Economy, Ministry of Environment and Urbanization, General Directorate of Treasury

Name of the policy or measure / mitigation activity	The purpose and / or activity affected	Greenhouse gases affected	Instrument type	Status and starting year of application	Implementing institutions and organizations
Promoting environmentally friendly vehicles	Encouraging alternative fuel vehicles through legislation regulations.	All gases	Regulatory, economic, other	Implemented (Since 2018)	PDK, Ministry of Science, Industry and Technology
Phasing out of old vehicles	Removal of old vehicles through scrapping and export of old vehicles	All gases	Regulatory economic	Implemented (Since 2016)	Ministry of Finance
Promoting electric and hybrid vehicles	Promotion of alternative fuel vehicles (including electric and hybrid vehicles) through financial incentives	All gases	Regulatory economic	Implemented (Since 2018)	Ministry of Finance

Source: Republic of Turkey Ministry of Environment and Urbanization, 2018

### 4.3. The Importance of Adaptation to Climate Change in the Industrial Sector

Climate variability and adaptation to change is a climate risk management issue in which an organization or industry seeks to mitigate potential threats and make the most of the opportunities that may arise as a result of climate change. This risk management requires the development and implementation of adaptation strategies and actions. However, adaptation is a complex, high-content, multi-faceted issue. The dimensions of adaptation to climate change are being aware of or raising awareness about the need for adaptation, understanding the current adaptation issue, planning and implementing strategies and actions to deal with these problems, and then monitoring and reviewing the risks that change over time as well as their performance. In this case, adaptation is a continuous awareness and understanding, planning, implementation, and monitoring and review process (Moser & Ekstrom 2010; Bowyer et al., 2014).

Each of these different aspects or stages of adaptation requires the application of different methods, approaches and skills to make progress. Progress in the awareness and planning stages may depend largely on establishing a knowledge or evidence base and on knowing how a system works to demonstrate the development of effective adaptation strategies. However, progress in the implementation phase can be largely due to a range of institutional, organizational and general governance issues. Ensuring that appropriate monitoring systems are already in place or that the performance of adaptation strategies and risks are reviewed periodically will depend largely on organizational and adequate resources. However, it is important to note that the importance of stakeholder dialogue and engagement must be properly taken into account at all stages. In addition, while the emphasis on the use or relevance of a particular method or approach may shift from one stage to the next, the different stages are clearly interrelated and should not be viewed or addressed by segmented analysis. Accordingly, it should be clear that adaptation is a social process in which the content is abundant and diverse for success (Moser & Boykoff 2013; Bowyer et al., 2014).

Once you decide to implement a particular adaptation strategy or action, these decisions can be classified according to the possible effects or risks that they may bring. The nature of adaptation decisions will be determined in part by the decision lifetime of any action taken, ie how long a particular adaptation action can be taken. Obviously, if the only action available offers little room for reversal, it will have to live for a few years before it can be realistically changed, otherwise it will require substantial costs. Therefore, careful thought is required when developing and evaluating a range of adaptation options.



## 4.4. The Necessity of New Policies for Adaptation to Climate Change in the Industrial Sector

Industry's adaptation to the negative effects of climate change will become more and more important in the near future as the severity of climate change increases. In the past, climate and environment were generally accepted as exogenous factors of the economy, but this is no longer acceptable. As changing climate effects create new economic threats and in some cases new opportunities, new development models will need to include climate as an intrinsic factor in economic calculations. Developing countries that are more vulnerable to climate change risks, especially due to their geographical location and lack of adaptability, will need to design their energy and industrial policies with a perspective that includes climate resilience (Bavbek, 2016).

The expected effects of climate change on the economy are diverse, including physical, social and economic impacts. Physical effects include rising temperatures, rising sea level, changes in rain patterns, and increased frequency and intensity of extreme weather events. These impacts lead to serious social consequences such as reduced productivity in agriculture and fisheries, water scarcity, the spread of various diseases, forced migration and natural disasters causing more damage to human life and infrastructure. From an economic point of view, these effects will lead to some consequences, such as the reduction of food and materials and the increase in prices, changes in agricultural cultivation patterns, changes in the distribution of labor supply, cuts in supply and end markets, and increased insurance costs, among many other predictable and unforeseen effects (Bavbek, 2016).

Any adaptation policy should take into account these weaknesses. Climate flexibility of the industry and the economy in general should be increased by taking a series of measures. Traditionally, most adaptation measures have been directed towards reducing vulnerabilities by increasing local capabilities to respond to the effects of climate change, such as climate monitoring and disaster response. However, such

reactive measures cannot be sufficient in the struggle for adaptation to climate change. To ensure successful adaptation, developing countries need to increase flexibility in the agriculture and industry sectors and promote health care.

The main objectives of the industrial adaptation policy should cover a range of issues, such as diversifying the industry, reducing dependence on imported energy, reducing vulnerability to natural disasters, and improving food security. Diversification of the economy is important for many developing countries; because many of these countries have based their industrial development strategies on one or more export sectors integrated into their global supply chains. This makes the livelihoods of these countries vulnerable to external changes such as rapid changes in exchange rates, the emergence of low-cost competitors and collapse in the global market. As the effects of climate change become more serious, the issue of industrial diversity can be expected to become more important. There are basically two reasons for this. First, although the prices of fossil fuels have been very low over the past period, there is a risk that they will increase due to climate policies. Second, there is a risk that climate events may make global supply chains more susceptible to disruptions. An important feature of climate change impacts is uncertainty. There are important gaps in our understanding of the impacts of climate change and so it must be accepted that there are always unpredictable consequences. Therefore, according to our updated understanding of the impacts of climate change, climate adaptation policies should be regularly reassessed and redesigned for both predicted and unforeseen effects of climate change (Bavbek, 2016).

## 5. CONCLUSION

Climate change affects the industrial sector directly and indirectly as in many other sectors. It is also clear that the industrial sector contributes to this effect with the emissions it releases. It is a fact that the impacts arising from climate change will continue for decades to come and we have to deal with this challenge. Industrial policies play a determining role in the increase or decrease of these impacts, as in all sectors. It is expected that Turkey, which is expected to be exposed to the effect of climate change in a wide scale and widespread manner, needs to adapt to this impact. There are many methods for adaptation to climate change in the industrial sector. Some of these methods are primarily related to mitigation. However, mitigation and adaptation are not alternative concepts, on the contrary, they are two complementary elements in combating climate change. The "Clean (Sustainable) Production" which is conceptualized by United Nations Environment Program (UNEP) is an important approach for the sector to adapt to climate change. Cleaner production, according to UNEP's definition, is "Reducing the risks on people and the environment by continuously applying a holistic and preventive environmental strategy to production processes, products and services". Three basic components of cleaner (sustainable) production are reduction of waste at source and consumption of resources; reuse and / or recycling and product modifications. The method of cleaner production has been experienced with examples that provide many environmental, economic and social gains in addition to adapting to climate change for businesses or the whole sector. Another method is the "Eco-Industrial Parks" which have become abundant in the emerging and developing economies. In this application, there are similar gains to the cleaner production method.

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# ENERGY POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

*Prof. Dr. Levent Aydın*



# 1. TURKEY'S ENERGY SECTOR POLICIES

Turkey's growing economy and a growing population increase the energy demand. Reducing demand with improvements in energy efficiency and using new and renewable energy sources in energy supply are seen as important developments. In line with these developments, it is considered to be covered in Development Plans, Annual Programs, strategy documents and National Energy and Mining Policy. It is targeted at increasing share of renewable energy sources in Turkey in the energy supply, increasing resource diversity, in terms of reducing emissions and reducing external dependency is aimed recording progress.

It is seen that target-based energy policies are included in government programs and strategic plans , especially Development Plans, Annual Programs and New Economy Program (Medium Term Program) . There are strategy documents and policy documents on energy prepared under the coordination of the Ministry of Energy and Natural Resources. 11. The main policies regarding energy under the Development Plan are:

- ▶ The main objective is to provide continuous, high quality, sustainable, safe and affordable energy supply.
- ▶ In meeting the increasing demand in energy, a competitive investment environment will be developed and the continuity of an energy market that is financially strong, stable, transparent, predictable, having consumer protection and sustainability will be considered.
- ▶ Rehabilitation of publicly operated power plants will be completed.
- ▶ Nuclear Power Plants (NPPs) will be included in the electricity generation portfolio, efforts to increase the share of nuclear energy in electrical energy generation will be continued and institutional capacity will be strengthened.
- ▶ The use of our lignite reserves in electrical energy production will be increased in line with environmental standards.
- ▶ Measures to reduce carbon emissions will be developed with additional

measures such as energy efficiency gains and increasing forest assets.

- ▶ R&D projects on clean coal technologies will be supported.
- ▶ Natural gas supply security will be strengthened and access to natural gas will be increased.
- ▶ Electricity generation from renewable energy sources will be increased, and necessary planning and investments will be made in order to ensure the safe integration of renewable energy production into the grid.
- ▶ Buildings that are more efficient and produce their own energy will be expanded.
- ▶ Support will be provided to encourage energy efficiency in existing buildings.
- ▶ A National Green Building Certificate System will be established.
- ▶ Unlicensed solar power plant and wind power plant applications will be expanded to meet its own electricity needs.
- ▶ Energy Efficiency Project in Public Buildings will be implemented.
- ▶ Smart grid applications will be expanded.
- ▶ Operation of energy infrastructure will be continued in an efficient and safe manner.

Besides the Development Plans, some of the main policy documents are:

- ▶ Ministry of Energy and Natural Resources, TEİAŞ, TKİ, TTK Strategic Plans
- ▶ Electric Energy Sector Reform and Privatization Strategy Document
- ▶ Renewable Energy Action Plan (2014-2019)
- ▶ Turkey's Climate Change Strategy 2010- 2023
- ▶ Energy Efficiency Strategy Document (2012-2023),
- ▶ National Energy Efficiency Action Plan (2017-2023)

It could be seen that in Turkey, incentive mechanisms are used for increasing the share of renewable energy in energy production in recent years, and the scope of legal regulations in the field of energy efficiency is expanded. In this context, with the Energy Efficiency Strategy Paper (2017-2023) it is aimed at mitigating Turkey's primary energy consumption cumulatively by 23.9 MTEP in the 2017-2023 period.

In addition, it is noteworthy that renewable energy investments have evolved from a hydropower-oriented growth strategy to a structure that focuses on other renewable energy sources such as wind and solar and grows in these areas with the effect of improved legislation and incentive mechanisms.

Electricity market legislation aims to provide the electricity produced to consumers in a sufficient, high-quality, continuous, low-cost and environmentally friendly way, to create a financially strong, stable and transparent electricity market and to make an independent regulation and supervision in this market. National policy documents aim to expand the use of renewable energy sources for electrical energy production, to bring these resources to the economy in a reliable, economical and quality manner, to increase resource diversity, to reduce greenhouse gas emissions, to utilize waste, to protect the environment and to develop the manufacturing sector needed to achieve these objectives. With the current policies, it is aimed to increase efficiency in the use of energy resources and energy in order to use energy effectively, to prevent waste, to alleviate the burden of energy costs on the economy and to protect the environment.

Electricity Market Law No. 6446, Natural Gas Market Law No. 4646, Law No. 5346 on the Use of Renewable Energy Resources for Electricity Generation, Energy Efficiency Law No. 5627 and Law No. 6094 Amending The Law on Use of Renewable Energy Resources for the Purposes of Electric Energy Production all guarantee everyone to have uninterrupted and quality access to energy.

There are various regulations in the field of energy efficiency that encourage increasing energy efficiency in industry, buildings and transportation. In order to increase the share of renewable energy resources, relevant institutions, especially the Ministry of Energy and Natural Resources and EMRA, are carrying out their activities. Natural energy sources such as hydraulics, water, solar, wind and geothermal are not only renewable but also clean energy sources and they are encouraged and supported by the public.

The Ministry of Energy and Natural Resources is the coordinator institution in energy policies. Relevant stakeholder institutions:

- ▶ Ministry of Treasury and Finance
- ▶ Ministry of Commerce
- ▶ Ministry of Agriculture and Forestry
- ▶ Ministry of Environment and Urbanization
- ▶ Ministry of Foreign Affairs
- ▶ Ministry of Transport and Infrastructure
- ▶ Ministry of Education
- ▶ Ministry of Industry and Technology
- ▶ Energy Market Regulatory Authority
- ▶ Strategy and Budget Department
- ▶ DSİ General Directorate
- ▶ TKİ
- ▶ TTK
- ▶ MTA

EMRA, EÜAŞ, TEİAŞ, TEDAŞ, EPIAŞ and BOTAŞ, which are affiliated, subsidiary and related institutions of the Ministry of Energy and Natural Resources, carry out their works under the general coordination of MENR in the phases from energy supply to final consumption.

Renewable Energy Resource Areas (YEKA) have been established by the Ministry of Energy and Natural Resources within the scope of supporting Renewable energy resources in recent years, where the production of solar and wind power plant equipment in the country and the establishment of the necessary R&D center and the establishment of 1,000 MW wind and 1,000 MW solar power plants are aimed. In this context, it is aimed to involve the private sector in the equipment production part of the investment and to encourage the use of domestic equipment. In order to ensure the diversity of primary energy sources and reduce Turkey's imports of fossil fuels, new and alternative energy sources and technologies are preferred. In this

context, Akkuyu Nuclear Power Plant project with an installed power of 4,800 MW is being carried out. There are also various projects in the fields of renewal of processes / structures / systems in order to increase energy efficiency in industry, public and service buildings, carrying out awareness-raising activities on this issue, providing energy efficiency consultancy services and improving energy management.

The share of renewable energy in final energy consumption is decreasing due to the widespread use of natural gas, vehicle park development and the rapid increase in fuel demand. In terms of electrical energy, it is seen that electricity generation from renewable energy has increased significantly with the effect of the support mechanism (feed-in-tariff). Supports provided encourage new investments.

It could be seen that Turkey's progress towards mitigating energy intensity remains at lower levels compared to EU and OECD averages. In order to detect the developments in energy efficiency in a healthier and more effective way, the need to monitor efficiency in industry and transportation sectors and buildings with separate and different indicator sets still exists. According to the Renewable Energy Action Plan, the installed capacity of Turkey's renewable energy power plants, is expected to increase by 77% in 2023 compared with realizations in year 2016, while the electricity generated from these plants is expected to increase by 83%. In addition to the target that the majority of the power plants to be commissioned will include renewable energy resources, the targets and steps to increase the share of renewable energy in the energy consumed in transportation, industry and residences are the developments that can lead to an improvement in the said indicator in the coming period.

Energy intensity of the economy in Turkey is decreasing. While the share of energy-intensive manufacturing industry sectors in GDP is decreasing, the increase in the share of service sectors is one of the factors that caused the energy intensity to decrease. In addition, it is observed that the transition from low and medium-low technology sectors with high energy consumption to medium-high technologies with lower energy consumption, albeit limited, has an effect on the decrease in

energy density. It is considered that the activities carried out in the field of energy efficiency in the country, especially the improvement investments made in the industrial sector, the higher heat insulation in the new buildings included in the stock, and the widespread use of high-efficiency household appliances are also considered to have a role in this development. However, Turkey should increase its efforts to reduce its energy intensity.

As the energy supply security is threatened by the fossil resources almost all of which is imported as in the case of natural gas and oil that have high share in the primary energy consumption of Turkey, the importance of using local resources in electricity production has increased. In this context, the private sector was encouraged to invest, and renewable energy investments were supported by various public practices / incentives.

Being a part of international agreements such as European Energy Charter Treaty in Turkey, the UN Framework Convention on Climate Change (UNFCCC) and following up the international standards in energy investments, are among the positive developments. Turkey's efforts will continue by more benefitting from financial mechanisms within the scope of UNFCCC. In addition to large-scale generation investments, it will be beneficial to increase studies on supporting renewable energy cooperatives and small-scale energy generation, taking into account the total system feasibility. The development of "Renewable Energy Cooperatives" that appeals to citizens of all walks of life is seen as an important step. Within the scope of unlicensed electricity generation activity, meeting the demand by generating electricity from renewable sources under the roof of domestic and cooperative, selling the excess production to the distribution company to which they are affiliated with the state guarantee over the determined tariffs will contribute to the reduction of foreign dependency in energy and support regional development.

In order for the targets within the scope of accessible and clean energy to be implemented, it should be the primary goal to increase awareness of these targets in all segments of society and to include all stakeholders in this process. Providing

uninterrupted energy requires optimization of supply, demand, transmission, distribution and storage systems. While increasing the installed capacity of renewable energy, it is important to adapt the electricity transmission infrastructure to this. In addition, increasing the use of clean energy resources in areas such as heating and transportation other than electricity generation, and reducing the rate of increase in energy consumption by improving energy efficiency will contribute significantly to achievement. It is a positive development to establish and plan technology transfer of Research and Development facilities where the renewable energy technologies, which Turkey mainly imports, will be developed.

Keeping a systematic inventory of energy efficiency in Turkey, monitoring the energy efficiency at a more detailed level on sectoral basis, and determining the energy saving and emission mitigation provided by the investments made, are among priority issues.



## 2. TURKEY'S CLIMATE CHANGE POLICIES

Climate change policies in Turkey were first included in the 8th Development Plan, and with the 9th Development Plan it was targeted to prepare climate change strategy and greenhouse gas mitigation action plan. In the 10th Development Plan, it is aimed that our country will contribute to the fight against global climate change, especially within the scope of emission reduction and adaptation, according to the principles of common but differentiated responsibilities and relative capabilities. The determinations and basic policies regarding climate change in the 11th Development Plan are as follows:

- ▶ Although various impacts of climate change are seen to accelerate at the global level, the commitment and adaptation levels of developed and developing countries within the scope of the Paris Agreement, which offers a new framework, are insufficient to achieve the global targets.
- ▶ While increasing demand for food, climate change, urbanization, soil and water resources create pressure on the agricultural products and producers, the development of plant and animal species suitable for the changing climate, the protection of the environment and biological diversity are gaining importance, and the need for qualified labor force and technology is increasing in order to meet the food demand with less resources.
- ▶ Increasing sudden rains, floods and drought disasters occur in our country, which is among the countries that will be most affected by climate change due to its geographical location. In parallel with the position of our country as a developing country, efforts for emission reduction and adaptation to climate change continue. Revealing the opportunities for access to climate financing for Turkey with an industry-intense growth trend, will ensure using emission mitigation opportunities with the lowest marginal cost.
- ▶ Turkey, due to its geographical location, is located among the countries which will be most affected from climate change and it contributes into the efforts for struggling climate change with an understanding that respects country realities.

In parallel with the position of our country as a developing country, a policy towards limiting the green growth and emission increase trend is followed, and efforts to adapt to climate change remain important.

- ▶ Environmental problems such as environmental pollution, climate change, desertification, deforestation, loss of biodiversity and drought affect human life and development process more and more every day.
- ▶ It is observed that the accelerated climate change with the effect of high greenhouse gas emissions causes an increase in natural disasters and poses a serious threat to humanity. In a world where demand and consumption are increasing, sustainable environment and natural resource management and the construction of livable cities are becoming increasingly important.
- ▶ To ensure the sustainable development of cities; actions such as the establishment of an accessible high-connection urban transport system, infrastructure resistant to disasters and climate change, creation of sustainable production and consumption mechanism, long-term integrated urban planning and design, and the implementation of effective disaster management require the participation of all stakeholders and a comprehensive cooperation.
- ▶ Our cities will be planned in coordination with the development vision, with a multi-centered approach that supports mixed use, especially that ensures accessibility; spatial plans will be based on ensuring harmony with the topography and observing disaster risk, climate change, geographical features and historical values.
- ▶ Within the scope of the green city vision, National Gardens will be built in our cities and the amount of green areas will be increased in order to increase the quality of life and adapt to climate change.
- ▶ The main objective is to ensure that everyone, especially those with low incomes, have access to adequate, livable, durable, safe, inclusive, affordable, sustainable, climate-resistant housing with basic infrastructure services.
- ▶ The main objective is to protect the environment and natural resources, to improve their quality, to ensure effective, integrated and sustainable management, to implement environmental and climate-friendly practices in every field, to increase environmental awareness and awareness of all segments

of the society.

- ▶ International climate change negotiations will be carried out within the framework of the Intended National Contribution, with the principles of common but differentiated responsibilities and relative capabilities, combating climate change in sectors that cause greenhouse gas emissions within national conditions, and increasing the capacity of the economy and society to adapt to climate change, this it will be possible to increase the resilience of the economy and society to climate risks.
- ▶ Studies will be carried out within the framework of the Intended National Contribution for emission control in buildings that cause greenhouse gas emissions and in the energy, industry, transportation, waste, agriculture and forestry sectors.
- ▶ Planning, implementation and capacity building studies, which include national and regional adaptation strategies, will be carried out to increase the capacity to adapt to the adverse effects of climate change.
- ▶ In order to adapt to climate change and take the necessary measures, needs will be determined at the regional and city scale and solutions will be determined, and Climate Change Action Plans will be prepared for 7 Regions, particularly the Black Sea Region.
- ▶ Disaster hazard and risk maps will be prepared taking into account the scenarios regarding the effects of climate change throughout the country.

Progress has been made in areas such as the integration of climate change-related measures into national policies, strategies and plans. However, progress remained limited in areas such as implementing legislation, reducing strategies to sectors and local levels, systematically assessing climate risks, and monitoring progress on adaptation. Other key policy documents are:

- ▶ National Climate Change Strategy 2010-2023
- ▶ Climate Change Action Plan 2011-2023
- ▶ Climate Change Adaptation Strategy and Action Plan 2011-2023
- ▶ National Strategy and Action Plan for Combating Desertification (2015),

- ▶ Action Plan for Combating Erosion, Combating Agricultural Drought Strategy and Action Plan, National Basin Management Strategy (2014),
- ▶ AFAD Strategic Plan,
- ▶ CSB Strategic Plan,
- ▶ National Drought Management Strategy Document and Action Plan (2017)
- ▶ Energy Efficiency Strategy Document (2012),
- ▶ National Biodiversity Strategy Document and Action Plan (2007)
- ▶ National Program and Action Plan for Mitigating Negative Impacts of Climate Change on Health Meeting of Parties
- ▶ Turkey Disaster Response Plan (TAMPA) (2013)
- ▶ National Recycling Strategy Document and Action Plan (2014)

National Climate Change Strategy, which was prepared by Turkey in order to contribute in the global efforts towards mitigating the climate change effects in Turkey within its specific conditions and opportunities, is one of the most important documents. The Strategy includes short-term goals such as one year, medium-term goals that are expected to be realized or to start within 1-3 years, and long-term goals with a duration of 10 years. The relationship between climate change and disaster has been established in the Climate Change Strategy Document, CCAP and Adaptation Strategy and Action Plan. Climate Change Strategy Document includes measures such as implementing the measures under Agricultural Drought Combat Strategy and Action Plan, the preparation of regional flood plans and their integration into provincial disaster plans, training to increase social awareness and participation, development of an early warning system in the fight against flood, monitoring and taking measures against heat waves caused by climate change, extreme colds, floods, storms and droughts, etc.

It includes increasing the capacity to adapt to the negative effects of human-induced climate change and building resilience to climate-related risks. It has been observed that climate change and climate-related disaster policies have come to the fore in recent Development Plans. The National Climate Change Strategy Document covering the years 2010-2020 is a guiding document that determines the basic policies regarding climate change. Another basic complementary document on

the subject is the National Climate Change Action Plan (2011-2023). Within the scope of combating climate change, both documents contain measures related to energy, buildings, industry, transportation, agriculture, land use and forestry, waste sectors under the titles of mitigation, adaptation, technology transfer, financing and capacity building.

Paris Agreement to which 189 countries are officially a part as of 05/06/2020, aims at keeping the global average temperature increase under 2 C and limit to 1.5 C compared to pre-industrial level. Within the scope of the agreement, it is envisaged that developed countries will provide financing, technology and capacity building support to developing countries in order to take measures regarding mitigation and adaptation. Although Turkey has signed the agreement on 22/04 /2016, it is not yet a party to the Agreement. The contribution of the Republic of Turkey was defined as 21% mitigation in year 2030 in the greenhouse gas emissions according to Reference Scenario (BAU) in the Intended National Contribution (INDC) document as per UNFCCC decisions. Turkey declared its intention to use domestic resources in order to reach this target and use international supports towards finance, technical, technology and capacity building so as to include Green Climate Fund. Although the amount of per capita greenhouse gas emissions in Turkey has been under the EU, OECD, G-20 and world averages, when looked from different metrics and the future positions are examined in line with official targets, it could be seen that this view is being changed.

Since 1997, climate-related laws, legislation and policies have approached 900 globally. A more apparent integration of climate change context to the existing environmental regulations in Turkey, could support more effective implementation of climate change policies and measures.

There are sufficient number of various guiding laws and regulations regarding disaster risk reduction strategies in the legislation on adaptation to climate change. In this context, the state established its own organization in relation to this issue under the Ministries and also worked together with civil society organizations, volunteers, suppliers in private/ public sector, local administrations, municipalities and provincial private administrations to design this responsibility of Turkey in collaboration with the sectors and other authorities that are related to the issue, including the central authorities. In the legislation that focuses on before, during and after disasters and emergencies, priority is given to the means such as insurance institutions to protect people and their goods, and adequate organization has been established in disaster and emergency response services that are taken to ensure that health and education services continue after the disaster. However, considering the principles set by the Sendai Framework for Disaster Risk Reduction, it is a deficiency that there is no regulation that focuses on the poor, who are more affected by these disasters than in other regions and who need special protection due to their age, gender and cultural differences. Although scientific researchers conducted in cooperation with data centers and real/legal persons, which are formed as another disaster risk reduction strategy, are sufficient, data collection is mostly organized within the framework of earthquakes, and organization and cooperation is insufficient for regions with disaster / emergency risk other than earthquakes. For the reconstruction works to be carried out after the disaster, an organization focused on the recovery of the damage and the continuation of daily activities has been established, but there is no legislation specifically designed to raise public awareness about the post-disaster rehabilitation activities and disaster risks that develop due to climate change, as specified in the Sendai Framework for Disaster Risk Reduction.

Since the beginning of the 2000s, important legal and institutional arrangements have been made that can be associated with the goal of including climate change measures in national policies, strategies and planning. Turkey's participation in the international climate regime by becoming a party in 2004 to UNFCCC and in 2009 to Kyoto Protocol and starting to create policies and measures against climate change at national level as a condition for these resolutions, enabled the establishment of relevant regulations and corporate structure. The current legislation covers the aim of minimizing greenhouse gas emissions, which is the biggest factor of climate change, as much as possible, and includes factors such as burning certain fuels, radiation, exhaust gas emissions, and emissions from heating, which are among the other causes that negatively affect climate change. The legislation prepared in this context constitutes organizations such as verifying institutions for monitoring and reporting greenhouse gas emissions originating from certain sectoral activities and other factors that should be kept under control, scientific advisory commissions that undertake research tasks in order to act in line with scientific research. National plans and strategies are intensified more on general framework of environmental impact assessments and monitoring mechanisms, and in relation to climate change for Turkey, and it could be seen that there is a need for regulations covering the mechanisms established for adaptation to the impacts and measures that specifically handled the issues that arise as a result of climate change rather than its reason, such as increasing importance of the protection of arable lands, the need for environmentally friendly reform in the energy sector, preventing deforestation, water scarcity and access to reliable water resources. While preventive and controlling legislation is sufficient for certain factors that increase global warming and cause climate change, a customized legislation will more fully cover the objective of the target, taking into account the situations that need to be adapted as a result of climate change and the regional differences and urgencies in the context of adaptation to climate change.

Under the Climate Change and Air Management Coordination Board, Education, Awareness and Capacity Building Working Group, Greenhouse Gas Emission Reduction Working Group and Climate Change Impacts and Adaptation Working Group carry out important projects. Education, research, publication and information activities of other relevant ministries and institutions, especially the Ministry of Environment and Urbanization, Ministry of Agriculture and Forestry, can also be evaluated within this scope. Before the sustainable development goals are adopted, the protocols that are integrated into the legislation within the framework of harmonization with the European Union and the internationally accepted regulations such as the Montreal Protocol stand out in the legislation. In line with these regulations, there are strategies to reduce air pollution arising from various activities that can be named as climate change mitigation studies, these are mostly planned to be implemented in the context of the organization of the Ministry of Environment and Urbanization; therefore, the Training and Publication Department which was established for creating awareness and engaging in cooperation with the organizations under the inspection of the Ministry and developing institutional capacity, Climate Change and Air Management Coordination Board which was established for fulfilling our obligations in the international conventions and environmental volunteers and auditors which are determined by the Ministry for carrying out the environmental audit in a continuous manner are a part of the corporate and systematic structure. However, an integration into the primary, secondary and tertiary curriculum aimed with this goal is not visible in the legislation within the above-mentioned scope; while regulating the mentioned issues, more emphasis was placed on supervision and organization, and informing the public could not reach the level of awareness raising aimed for this purpose. Therefore, if the organization, which is already included in the climate change adaptation policies by raising public awareness, is expanded and the integration into education programs is focused on, it will be easier to create an awareness at the level specified by the target and expand human capacity.

According to the UNFCCC, the need for technology and sufficient capital transfers to the developing countries is emphasized in various sections in the plans to be made in line with the purposes listed in the articles of the contract. In this context, there are laws regarding the approval of the decisions taken regarding the Kyoto Protocol, which is an extension of this convention, and although it does not contain a specific commitment to provide capital to developing countries in the Kyoto protocol, this issue has been addressed within the scope of climate change adaptation and preventive policies.

In the current legislation in Turkey, there is no regulation at sufficient level that handles supporting mechanisms to increase effective planning and management capacity with climate change by focusing on women, young people, local communities and marginalized groups. The Ministry of Environment and Urbanization stands out as the coordinator institution. The Ministry also carries out the secretariat of the Climate Change and Air Management Coordination Board. Other relevant institutions are:

- ▶ Ministry of Energy and Natural Resources
- ▶ Ministry of Agriculture and Forestry
- ▶ Strategy and Budget Department
- ▶ AFAD
- ▶ Natural Disaster Insurance Institution

In recent years, there has been a significant increase in the number of disasters such as hurricane, flood, lightning, extreme heat and hail. Economic losses caused by floods due to climate change in Turkey are in second place after the economic losses due to seismic disasters Turkey's cumulative and per capita greenhouse gas emissions are on the rise. The biggest share in these emissions belongs to the energy sector, and CO<sub>2</sub> emissions in terms of greenhouse gas emissions. The amount of greenhouse gas emissions per person in Turkey remains below the EU, the OECD and the G-20 and the world average.

## 3. ENERGY POLICIES, CLIMATE CHANGE AND ADAPTATION IN TURKEY

Turkey has the highest increase in energy demand among the OECD countries. According to the Development Plans targets, economic growth, population growth, urbanization have led to increased energy demand. Turkey's domestic energy resources, especially oil and natural gas reserves are quite limited in terms and is not enough to meet national demand. Turkey is heavily dependent on imported fuel and covers vast majority of oil and natural gas supply through imports. Depending on the increasing energy demand, energy import dependency is increasing. Likewise, Turkey is the second highest country after China since 2002 with the rate of increase for demand for electricity and natural gas. Estimates made by the Ministry of Energy and Natural Resources show that this trend will remain the same in the medium and long term.

The total primary energy supply, which was 52.5 MTEP in 1990, increased to 153 MTEP in 2018. The share of fossil fuels in the total primary energy supply is higher. On the other hand, the share of renewable resources was 14% in 2019. Turkey's total installed capacity of primary energy supply increased more than fourfold since 1990, rose in 2019 to 78 497 GW. It is expected to reach 114 GW by 2023.

Energy consumption has been observed to decline significantly in times of economic crisis (ie 1994, 2001 and 2008), especially for the industrial sector. The industrial sector and the building sector are the sectors with the highest energy consumption.

In 2014, 14% of Turkey's total primary energy supply (16.9 MTEp) was met from renewable energy sources. In terms of energy generation, the installed capacity of renewable energy reached 34582 MW in 2019. Turkey has an important renewable energy resource potential; but an important part of this potential has not been utilized yet. According to Wind Energy Potential Atlas, Turkey's potential is 48,000

MW in total comprising land potential of 38,000 MW and offshore potential of 10,000 MW. As of its located in the world, Turkey is located in one of the regions that benefit the best from solar energy, called the solar belt. According to Turkey's Solar Energy Potential Atlas (GEPA), the annual sunshine time is 2,737 hours (total of 7.5 hours per day) and annual total incoming solar energy is 1,527 kWh / m<sup>2</sup> (daily total of 4.2 kWh / m<sup>2</sup>). Geothermal energy is an important renewable energy source for Turkey due to intense tectonic movements. To put it theoretically, Turkey's geothermal potential is 31,500 MWt and this potential is estimated that 12% of them still theoretically be suitable for the production of electricity. When we look at the current spring and well temperature in Turkey, 58% of geothermal energy is used for heating purposes (greenhouse, residential areas, facilities etc.), 30% for thermal tourism and 12% for electricity production. It is estimated that the heat potential in Turkey is 16 098 MWt and 3,322 MWt of it is used for heating purposes. However, considering the total potential, it is observed that the use of existing resources is around 20%. In Turkey there are 19 settlements using geothermal energy in heating systems, providing approximately 115,000 housing equivalent of central heating. Although it is estimated that the technical potential for electricity generation from geothermal sources is 4,000 MW, the total installed capacity in Turkey reached 832 MW by the end of 2016. Turkey's gross theoretical hydroelectric potential is 433 billion kWh. However, the technically feasible potential is about half of this amount (which is 216 billion kWh) as it is not possible to use the full potential with current technologies. Another limitation is the fact that not every technically built facility can be very cost effective. Therefore, a more realistic potential is around 180 billion kWh/year. Turkey has around 2.3% of the hydroelectric potential that could be economically applied in the world, and around 17% of the total potential of Europe. As of the end of 2016, it has a total capacity of 26678 MW. This is the equivalent of 34% of the total capacity. Hydroelectric production increased to 67.2 billion kWh in 2019. Turkey's Biomass Energy Potential Atlas (BEP) was prepared. According to Atlas, the biomass potential is determined as 44.1 MTep in theory.

According to the latest national greenhouse gas inventories, the total CO<sub>2</sub> emission released by the energy sector in 2018 is 390 million CO<sub>2</sub> equivalent, of which 140 million has arisen from electric sector.

Energy efficiency is a very important component of the National Energy and Mining Policy in terms of supply security. An overall target has been set to reduce energy intensity by 20% by 2023 compared to 2008. Accordingly, the importance of sustainable development as well as competitive and green growth has been the subject of interest in the National Energy Efficiency Action Plan (2017-2023). Thus, it is expected that the primary energy consumption of Turkey will decrease by 14% (23.9 MTep) and with an investment of 109 billion USD, an emission saving of 66.6 million tons CO<sub>2</sub> will be accomplished by the year 2023.

The main source of anthropogenic greenhouse gas emissions in Turkey is the energy sector. The energy sector constituted the largest part of greenhouse gas emissions with 73%.

Turkey's Energy Policy, gives priority to mitigating import dependency through healthy use of renewable energy resources in environmental terms and increasing supply security. Therefore, the priority of Turkey in the coming period will be realizing the domestic and renewable energy potential and mitigating import dependence in addition to ensuring energy supply security. Energy efficiency policies are one of the main areas that need to be discussed delicately because of their direct relationship with the sustainability of economic growth and social development goals and their key role in reducing total greenhouse gas emissions. Energy conservation and efficiency is one of the most important elements of energy policies such as reducing the risk of dependence on foreign sources, increasing the efficiency of the fight against environmental protection and climate change as well as Turkey's 2023 national strategy targets. With energy efficiency efforts, it was targeted to mitigate Turkey's energy intensity (energy consumed national income per capita) by 20% compared to the year 2011 until 2023. In addition, under the National Energy Efficiency Action Plan to be implemented during the period 2017-

2023, it is targeted to mitigate primary energy development of Turkey by 14% until 2023. In this regard, Turkey's key strategies and policies based on security of energy supply are summarized as follows:

- ▶ Providing resource diversity by giving priority to local resources,
- ▶ Increasing the share of renewable energy sources in energy supply,
- ▶ Increasing energy efficiency,
- ▶ Making free market conditions fully functional and improving the investment environment,
- ▶ Taking measures to ensure resource diversity in the oil and natural gas fields and to reduce the risks arising from imports
- ▶ Transforming into an energy corridor and terminal within the scope of regional cooperation processes that use the geostrategic location effectively,
- ▶ Ensuring that environmentally sensitive activities are carried out in energy and natural resources,
- ▶ Increasing the contribution of natural resources to the national economy,
- ▶ Increasing the production of industrial raw materials, metal and non-metal minerals and ensuring their domestic use,
- ▶ To make energy accessible to consumers in terms of cost, time and quantity.

National Contribution Intention (INDC) which gives an open policy framework of Turkey, recommends the following:

- ▶ Increasing the electricity generation capacity from solar energy to 10 GW by 2030.
- ▶ Increasing the electricity generation capacity from wind energy to 16 GW by 2030.
- ▶ Utilizing the full hydroelectric potential.
- ▶ Operation of a nuclear power plant by 2030.
- ▶ Reduce electricity transmission and distribution losses to 15 percent by 2030.
- ▶ Rehabilitation of public power generation plants.
- ▶ Micro generation in electricity generation, establishment of joint generation

systems and production in the field.

Witnessing a sharp and continuous increase in almost all forms of energy demand, large amounts of investment are required to meet this growing demand. In the last decade, Turkey's economic boom has been accompanied by an increase in electricity demand. Economic expansion, increase in per capita income, positive demographic trends and rapid urbanization tendency are the main indicators that energy demand will continue in an increasing trend.

Turkey's increasing renewable energy board will provide direct mitigation of greenhouse gas emission in the energy sector. It provides contribution in the greenhouse gas emission of Turkey in the energy sector. In addition, the Energy Efficiency Strategy will be implemented effectively and efficient use of energy will be ensured in all sectors. The rehabilitation of thermal and HEPPs that are expected to remain in the government will be completed, and the loss-leakage rates will be reduced to the lowest possible level.

Ministry of Energy and Natural Resources Strategic Plan, which is a road map in Turkey for the energy policies, it is foreseen to "use energy and natural resources in the most efficient and environmentally sensitive manner to provide the highest contribution to national welfare". Although the targets defined in the plan have not yet been achieved, these targets are important due to the direct effects of energy sector emissions on climate change.

When the hydroelectric potential is considered under adaptation to climate change: Turkey's current sustainable usable water potential is 112 billion m<sup>3</sup> of which 94 billion m<sup>3</sup> is surface and 18 billion m<sup>3</sup> is ground water. Approximately 50% of this potential is currently being used in Turkey. 54 billion m<sup>3</sup> corresponds to 48% of the total water potential of Turkey's net water consumption. Total usage is covered by 39 billion m<sup>3</sup> surface and 15 billion m<sup>3</sup> ground water. Water used in agricultural irrigation has the highest share with 74%, where 13% is used in domestic and 13% in industry. In Turkey it is estimated that all of 112 billion m<sup>3</sup> water will be totally used

in 2023. It is expected that the water consumption amounts for 2023 will be a total of 112 billion m<sup>3</sup>, of which 72 billion m<sup>3</sup> for irrigation, 18 billion m<sup>3</sup> for utilization and 22 billion m<sup>3</sup> for industry. According to these data, it is estimated that the share of water use in agricultural irrigation will be reduced to 64%, the share of industrial use and domestic use will increase to 20% and 16%, respectively, by 2023.

According to Turkish Statistical Institute (TUIK) projections, Turkey's population is estimated to reach about 93 million by 2030. In this case, the amount of water per capita that is currently 1,302 m<sup>3</sup>/year will decrease to 1,204 m<sup>3</sup>/year in 2030. It is possible to estimate the pressures on water resources with the effect of factors such as the current growth rate of the country and changes in water consumption habits. In addition, all these estimates may arise if existing resources are transferred without destruction until that year. In this sense, contrary to common belief, Turkey is not a water-rich country in terms of per capita amount of water. According to the Falkenmark index which classifies the countries in terms of per capita water potential, since Turkey has a per capita water potential of 1.000-1.500 m<sup>3</sup> annually, it is a country with "water stress" and the amount of water per capita is below global average.

It is estimated scientifically that the most important effect of climate change will be on water cycle and the climate change in the future will lead to decrease in water resources in Turkey. It is stated that in some river basins there is a tendency to decrease in precipitation, a significant increase in temperature and thus decrease in flows. For example, it is estimated that 50% of surface waters in Gediz and Büyük Menderes Basins will be lost in this century, and therefore, water users will experience extreme water scarcity in agriculture, home and industry. In this case, the amount of water per capita in the future will be even lower than the figures stated above. Based on a pessimistic scenario, the model projections indicate that there will be a fall in Turkey's water potential in by 16% and 27% respectively in 2050 and 2075. When we consider these figures instead of water that is constantly available throughout this century, it is inevitable that the amount of water per capita in 2050 and 2075 will be even lower than the figures stated above.

In Turkey, the decrease in total rainfall is estimated to be more pronounced especially after the year 2041 Turkey's southern part, especially in the Eastern Mediterranean, Seyhan and Ceyhan basin, the rains will decrease significantly and in the north and especially the Eastern Black Sea, Black Sea and Yesilirmak River Basin the rainfall (up to 150 mm) is expected to increase slightly. The decrease in the precipitation trend between 2015 and 2100 in Konya, Akarçay, Burdur, Kızılırmak and Sakarya Basin is similar in all models located partially away from the coastline. Thus, Turkey's new challenges will be added to the existing water resources and irrigation problems, big problems will be encountered in drinking water and use. In this way, this change in the water cycle will lead to significant changes in the quality and supply of water resources and will affect many climate-dependent industries, including food production, where water is vital. The increase in summer temperatures in Turkey, the decline in winter precipitation (especially in the western provinces), surface water loss, frequent drought, soil degradation and coastal areas caused by climate change in Turkey effects such as erosion and flooding directly threaten the existence of water resources.

At home, families consume significant amounts of energy for activities such as heating, cooling, lighting, cleaning and personal care. Women play an important role in daily household activities, i.e. in energy consumption That's why the awareness of women on energy consumption and energy efficiency as a target audience should be increased. The aim of the “Energy Lady” project is to teach women to use energy efficiently to contribute to the domestic and national economy. The Project is a joint project of Ministry of Energy and Natural Resources and the Ministry of Labor, Family and Social Policies and continues its Turkish tour, and reached to 20,000 women in 20 provinces as of June 2018.

Some actions in the Climate Change Action Plans that may be related to adaptation in the energy sector are:

- ▶ Reducing primary energy density
- ▶ Reducing losses and leaks in electricity distribution

- ▶ Taking necessary supportive measures to rehabilitate and strengthen distribution networks and direct them to "Smart Grid" applications
- ▶ Assessing the entire technical and economic potential of hydroelectric energy on a basin basis, taking into account the economic, environmental and social conditions
- ▶ Including the measures to be taken against the effects of climate change on water resources in development plans and programs
- ▶ Establishment of a single institution that will cover surface and ground water resources and be responsible for water allocation and quality in a way that will allow for holistic water resources management.
- ▶ Revision of institutional and sectoral strategy plans (industry, agriculture, energy, tourism, urban, drinking water) of organizations involved in water management in the context of combating climate change
- ▶ In order to use water resources effectively and efficiently, to determine the economic instruments by taking into account the principles of user pays and polluter pays, and socio-economic conditions.
- ▶ Development of hydrological drought studies
- ▶ Conducting research and evaluations for the integration of climate change effects into water resources planning studies
- ▶ Determining hydrological, social, economic and environmental vulnerabilities (including natural disasters) in river basins and sub-basins, developing and implementing adaptation options
- ▶ Creating, developing and disseminating innovative solution options that increase the capacity to adapt to climate change
- ▶ Preparation of Integrated River Basin Management Plans taking into account ecosystem services and the effects of climate change
- ▶ Accelerating erosion and sediment control projects in all basins, especially in dam and pond basins
- ▶ In the location and planning of HEPPs, considering the effects of climate change as well as environmental, economic and socio-cultural effects
- ▶ Adding climate change parameters among location selection and planning criteria

- ▶ Planning of Renewable Energy Resources by Considering the Effects of Climate Change and the Sustainability of Ecosystem Services that Increase Resilience to Climate Change
- ▶ Increasing share of renewable energy in total electricity production to 30% in Turkey until 2023
- ▶ Turkey is required to benefit at the highest level from various energy resources including at first coal, hydroelectric, wind, geothermal and solar energy, in line with energy supply safety and climate change targets.
- ▶ Considering the pressure of climate change on water resources and natural systems; HEPPs should be planned in a way that does not damage the nature and allows the rational use of water resources.
- ▶ Planning hydraulic and geothermal energy resources from the perspective of adaptation to climate change (Climate risk management requires balancing of many factors on the basis of each policy, application and investment. For example; although a hydroelectric power plant project is a renewable energy source, negative impacts may arise in terms of environment, natural life and social aspects in the selection of the plant's location and construction phase.)
- ▶ Increasing the share of hydroelectric energy in total energy generation

It is inevitable that the HEPPs, which constitute an important place in the renewable energy policies of Turkey, take into account the climate risk policies. Accordingly, the full utilization of the technical and economic hydraulic potential in the country will be provided. In the framework of combating climate change, it is envisaged to ensure that hydroelectric power plants operate more efficiently by using cleaner production technologies and the best techniques. In the location and planning of HEPPs, the effects of climate change as well as environmental, economic and socio-cultural effects shall be taken into consideration. Maximum use of HEPPs has been accepted in the Electricity Energy Market and Supply Security Strategy Document. On the other hand, in geothermal energy use, regional heating applications and widespread use of geothermal heat pumps are considered to be important tools in adaptation to climate change.

Sustainable Energy Action Plans have been made by municipalities in recent years. It is planned towards reducing the fossil fuel and electricity amount consumed for municipality services such as heating, lighting, transportation, etc. Emissions from activities other than energy consumption are not covered in these plans and therefore the scope of SEAPs is limited. These plans are preferred by the municipalities to gain experience before preparing a comprehensive climate action plan.

Adaptation action plans are prepared by the municipalities on the basis of historical data and future projections related to climate change. In the city adaptation action plans, the effects of the change on that city and the vulnerabilities/vulnerabilities against these effects (by classifying sectoral and thematic areas) are determined, the risks are defined and various actions to reduce these risks are placed in a time plan. The success of such qualitative adaptation action planning studies may vary depending on the consistency of the selected risk assessment methodology, how well the climate vulnerabilities are evaluated and how actions are prioritized. As a suggestion:

- ▶ Reducing energy and water consumption in new and existing homes and public buildings; incentives for green buildings; resistance to extreme weather events (such as heat and floods)
- ▶ Demand management (residential and commercial); renewable energy production; distributed energy systems; the durability of the infrastructure; Contingency plans for shortage of supplies
- ▶ Public transportation options; cleaner fuels; active/non-motorized transport (pedestrian and bicycle paths); climate-resistant transport infrastructure; traffic congestion pricing and different/other demand management methods for private vehicles
- ▶ Waste reduction, reuse and recycling; from waste to energy; the resistance of landfill facilities to natural disasters
- ▶ Demand management (residential and commercial); water reuse and recycling; the durability of the infrastructure; energy efficient water treatment; contingency plans for shortage of supplies

- ▶ Reducing short-lived climate pollutants that cause air pollution in cities and improving air quality; health action plans related to sudden heat and cold weather waves; prevention of diseases caused by climate change
- ▶ Actions for various sectors (waste, building, transport, etc.), including buildings and basic urban services
- ▶ Disaster-resilient public and private investments in various sectors, other city-level applicable priorities set out in the Sendai Framework for Disaster Risk Reduction (2015-2030)

Within the scope of resilience and Vulnerability, increase in temperature caused by climate change, imbalance in air movements, drought and sudden rainfall make it difficult to meet energy demand in a sustainable way.

Energy production and demand are particularly sensitive to the effects of climate change. The subtropical zone such as Turkey where both heating (winter) and cooling (summer) requirements are relatively high, could be bigger in Mediterranean and middle latitude climate countries.

The amount of water required for electrical power generation may increase or decrease, depending on water use efficiency and future trends in the development of more efficient new power plants.

On the other hand, in high latitude lands (e.g. Northern Europe, Northern Russia, North of North America, Alaska and Canada) strong blizzard, the spatial spread of snow and ice storms, the duration, frequency and intensity of the effect and the existence of permafrost soils affect energy infrastructure, energy transmission lines, natural gas and oil pipelines. In the future, this effect may show significant changes in area and time scales. Hydroelectric production, on the other hand, may be affected by changes in water availability, especially in river basins where snowmelt is effective (important effects are also observed today).

Hydroelectric generation based on large water structures operated to serve multi-purpose purposes (e.g. flood risk reduction, irrigation, urban and industrial water supply, transport, regulation of stream flows, freshwater fishing and water quality, etc.) is particularly open to these changes which are expected to take place in the future. Future changes in water availability and water quality could affect thermal power and industrial production. For example, thermal power plants, industries with high water consumption and uses in production, cooling or washing processes (e.g. food, cement, etc.) or chemical (e.g. cyanide) metallic mining (e.g. gold, silver, iron, nickel) etc.) activities may have to limit or stop their production in some regions characterized by limited water availability due to changes in precipitation regime and increased droughts. In this case, in many parts of the world and in particular in developing countries and in Turkey, as in the case of today, some public institutions and organizations, ecology movements, local administrations, irrigation and agriculture unions or cooperatives and citizens will express their concerns and complaints on potential water uses in the basin or geography areas in question at various levels and magnitudes. The connections between water and energy may be disrupted by the use of water in energy production and the use of energy in water transmission, distribution and waste water treatment.

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# NATIONAL ADAPTATION PLAN

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# 1. NATIONAL ADAPTATION PLAN

National Adaptation Plan is prepared by the central government in line with the adaptation strategies and action plans based on the vulnerabilities and priorities of the country. The plan covers the effects of climate change on the country, climate vulnerabilities of sectoral and thematic fields, risks and emergency requirements (priorities) for mitigating the risks, solution development actions, and the time schedule for implementing the actions. These plans include the mitigation and adaptation measures together and develop practical ways for creating climate resilience against climate risks at all sectors and for providing benefit.

Objectives of the National Adaptation Plan process are (UNDP, 2012):

- ▶ building adaptive capacity
- ▶ building climate resilience
- ▶ reducing vulnerability to the impacts of climate change
- ▶ facilitating the integration of climate change adaptation, coherently, into relevant new and existing policies, programmes, and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate.

The questions that the countries seek answers to in the preparation of National Adaptation Plan (UNDP, 2012):

- How should the National Adaptation Plan process be started in consideration of the adaptation efforts in progress? How can the process develop in time?
- What can be the milestones that would provide benefit for each stage?
- How can the best work flow be ensured in the National Adaptation Plan process?
- Which supports can be obtained?

National Adaptation Plan is prepared by a comprehensive team consisting of planners, implementers, direct and indirect beneficiaries under the leadership of the central government. Among the stakeholders that can take part in the process can be listed as ministries, government bodies and organizations, universities and

research institutes, private companies, media, civil defense organization, emergency search and rescue units, non-government organizations, international protection units, planning offices, statistics entities, international aid institutions, UN offices and the community (Smit and Wandel, 2006).

As the effects of climate change vary according to geographical and ecological structure, physical and economic conditions, there is no general template that can be used everywhere.

Country-specific methodologies are used in the preparation of National Adaptation Plans. A list of indicative activities for each step of the NAP technical guidelines is prepared by UNDP. It consists of four stages: Lay the groundwork and address gaps, preparatory elements, implementation strategies and reporting, monitoring, and review (Table 1) (UNDP, 2012).

**Table 1:** National Adaptation Plan stages

#### Lay the groundwork and address gaps

- ▶ Initiating the National Adaptation Planning process
- ▶ Collecting data related to the effects of climate change on the country, identifying sectors affected by climate change, risk assessment
- ▶ Providing necessary conditions for preparing the National Adaptation Plan
- ▶ Addressing capacity gaps and weaknesses in the National Adaptation Plan preparation process
- ▶ Assessing development requirements

#### Preparatory elements

- ▶ Analyzing current climate and future climate change scenarios
- ▶ Assessing climate vulnerabilities and identifying adaptation options at the sector, subnational, national and other appropriate levels
- ▶ Reviewing and appraising adaptation options (benefit-loss analyses for adaptation options)
- ▶ Compiling and communicating national adaptation plans
- ▶ Integrating climate change adaptation into national and subnational development and sectoral planning

### Implementation strategies

- ▶ Prioritizing climate change adaptation in national planning policies
- ▶ Developing long term climate adaptation implementation strategies
- ▶ Enhancing capacity for planning and implementation of adaptation
- ▶ Integrating climate change adaptation into national and subnational development and sectoral planning, encouraging cooperations

### Reporting, monitoring and review

- ▶ Monitoring the National Adaptation Planning process
- ▶ Reviewing the National Adaptation Planning process to assess progress, effectiveness and gaps
- ▶ Iteratively updating the national adaptation plans
- ▶ Outreach on the NAP process and reporting on progress and effectiveness

*Source: UNDP, 2012*



## 2. LAY THE GROUNDWORK AND ADDRESS GAPS

This stage aims to create a national mandate and strategy for the National Adaptation Planning process that establishes clear responsibilities for government ministries and departments, and specifies key milestones and expected outputs of the National Adaptation Planning process and the frequency of such outputs over time (UNDP, 2012).

Countries are encouraged to give consideration to the establishment of strong coordinating and cooperating mechanisms whose roles and expectations are clear and in which stakeholders are enabled to participate for the adaptation process. Additionally, identification of weaknesses and gaps in “enabling environments” are necessary for the formulation of comprehensive adaptation plans, programmes and policies. It encourages countries to consider institutional arrangements, the adequacy of scientific information and how climate change will impact on specific development goals and activities (UNDP, 2012).

National Adaptation Plans can be prepared based on sectors or regions affected by climate change. Sectors affected by climate change are identified by different approaches depending on the countries. Geographical, ecologic, and socio-economic conditions of the country, as well as its scientific infrastructure have determining effect in identifying these sectors. For this reason, numbers and names of the sectors and thematic areas, in some cases of sub-regions, included in National Adaptation Plans may be different.

European Climate Adaptation Platform (Climate-ADAPT) identifies the sectors related with climate change as agriculture, biodiversity, buildings, coastal areas, disaster risk reduction (protection from natural disasters), energy, financial, forest, health, transportation, marine & fisheries, urban, water resources & water

management and ecosystem-based approaches (EUStrategy, 2013). Besides these, other sectors are identified in the adaptation plans prepared by the countries such as tourism, education, industry, rural settlements, local people, and biochemical cycle. The most commonly used sectors in climate adaptation planning are given in the Table 2.

**Table 2:** Sectors commonly used in climate adaptation planning

	Agriculture		Financial
	Biodiversity		Forestry
	Buildings		Water resources & water management
	Coastal areas		Marine & fisheries
	Disaster risk reduction		Biochemical cycle
	Ecosystem-based approaches		Health
	Energy		Tourism
	Urban		Rural settlements
	Transport & infrastructure		Education
	Local people		

Source: EUStrategy, (2013); Bierbaum, et al. (2014)

In order to have sufficient scientific information and infrastructure on how climate change will affect the development goals and practices of the country, it is recommended to make institutional agreements and partnerships. Infrastructure

will be built for up-to-date data and information flow between related institutions. Solutions will be developed to provide economic resources for the National Adaptation Planning process.

Also, adaptation strategy and action plans will be prepared that define the country's main development and adaptation goals, interactions between policies and programs and the risks and benefits.

The main outputs of this stage are:

- ▶ Strategic plan for National Adaptation Planning process
- ▶ the designation of a multi-stakeholder secretariat or coordinating committee to spearhead the process
- ▶ Deficiency-need and benefit-loss analyses and recommendation to find solutions for them
- ▶ National adaptation communication strategy
- ▶ a programme to communicate and build capacity for the formulation and implementation of the National Adaptation Plan (UNDP, 2012).

By these means, it will be ensured that information, technology and capacity required to start the National Adaptation Planning process are available.

### 3. PREPARATORY ELEMENTS

Effect, vulnerability, risk, and adaptation analyses are performed at the second stage of the National Adaptation Planning process. All stakeholders are made to participate in this analysis process. The steps followed at this stage are as follows:

- ▶ Identifying present climate risks, considering the climate characteristics and extreme weather conditions,
- ▶ Identifying present climate vulnerabilities caused by climate risks,
- ▶ Performing climate risk analyses for identifying the risks that may occur in the future by using climate change models intended for future, and
- ▶ Identifying “climate flaws” by utilizing climate risk analysis and determining the sectors that will develop suitable solutions or areas at various scales.

In case there are previously developed climate models that are still valid, savings can be made from resources by using these models in preparing the National Adaptation Plans.

Analysis results can be integrated into regional, sectoral and local plans and plan strategies. The steps to be followed at this stage and the activities are given in Table 3

**Table 3:** Proposed steps

Steps	Indicative activities
Analysing current climate and future climate change scenarios	<ul style="list-style-type: none"> <li>▶ Analyse the current climate to identify trends in variables and indices that could be used to support planning and decision-making</li> <li>▶ Characterize broad future climate risks and levels of uncertainty using scenario analysis at the national level or as part of a regional analysis including through climate and socioeconomic scenarios</li> <li>▶ Communicate projected climate change information to all stakeholders and the public</li> </ul>

Steps	Indicative activities
Assessing climate vulnerabilities and identifying adaptation options at sector, subnational, national and other appropriate levels	<ul style="list-style-type: none"> <li>▶ Assess vulnerability to climate change at sector, subnational, national or appropriate levels (by applying applicable frameworks)</li> <li>▶ Prioritizing the climate risks and vulnerabilities</li> <li>▶ Identify and categorize adaptation options at multiple scales to address priority vulnerabilities a.</li> </ul>
Reviewing and appraising adaptation options	<ul style="list-style-type: none"> <li>▶ Appraise individual adaptation options, including economic, ecosystem and social costs and benefits, and possibilities for unintended (positive and negative) impacts of adaptation measures</li> </ul>
Compiling the adaptation plans	<ul style="list-style-type: none"> <li>▶ Aggregate sectoral and subnational adaptation priorities into National Adaptation Plans through stakeholder ranking processes and make the drafts available for review</li> <li>▶ Integrate review comments into the national adaptation plans</li> <li>▶ Communicate and disseminate the national adaptation plans widely to all stakeholders in the country</li> </ul>
Integrating climate change adaptation into national and subnational development and sectoral planning	<ul style="list-style-type: none"> <li>▶ Identify opportunities and constraints for integrating climate change into planning</li> <li>▶ Build and enhance capacity for integrating climate change into planning</li> <li>▶ Integrating climate adaptation into existing national and subnational planning process</li> </ul>

Source: UNDP, 2012

The factors that can be used to identify the vulnerabilities include time and intensity of the effect, continuity of the effect and persistence and reversibility, probabilities, distributional aspects, thresholds or trigger points that could exacerbate the change, presence of early warning systems, and adaptation potentials. vulnerability analyses must be performed and reported diligently and be updated when required in time taking into consideration scientific developments and changes in the effects (Rosenzweig et al., 2011).

The main outputs of this stage are climate risk analyses, vulnerability and adaptation assessments, plans at different subnational levels or sectors, an appraisal of adaptation options (such as benefit-loss analyses). As the climate change risks and vulnerabilities of the sectors may change in time these outputs may have validity for certain periods and they need to be updated in time (UNDP, 2012).

## 4. IMPLEMENTATION STRATEGIES

At the stage of determining implementation strategies, it is aimed to prioritize the adaptation actions by taking into consideration the short, medium, and long term goals of the country, planning capacity, climate risks, and vulnerabilities and to develop the capacity of the country to plan and implement adaptation solutions of the country in the long term. In this context, the strategy will be developed for implementing the adaptation actions.

Determining the priorities of the adaptation actions helps decision-makers and related stakeholders select the most important adaptation actions by taking into consideration the development and climate resilience forming goals of the country. This also ensures the development of adaptation solutions which coincides with the vision of the country and its ecologic, social, and economic goals that have high priority at national level.

Capacity development, cooperation between agencies, information sharing and assessment are quite important in this well-attended process. Implementation may be in the form of finding a new adaptation solution or improving an existing action. The National Adaptation Plan implementation strategy developed at this stage defines the steps to be followed for preparing the conditions for implementing the actions identified as priority actions in the adaptation plan (for example, fund supports for implementing the adaptation actions are defined) and developing cooperation in multi-national programs.

Adaptation actions are programmed and implemented as short, medium or long term, depending on the policies, projects and programs in the National Adaptation Plan. Even though adaptation actions may be in different scales and forms depending on the circumstances they are developed within the framework of common purposes. They are;

- ▶ Food security: changing the planting times of agricultural products, using product species resistant to drought and genetic expansion, using efficient irrigation techniques, developing processing and storage techniques for animal products,
- ▶ Security of water resources: efficient use of water, preventing pollution and salinization of water resources, developing rainwater management systems, ecologic improvement of wetlands and water systems, building water structures such as flood levees and reservoirs as climate-resilient,
- ▶ Developing life and resource protection systems against extreme weather events and climate disasters: building coast protection berms, building flood levees, publishing updated coast disaster risk maps, planning constructions at places with low disaster risk, developing early warning systems,
- ▶ Developing and improving structures and functions of the ecosystems: guaranteeing ecosystem services of natural ecosystems, soil, water and air management, basin management, coastal area management,
- ▶ Protecting and improving human health: improving environmental health, taking measures against actions that may constitute a health risk, preventing health problems of climate origin,
- ▶ Making basic components of the national economy climate-resilient: organizing climate change training courses at national level,
- ▶ Protecting cultural values: protection of cultural heritage sites and important species.



## 5. REPORTING, MONITORING, AND REVIEW

Reporting, monitoring, and assessment is the last stage of the National Adaptation Plan preparation process. Information, data, and outputs obtained at all steps will be compiled and reported. Monitoring and assessment process starts with the first stage of the adaptation plans and it is repeated at regular intervals. Selection of proper assessment metrics ensures a healthy assessment of the adaptation process. In the adaptation process, data related with the process is collected and recorded systematically.

Monitoring and assessment of the implementation and actions is quite important for determining at what level planning goals have been achieved. Furthermore, new information can be acquired for climate effects or vulnerabilities in the process. Monitoring and assessment results allow systematic updating of national plans. Also, gained experiences make contribution to the adaptation works to be implemented in the future.

The following steps may be used in the monitoring and assessment process:

### Starting the National Adaptation Planning process

- ▶ Identifying a vision for National Adaptation Plan process, bringing together all public and private sector entities under this roof, designating authority among the related agencies
- ▶ Developing a framework, strategy and road map covering monitoring and assessment program

### Monitoring the National Adaptation Planning process

- ▶ Identifying thematic fields that can measure the performances qualitatively and quantitatively in the adaptation planning process
- ▶ For the areas identified for evaluation, define metrics for documenting

progress, measuring and communicating levels of effectiveness and assessing gaps

- ▶ Collecting information on the metrics in National Adaptation Planning process

### **Assessment of the progress in National Adaptation Planning process and effectiveness of the process**

- ▶ Following the current scientific developments and incorporating them into the process and assessing the effectiveness of the results of implemented adaptation activities
- ▶ Assessment of the activities in the National Adaptation Planning process using the related metrics.

The main output of the process includes a plan for monitoring and evaluation, with a plan for data collection and ongoing compilation and synthesis of new information on impacts and vulnerabilities to be used in updating the National Adaptation Plans (UNDP, 2012). Stages of the National Adaptation Planning process, implemented methods, outputs and information relating to the effectiveness of the process will be shared at national scale regularly. It will be determined whether the planned adaptation goals have been reached or not.

Furthermore, National Adaptation Plans must be open for access at national and international level. Reports will be sent to United Nations Framework Convention on Climate Change-UNFCCC and communication centers of other countries.

In conclusion, the preparation of National Adaptation Plans is one of the conditions for achieving the global adaptation goal. Developing countries need technical and economic support for achieving this goal. For this purpose, NAP Global Network (National Adaptation Plan Global Network) was founded in COP20, which was held in Peru in 2014. This network forms a convenient platform for sharing information and experience among the countries and helps the developing countries receive the short and long-term supports they need for accelerating their adaptation endeavors in the process of preparing and implementing the National Adaptation Plans.

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# 1. INTRODUCTION

According to the Framework Convention on Climate Change, all parties to the convention are obliged to take climate change into account in their decisions and policies. As the negative effects of climate change started to be seen more severe since the 2000s, countries have accelerated the process of preparing adaptation responses, planning, and implementation in order to reduce these negative effects. Including issues related to climate change adaptation in the policy documents of the countries has become a necessity due to international agreements and to a need to reduce the impact (Dellal et al., 2020). Adaptation programs prepared in various types, scales, and scopes help reduce the expected climate change impacts at national, regional, local / community levels, manage risks and reveal opportunities. Adaptation programs also help strengthen the resilience of key stakeholders to expected climate change risks and build the capacities of institutions.

Countries within the scope of adaptation to climate change (UNDP, 2010) may engage in activities in the following issues and contribute to climate risks mitigation and capacity building:

- ▶ Analyzing possible biophysical and socio-economic impacts of long-term climate change risks,
- ▶ Preparing development strategies and plans that include consideration of climate change risks and opportunities,
- ▶ Reviewing / designing national and regional policies to take into account climate change risks and opportunities,
- ▶ Developing partnerships, tools, and practices to incorporate climate resilience into investment decision-making processes,
- ▶ Testing and demonstrating different methods to manage climate risks.

In policy studies, the issue of adaptation to climate change and adaptation policies is a new concept that emerged with the onset of the effects of climate change. However,

since climate change is a development problem, it is directly related to development policies. For this reason, there is a link between climate change adaptation policies and development policies. Development-oriented studies also provide benefits in the management of climate change risks. For example, what a country does within the framework of its development policy including the following will mitigate sensitivity/ fragility against climate change:

- ▶ Poverty reduction
- ▶ Improving nutrition
- ▶ Increasing the level of education,
- ▶ Infrastructure development
- ▶ Improving health.

On the other hand, all policies in a country should include and integrate climate change adaptation policies. This requires an approach that incorporates adaptation into both policy and investment, planning, and decision-making processes. This section will explain how to integrate climate change adaptation policies with other policies.



## 2. DEVELOPMENT PLANNING

Events such as the increase in the number and intensity of extreme events such as climate change and temperature increase, changes in precipitation, rise in sea level, drought, floods will increase the effects that may cause food shortages, infrastructure damage, deterioration of natural resources and loss of income. This can also make it difficult for countries to reach their development goals. Therefore, climate change is not only an environmental problem but also an event affecting the economic and social dimensions of sustainable development (OECD, 2009).

Since climate change is a development problem, adaptation policies are closely related to development policies and development planning. A country should develop economically, socially, and environmentally sustainable (Figure 1). Development moves that do not take any of these into consideration are incomplete. Sustainable development of the country should be the primary objective of climate change adaptation policies. National investments must be made resistant to the climate and for this, country priorities must be known, defined, and addressed.

**Figure 1:** Sustainable development



The goals, priorities, objectives, tools, and budget of a country's development policy can be found in the country's published policy documents. These include:

- ▶ Laws
- ▶ Development plans
- ▶ Short, Medium, Long term programs
- ▶ Strategy documents and action plans (Sector and subject-specific, national, regional, local level)
- ▶ Budget programs (national, sectoral, regional, local, etc.) Risks arising from climate change and adaptation policies should also be included in these documents.

Climate change adaptation policies should be integrated with new and existing development planning processes, with all relevant sectors (Horizontal) and all levels (Vertical) (UNFCCC, 2011).

On the other hand, climate change, adaptation, and mitigation issues are not only an environmental problem, and the country's adaptation programs that meet only the most urgent adaptation needs of the region and that are individual and are independent of other sectors and levels are not a solution to reduce the effects of climate change. It is necessary to address vulnerabilities in different sectors systematically and in the long term, and to identify problems between sectors. For this reason, vertical integration at all sectors and levels is important to achieve the goal expected from adaptation policies.

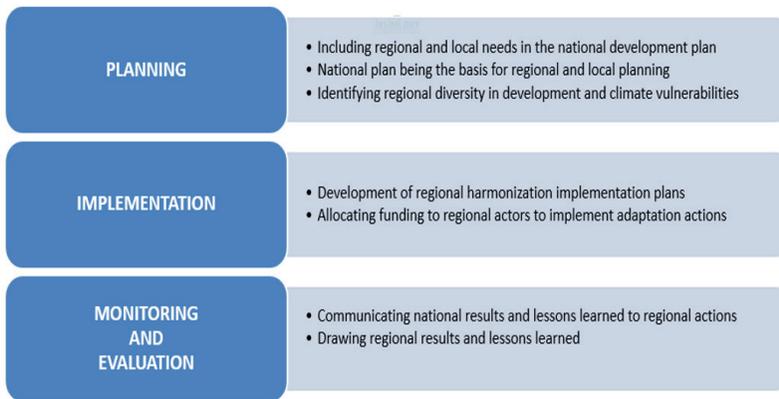
## 3. VERTICAL INTEGRATION

With vertical integration, the aim is to have a system that covers all sectors of the country and integrates with development plans and with all levels national to local. Vertical integration is the process of creating purposeful and strategic links between 1) Planning, 2) Implementation and 3) Monitoring and evaluation (M&E) at national, regional, local levels. Coordination of all relevant institutions is required for this. On the other hand, while creating climate change adaptation policies, it is important to include areas and groups exposed to climate change. Providing entry points for vulnerable groups and communities to participate in the process, reflecting local needs are important elements in successful policymaking. At the national level, it is important to consider climate risks and reflect country priorities when deciding on any policy change (Daze et al., 2016).

Also within UNFCCC Cancun Cohesion Framework: Basic principles are defined as:

1) Participation in decisions, 2) Transparency; enabling the sharing of information at different levels; and 3) addressing vulnerable/vulnerable groups, including gender issues; regional/local diversity (UNFCCC, 2011). For this reason, while ensuring vertical integration, it is necessary to ensure the participation of relevant sectors in this process, taking into account transparency and diversity criteria, in addition to the institutions responsible for policy formulation, implementation, and monitoring. Vertical integration in the policy-making process is related to national and regional planning in a country. Vertical integration requires the participation and contribution of various actors (such as the Central government, Local actors (NGOs), Local communities, Other vulnerable groups) in national adaptation planning and implementation. Vertical integration includes institutional arrangements, knowledge sharing, and capacity building (NAP, 2016).

**Figure 2:** Vertical Integration



*Resource: Dazé, et al., 2016*

The first step of the process of creating adaptation policies is to analyze climate sensitivities/vulnerabilities. It is necessary to know what the effect of climate change on the development of the country is and how it will affect development goals. The second step is to determine how the issue of adaptation to climate change can be included in the current policies, plans, and budgets in the country, and where and what are the entry points to these. Establishing or developing mechanisms for dialogue, coordination, and information sharing between national, regional, and local actors will help ensure continuous and broad-based participation, in addition to identifying the entry points. The third step is to change existing policies, plans, budgets according to adaptation activities. The last step is in practice. At this stage, it is the definition of who will be responsible, what resources and capacity will be required. Determining which functions are best undertaken by actors at different levels, including non-governmental organizations and actors such as the private sector, can help identify roles and responsibilities in adaptation planning, implementation, and M&E (Figure 3).

It is important to ensure flexibility of institutional arrangements and facilitate changes in policy and governance context for the implementation process of adaptation policies.

**Figure 3:** Vertical Integration Steps**Analyzing climate sensitivities/vulnerabilities**

- How are development goals affected by climate change?

**Defining entry points**

- Which policies, plans, budgets can be transformed to reduce fragility?
- In all sectors and at all levels

**Changing policies, plans, budget**

- What adaptation options are relevant to reduce sensitivity/fragility?

**Implementation**

- What resources and capacities are required?
- Who is responsible?

*Resource: NAP, 2016*

Countries that have become a party to international agreements on climate change should also take into account climate change while creating any policy, plan, and budget. Therefore, entry points can be at the stage of national and regional plans, programs, budget formulation, and during the preparation of sectoral plans and while preparing sectoral annual budgets (Figure 4).

**Figure 4:** Climate change adaptation entry points within the plan and budget

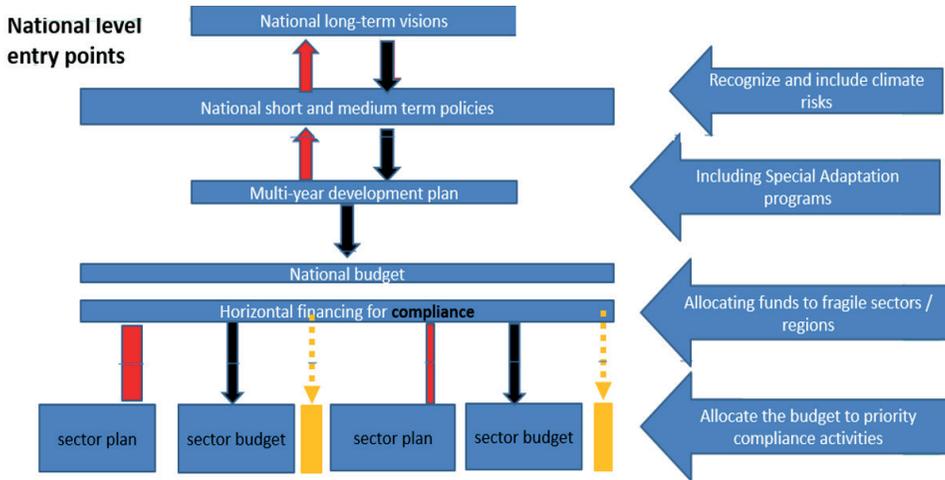


Resource: Dazé et al., 2016

The entry points to policies at the national level are to recognize the climate risks within the national long, medium, and short-term vision of the country, to include climate change adaptation issues, to include special adaptation programs in multi-year development plans, to allocate funds to fragile sectors in the national budget, and allocating the budget to adaptation activities in sectoral plans and budgets (Figure 5).



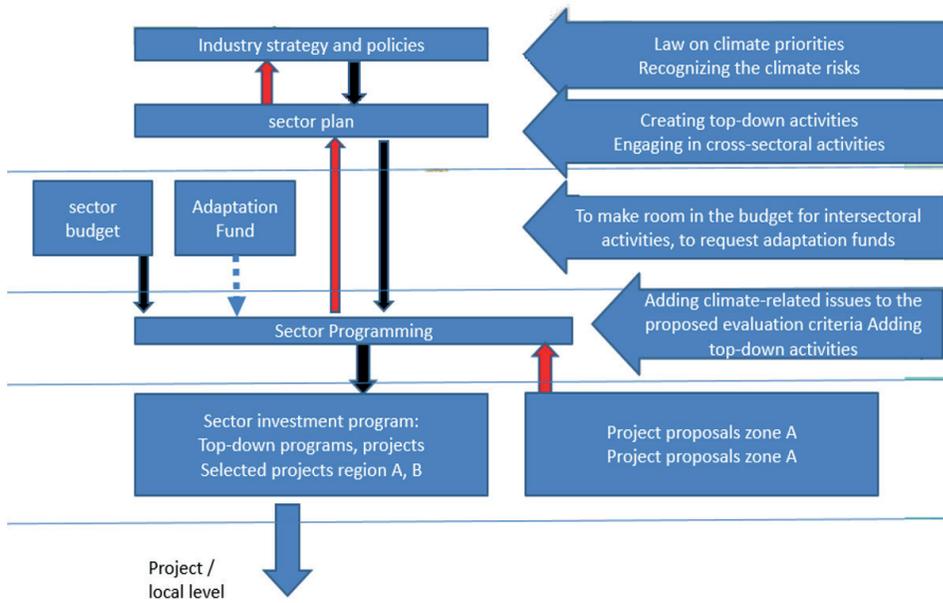
**Figure 5:** National level entry points



Resource: Dazé et al., 2016

At the sectoral level, the first entry point is to recognize climate risks and include adaptation issues in the main policy documents related to the sector. Afterward, while creating the plan, program, and budget of the sector, it is necessary to create activities on adaptation, to make room for them in the budget, and to demand adaptation funds. In the next phases of this process, it is necessary to add climate-related issues to the sector programs, program evaluation criteria, and to add activities from top to bottom. In the investment program of the sector, it is possible to receive project proposals according to the regions, to make a selection among them, and to budget accordingly (Figure 6).

**Figure 6:** National level entry points



Resource: Dazé et al., 2016

## 4. CONCLUSION

Integration of climate change adaptation policies into national/regional / local / sectoral policies is an obligation for all countries that are parties to the Framework Convention on Climate Change. With the emergence of the expected effects of climate change earlier, and having already experienced many negative impacts originating from the climate, rapid implementation of adaptation activities has become a necessity. The most important issues in reducing and preventing the negative impacts that may arise due to climate change are recognizing the risks of climate change in the policy-making processes of countries, evaluating their effects, determining adaptation activities, ensuring vertical integration, and determining the entry points and allocating a place and budget for adaptation activities.

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# PRIORITAZION OF ADAPTATION RESPONSES

*Prof. Dr. İlkay Dellal*



# 1. INTRODUCTION

There can be many adaptation responses that are currently used to mitigate the negative impacts of climate change. For example, in the agricultural sector, the most important negative effect of climate change is the decrease in the yield and production of crops in terms of both quantity and quality (Dellal and McCarl 2010, Dellal et al., 2011, Dellal 2012). In order to reduce these negative effects and other effects caused by production reduction, many adaptation responses can be listed, such as using more temperature-resistant varieties, changing technology, increasing access to financing resources, improving farmers' access to the market, strengthening institutional capacity (Dellal et al., 2019). These adaptation responses may differ between sectors, sub-sectors, and regions.

Implementing all of the adaptation responses determined for each sector and for all sectors is not possible due to cost, time, capacity, other objectives of the country, region, sector, etc. the mitigation potentials and implementation processes of each of the adaptation responses are different from each other. On the other hand, a sector's adaptation response can also provide benefits, synergies, or challenges for other sectors.

For this reason, it is necessary to make a selection among the determined adaptation responses. In the selection of which adaptation responses can be applied at national, regional, local, levels, prioritizing according to a specific method is the most important factor for obtaining and increasing the expected benefit. Prioritizing them in accordance with the goals and objectives while making choices will not only minimize the negative effects of climate change, but also allow more rational use of limited resources.

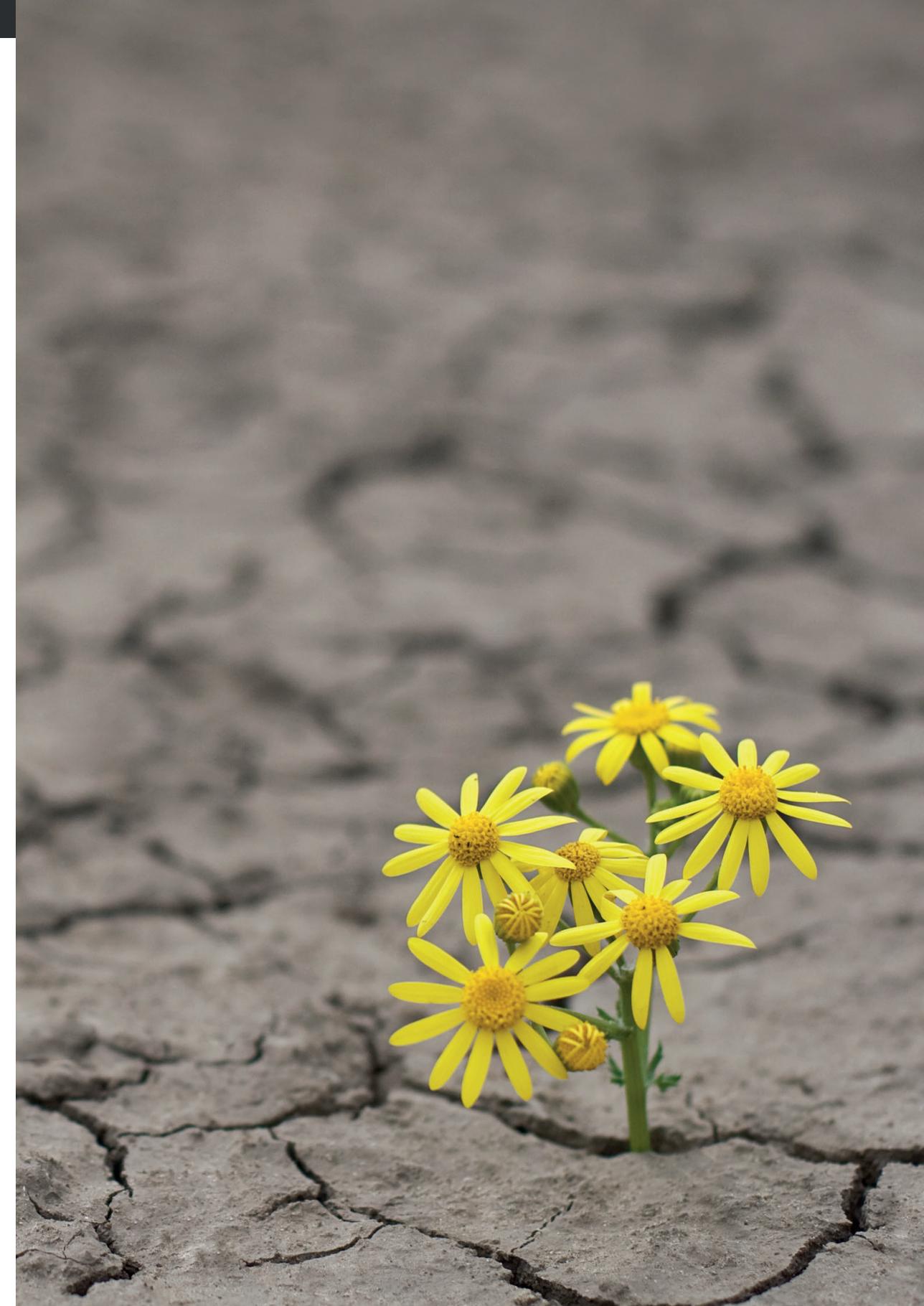
In this section, the methods that can be used in prioritizing responses will be explained in general framework and will be explained practically through examples.

## 2. WHAT IS PRIORITIZATION?

Prioritization is the process of paying attention to specific compliance responses based on agreed indicators or criteria. Prioritizing adaptation responses generally takes into account the predicted geographic distribution of climate change impacts and the different vulnerabilities to impacts among the country's population (GCF 2016).

Its main purpose is to evaluate compliance responses within a certain system and to rank them according to their importance in line with national financing criteria and investment framework.

For this reason, it is necessary to know the objectives, targets, and basic indicators as t level the prioritization of adaptation responses (sector, region, country, etc.) will be made. For example, if the adaptation responses of the agricultural sector are to be prioritized at the national level, the current and future targets of the sector can be listed within the framework of the policy documents (relevant laws, development plans, strategy documents, action plans, etc.). The frame of its current capacity can be drawn by obtaining data from relevant institutions. Without knowing these basic indicators and the objectives of the sector, selecting and prioritizing adaptation responses may cause wrong results for the sector and the country, even if the adaptation response is very successful on its own.



## 3. WHAT ARE PRIORITIZATION TOOLS?

Many tools can be used to prioritize adaptation responses. These tools may be some of the methods commonly used in scientific studies or tools developed by some institutions within the scope of study subjects. There are many tools in practice, ranging from simple techniques to very detailed techniques. Prioritization of adaptation responses can be made within the scope of needs, constraints, goals, objectives, time, cost, capacity in the country, region, or local unit.

Some tools that can be used for prioritization in general are as follows (GCF, 2016):

- ▶ SWOT Analysis
- ▶ Cost / Benefit analysis
- ▶ Multiple Voting Technique - Multiple Criteria Analysis
- ▶ PEST Analysis
- ▶ MCA4climate prioritization tool developed by UNEP
- ▶ OECD-DAC criteria developed by the OECD to evaluate development projects
- ▶ Criteria Based Matrix (KDM / CBM)

### 3.1. SWOT Analysis

SWOT (Strengths and Weaknesses, Opportunities and Threats - SWOT) analysis is a widely used method to evaluate the strengths, weaknesses, opportunities and threats involved in a project. SWOT analysis includes determining the purpose of the project and determining internal and external factors that affect the project goals.

**Table 1:** SWOT Analysis

STRENGTHS	WEAKNESSES
.....	.....
.....	.....
OPPORTUNITIES	THREATS
.....	.....
.....	.....

SWOT analysis is carried out in group work or in the form of taking the opinions of people and institutions related to the subject in other ways. Strategic goals and objectives are determined within the framework of strengths, weaknesses, opportunities, and threats by contacting the stakeholders through meetings attended by the relevant stakeholders or via e-mail, phone calls, etc. The best adaptation responses to achieve the determined goals and objectives are selected.

### 3.2. Cost/Benefit analysis

Cost/Benefit Analysis (CBA) is done by costing compliance responses and calculating benefits. Adaptation responses with the highest benefit/cost ratio are selected. It is used to prioritize compliance responses when the only decision-making criterion is efficiency (UNFCCC, 2011).

Comparing expected costs and benefits can help inform decision-makers about the potential effectiveness of an adaptation investment. However, it is difficult to use for many adaptation responses, because it is necessary to find numerical values of benefits and costs. On the other hand, not all activities have a monetary value: For example, costs and benefits associated with issues such as environmental goods and services, and social or cultural values. This may lead to the exclusion of some costs and benefits and, consequently, to misleading the results of the analysis. Moreover, benefit/cost analysis alone may not be sufficient to prioritize and implement compliance responses (UNFCCC, 2011).

### 3.3. Multiple Voting Technique - Multiple Criteria Analysis

The Multiple Vote Technique is a method of voting with a team to select the most important or popular items from a list. The Multiple Voting Technique is used to narrow the high priority options of the compliance responses list (GCF, 2016).

Multiple Criteria Analysis (MCA) allows the evaluation of different compliance responses according to various criteria with the multiple voting technique. Each criterion is given a weight. Using this weighting, an overall score is obtained for each adaptation response. The highest scored adaptation response can be selected. The MCA offers an alternative to prioritization when only partial data are available, when cultural and ecological considerations are difficult to measure, and if only monetary benefits or efficiency out of many criteria are to be assessed. The MCA basically integrates different decision criteria into a quantitative analysis without assigning monetary values to all factors (UNFCCC, 2011).

**Table 2:** Multiple Criteria Analysis (MCA)

To what extent is it compatible with priority areas approved by the competent authority?	To what extent can it be applied in 5 years according to the existing people, technology, institution, law, administration?	To what extent is it transformative? Potential for replication / enhancement, knowledge, and contribution to learning and / or activation environment	Score/Degree
3: Largely	3. It is quite applicable. (Made using available resources)	3:High	
2: Moderate	2: Applicable at moderate level (Limited resources should be provided from outside)	2:Medium	
1: Limited extent	1: Applicable at a limited level (To be outsources to a high degree)	1.Low	
0: Not appropriate at all	0: Not applicable	0: None	

Resources: NAP, 2016

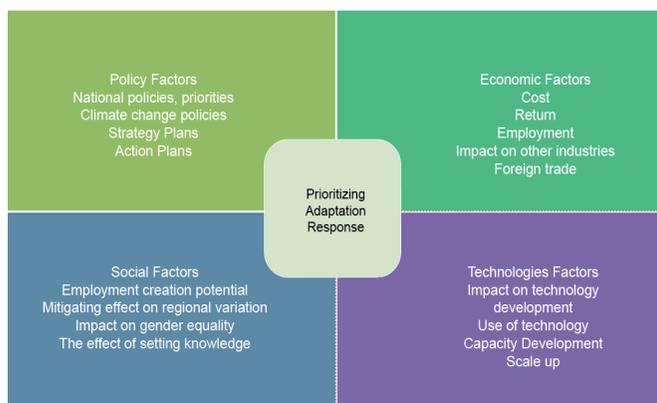
### Possible criteria for Multiple Criteria Analysis (IPCC, 2015):

- ▶ Efficiency in reducing sensitivity / fragility and increasing flexibility
- ▶ Efficiency (increasing benefits and lowering costs)
- ▶ Equality
- ▶ Integration with social goals and activities
- ▶ Consistency with social norms and traditions
- ▶ Legitimacy and social acceptability
- ▶ Sustainability (environmental, corporate)
- ▶ Flexibility (can respond to feedback and learning)
- ▶ Avoiding incompatibility
- ▶ Resilience against a wide variety of climate and social scenarios
- ▶ Resource availability (eg. Information, finance, leadership, management cover)
- ▶ Transformative
- ▶ Consistency and synergy with other targets (e.g. mitigation)

## 3.4. PEST (Political, Economic, Social and Technological) Analysis

PEST (Policy, Economic, Social and Technological) Analysis is an analysis in which adaptation responses are examined in terms of policy, economic, social and technological factors, and the important and feasible ones in terms of these factors are determined (GCF 2016).

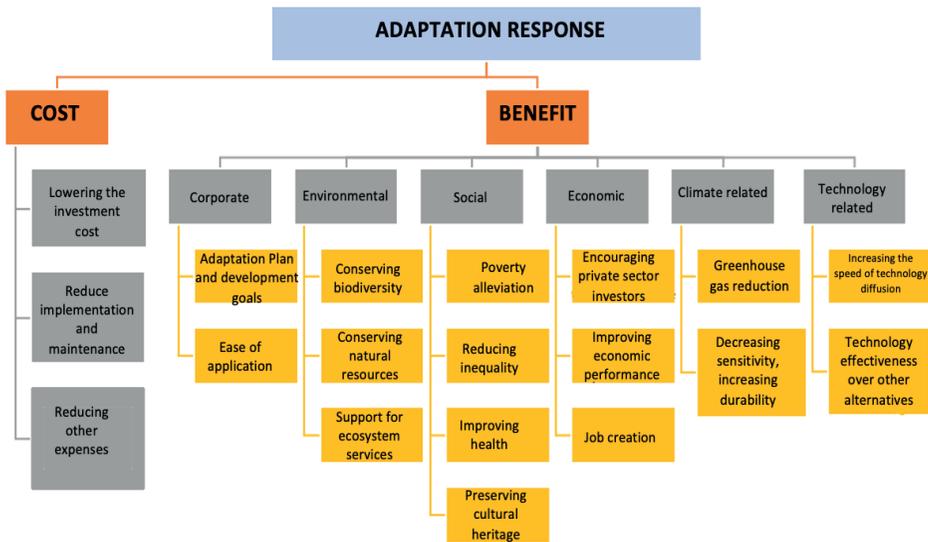
**Figure 1:** PEST (Political, Economic, Social and Technological) Analysis



### 3.5. MCA4climate Prioritization Tool

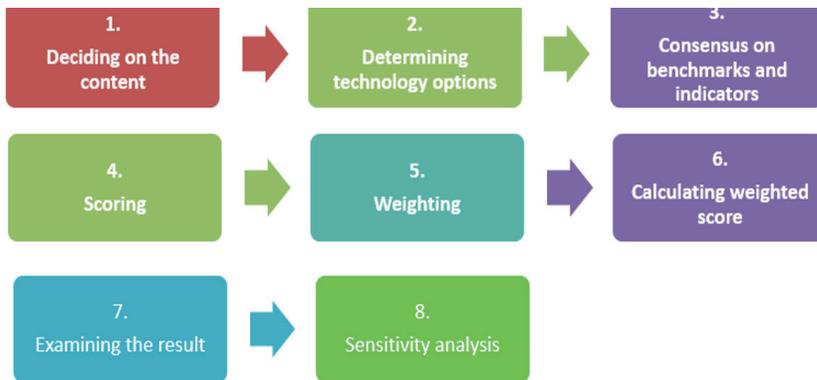
The MCA4climate (Multiple Criteria Analysis for Climate) project prioritization tool was developed by UNEP to help prioritize climate change mitigation and adaptation programs and projects. MCA4climate allows to evaluate different compliance responses on a number of criteria (UNEP, 2011).

**Figure 2:** MCA4climate project prioritization Tool



Resource: UNEP, 2011

Steps are followed in the order below to make the assessment (UNEP, 2011).

**Figure 3:** MCA4climate project prioritization tool steps

Resource: UNEP, 2011

### 3.6. OECD-DAC criteria

It is a method developed by the Organization for Economic Cooperation and Development (OECD) for the evaluation of issues of policy, intervention, investment etc.

It was developed by the OECD for the evaluation and selection of development projects (OECD 2020).

- ▶ Relevance
- ▶ Efficiency
- ▶ Effectiveness
- ▶ Sustainability
- ▶ Cost

The foregoing five criteria are used.

## 3.7. Criteria Based Matrix (CBM)

The Criteria Based Matrix (CBM) is used to determine which projects will deliver successful improvements based on key factors or criteria. It helps to rank various projects in order of importance by scoring and prioritizing according to the criteria decided (GCF, 2016).

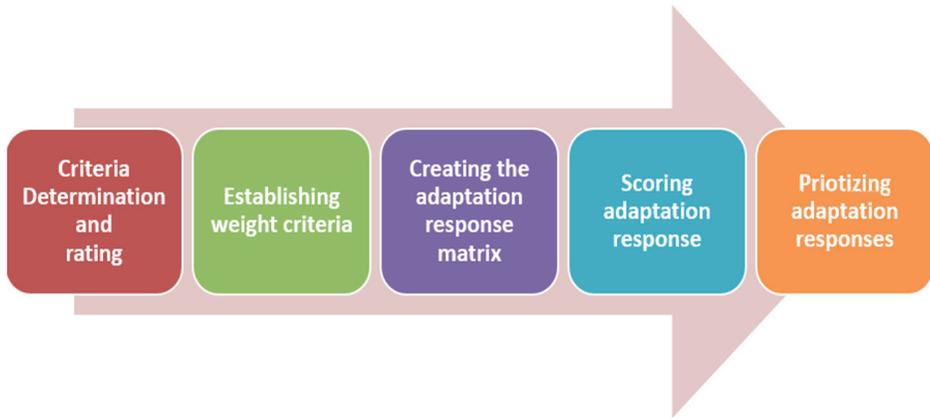
In the criteria-based matrix method, especially complex projects that include more than one criterion to determine importance can be evaluated. It is a very consistent method of evaluating the project. It helps to reduce prejudices and individual perceptions in project selection. It provides ease of sorting all projects, qualitative evaluations can be converted into numerical values. It can be adapted to prioritize different types of projects. It can provide more detailed analysis of vital factors. When used by many experts, it facilitates easy consensus-building (GCF, 2016).

On the other hand, the effectiveness of the criteria-based matrix depends on the expertise of the staff involved in the evaluation of the project. It reduces project evaluation to quantitative evaluations, but some aspects of project evaluations require qualitative evaluation (GCF, 2016).

### **Steps of Criteria Based Matrix (CBM) Prioritization**

The steps in prioritization according to the Criteria Based Matrix (CBM) method are as follows (GCF, 2016): 1. Determining and Evaluating Criteria, 2. Weighting, 3. Creating a matrix of adaptation responses, 4. Scoring the adaptation responses, 5. Prioritizing the adaptation answers, 6. Making the decision.

## Şekil 4: Steps of CBM Prioritization



Resource: GCF, 2016

### a. Criteria Determination and Evaluation

The first step is to identify key factors or criteria that will be used to evaluate the importance of each adaptation option. The factors should help to clearly distinguish the important adaptation responses from the unimportant ones.

Examples of criteria:

- ▶ Potential for Pervasive Impact
- ▶ Country needs
- ▶ Sustainable development potential
- ▶ Efficiency
- ▶ Effectiveness
- ▶ Local and national
- ▶ Gender equality.



**Table 3:** Determining CBM Criteria

No	Sample Criteria	Definition	Rating
1	Sustainable development potential	It is status in term of environmental, economic and social sustainability, side benefits, width of impact area, etc.	0: Not applicable 1: Very low 2: Low 3:Medium 4: High 5: Very High
2	Local and national	Is it a technology produced by the country itself or does it require external dependency?	0: Not applicable 1: Very low 2: Low 3:Medium 4: High 5: Very High
3	Compliance with country needs	The suitability of the country, region, or target audience in terms of sensitivity and cost	0: Not applicable 1: Very low 2: Low 3:Medium 4: High 5: Very High

## b. Weighting

The second step is to give weight to the determined criteria. Because not all criteria are equal in importance. Weights are determined in the form of a table according to the importance of the criteria.

**Table 4:** CBM weighting

Criterion	Recommended weight
Sustainable development potential	3
Local and national	5
Compliance with country needs	4

### c. Creating the adaptation responses matrix

After the criteria are determined and their weights are given, a matrix of adaptation responses is created. The matrix shows which option got the most points.

**Table 5:** Adaptation responses matrix for CBM Prioritization

Criterion	Adaptation Responses				
		1 <sup>st</sup> Response	2 <sup>nd</sup> Response	3 <sup>rd</sup> Response	3 <sup>th</sup> Response
Sustainable development potential	Degree				
	Weight				
	Score				
Local and national	Degree				
	Weight				
	Score				
Compliance with country needs	Degree				
	Weight				
	Score				
TOTAL POINTS					

### d. Scoring Adaptation Responses

After the matrix is prepared, each adaptation response is scored. The weighted value and total score are calculated for each adaptation response:

- ▶ Weighted value = Score x weight
- ▶ Adaptation response total score =  $\Sigma$  (Score x weight)

**Table 6:** Scoring CBM Adaptation Responses

Criterion	Adaptation responses				
		1 <sup>st</sup> Response	2 <sup>nd</sup> Response	3 <sup>rd</sup> Response	3 <sup>th</sup> Response
Sustainable development potential	Degree	5	3	2	4
	Weight	3	3	3	3
	Score				
Local and national	Degree	3	4	5	4
	Weight	5	5	5	5
	Score				
Compliance with country needs	Degree	2	5	3	4
	Weight	4	4	4	4
	Score				
TOTAL POINTS					

### e. Prioritizing adaptation responses

The scores given to the adaptation answers are multiplied by the weights and the total score for each is calculated first according to the criteria.

**Table 7:** Prioritization of CBM Adaptation Responses

Criterion	Adaptation responses				
		1 <sup>st</sup> Response	2 <sup>nd</sup> Response	3 <sup>rd</sup> Response	3 <sup>th</sup> Response
Sustainable development potential	Degree	5	3	2	3
	Weight	3	3	3	3
	Score	15	9	6	9
Local and national	Degree	3	4	5	3
	Weight	5	5	5	5
	Score	15	20	25	15
Compliance with country needs	Degree	2	5	3	4
	Weight	4	4	4	4
	Score	8	20	12	16
TOTAL POINTS		38	49	43	40

## **f. Decision Making**

The last stage of the matrix evaluation based on the criteria is to decide which responses to apply. The answers with the highest scores as a result of the evaluation are the top priority answers for adaptation to climate change and implementation decision can be made. However, it should not be forgotten that all the methods used in prioritization are tools. The formed team makes an evaluation based on the developed criteria. Changes in country, region, sectoral policies, current developments, etc. may cause changes in the chosen adaptation responses.

## **4. CONCLUSION**

The instrument to be selected in prioritizing the adaptation responses to climate change is decided by considering national, regional, local conditions, limitations, goals, targets, capacities, availability of data, etc. Identifying problems, goals, decision criteria, risks, defining and evaluating options, analyzing and ultimately making decisions, implementing and monitoring the decision is the way to prioritize and implement adaptation responses. All of the methods used are a tool and changes in policies and objectives, current developments, etc. issues may cause changes in the selected adaptation responses.

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# DISASTER MANAGEMENT POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

*Prof. Dr. Aslı Akay*



# 1. INTRODUCTION

Disaster risk and climate change are considered today as two threats towards the wealth of the societies that strengthen each other in a negative direction. Disaster risk is mitigated with the government's measures, or, on the contrary, increases with a lack of measures. While the negative impacts of climate change on society increase, disaster risks also increase parallel to this. Disasters erode environmental and social resilience and thus increase vulnerability to climate (O'Brien et al., 2008).

It has been demonstrated by a report prepared by the United Nations Office for Disaster Risk Reduction (UNDRR) and Belgium centred Disaster Epidemiology Research Center that major scale disasters recorded in the last twenty years occurred as a result of weather-related events. It is stated that as a result of 6,457 floods, storms, drought, hot weather, and other weather events recorded within the scope of the study, 606 thousand people lost their lives and 4,1 billion people were injured, left homeless, or became in need of assistance. The five countries most affected by these disasters are the USA, China, India, Philippines, and Indonesia (MGM, 2018). Besides, it is stated in the reports prepared by the United Nations Development Program that in the last decade, there has been little progress in the world, including the poorest countries in access to services such as poverty reduction, disease control, health, and education. The proportion of workers earning less than \$ 1.90 a day fell from 26% in 2000 to 9% in 2017. (UNDP, 2019). For example, the mortality rate for children under five has declined globally by more than half, and maternal mortality rates in sub-Saharan Africa have fallen by more than 35% since 2000. Primary education enrollment rates in sub-Saharan Africa increased by 20 percentage points between 2000 and 2015 (UNDESA, 2015). However, these acquisitions are unfortunately fragile. Current sources of risk, inequality, conflict, gender inequality, unequal growth, and environmental degradation continue. Disasters, crises, and natural hazards still have widespread negative effects. These negative impacts are not only triggering the danger or threat event but are also determined by the social, political, economic, and environmental conditions and trends caused by unequal,

non-resilient, and unsustainable development within countries globally. While no development can be completely risk-free, socioeconomic development choices and policies can increase the risk and exposure of natural and human systems when threats arise. Instead of enhancing resilience, socioeconomic development choices and policies can reduce people's ability to take advantage of the opportunities that arise as societies, technologies, economies, and the environment change. Most importantly, by causing new threats such as climate change, in other words, new risks arise in development' (UNISDR, 2015).

Today, although there is no obvious increase in the occurrence number of geological or geophysical disasters, it has been observed that the incidence of meteorological, climatic, and hydrological disasters has increased significantly with the effect of climate change. In particular, 2017 was the third-highest year regarding the number of natural disasters occurring worldwide in the 1980-2017 period. (MGM, 2018). SIGMA, the disaster analysis arm of Swiss Re, one of the largest global reinsurance companies (insuring the insurance industry), reported that airborne disaster incidents started to increase in 2010 at a much faster rate than in previous periods in the following countries (Chart 1) (Pollner et al., 2010).

Table 1. Disasters Arising From Climate Change By Countries (Pollner et al., 2010)

**Chart 1:** Disasters Arising From Climate Change By Countries

COUNTRY	HAZARD
Hungary	Wind Storms, Floods
Estonia	Cold Wave
Latvia	Snow, Extreme Cold, Lack of Energy Source
Lithuania	Avalanche, Extreme Cold, Lack of Energy Source
Moldova	Snow, Extreme Cold, Lack of Energy Source
Poland	Cold Wave, Floods
Russia	Cold Wave
Romania	Cold Wave, Floods
Bulgaria	Cold Wave, Floods

COUNTRY	HAZARD
Czech Republic	Cold Wave, Floods
Turkey	Cold Wave, Floods
Slovakia	Floods
Montenegro	Floods
Croatia	Floods

*Resources: Pollner et al., 2010*

The climate has already been changing in Europe and Central Asia. Increased temperatures have been recorded in many sub-regions, particularly in the Baltics, Central Asia, the Caucasus, and Russia's northern and eastern parts. Comparing the average value for the annual temperature between 1901 and 2002, warming ranged from 0.5 ° C (South-East Europe) to 1.6 ° C (South Siberia). Over the past two decades, there has been an increase in drought conditions in most European countries, even in regions where average annual rainfall has increased. The expected increase in annual average temperature in Europe ranges from 1.6 ° C to 2.6 ° C by the middle of this century (Pollner et al., 2010).

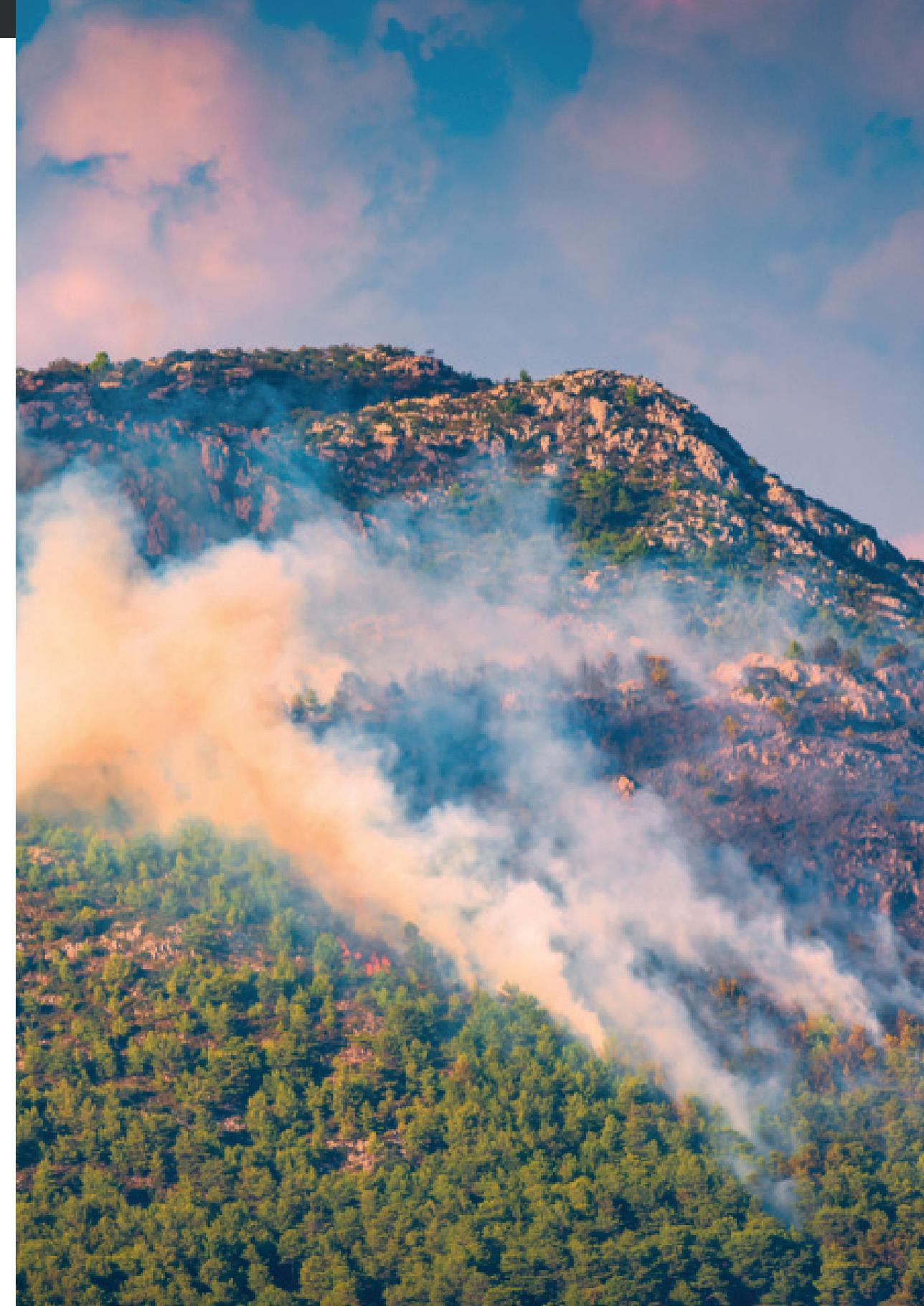
Today, this situation appears as an increase in disasters caused by climate change, with the determinations made by the United Nations and the World Meteorology Organization and by reinsurance companies. Between 1997 and 2017, 88 million people were affected by multiple disaster factors and 76 million people were affected by floods. In the last ten years, 24 million people had to migrate from their countries due to these disasters (UNDRR, 2019a).

In the Sendai Framework Strategy for Disaster Risk Reduction, it is stated that more than seven hundred thousand people died, more than 1.4 million were injured, and approximately 23 million people were left homeless, and a total of 1.5 billion people were damaged by disasters between 2005 and 2015, the previous Hyogo Action Period. Especially women, children and disadvantaged groups suffered more in these societies. The total economic loss was more than \$ 1.3 trillion. Moreover,

between 2008 and 2012 alone, 144 million people had to migrate from their places of residence due to disasters. Disasters, many of which are exacerbated by climate change and increasing in frequency and intensity, significantly hamper the progress towards sustainable development. Evidence suggests that in all countries, people and assets exposed to danger are increasing faster than the decrease of vulnerability, thus creating new risks and steadily increasing disaster losses, especially at the local level, in the short, medium and long term, showing the reveal of significant economic, social, health, cultural and environmental impacts<sup>1</sup> (UNISDR, 2009).

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<sup>1</sup> Vulnerability is defined in the Hyogo Framework Action Plan as "conditions determined by physical, social, economic and environmental factors or processes and that increase the sensitivity of a community to the effects of hazards".



## 2. DISASTER MANAGEMENT AND RELATED CONCEPTS

Having increasing experience of both disaster risk reduction and adaptation to climate change has led to the increasing acceptance of these two areas and to share two common goals to reduce the vulnerability of societies and to contribute to sustainable development (UNISDR, UNDP, 2012).

The definition of disaster is given as follows in the Glossary of Disaster Terms prepared by AFAD (2014): “Nature, technology or human-induced event that causes physical, economic and social losses for the whole or certain segments of the society, stops or interrupts normal life and human activities, where the affected society's capacity to cope is not sufficient” In the same Glossary, the disaster risk is defined as follows: “the possibility of losses to people, human settlements and the natural environment in proportion to their damage or vulnerability if a particular hazard occurs within a certain period in the future” (AFAD, 2014).

Disaster risk reduction is the analysis and management of the causal factors of disaster risks and the reduction and improvement of risks. Disaster risk reduction reduces exposure to hazards, people's vulnerability, improves preparedness for adverse events, and improves the management of residential areas and their surroundings (UNISDR, 2009).

Resilience is defined in UN documents as follows: “The ability of a system, community or society exposed to dangers to resist, adapt and overcome the effects of a threat in a timely and effective manner, including protecting and repairing its basic structures and functions” (UNISDR, 2009).

Definitions of mitigation are different in the context of disaster risk reduction and

climate change. The Intergovernmental Panel on Climate Change (IPCC) uses the concept of mitigation as a reduction and defines it as “a human measure to reduce resources or improve greenhouse gas sinks”. Climate change mitigation measures include energy conservation, implementation of the land use plan, strengthening institutional and legal mechanisms, energy efficiency measures, waste management, fossil fuel substitution with renewable energy sources, other measures in the transportation and agriculture sectors, and the creation of carbon sinks through reforestation (REC, 2015; Pollner et al., 2010).

The concept of mitigation, defined by the United Nations Strategy for Disaster Risk Reduction, means "structural and non-structural measures taken to limit the negative effects of natural disasters, environmental degradation, and technological hazards". Examples of these include seismic strengthening, construction of flood protection dams, and afforestation studies to reduce the risk of landslides. In the context of climate change, these are called "adaptation" activities. These activities represent an aspect of adaptation, as an adaptation to climate change involves broader and more comprehensive measures. For climate change professionals, adaptation refers to adaptation in natural or human systems in response to actual or expected climate stimuli or their mitigating effects (Pollner et al., 2010).

Climate change in Glossary of Disaster has been defined as "the statistical changes in the climate both in general average and as of periods of 30 years or more". Climate change changes depending on the effects of the natural process of the earth or external forces or the permanent changes in the atmosphere caused by man; adaptation to climate change is "taking necessary measures to prevent the harmful effects of climate change and determining appropriate domestic and foreign policies by reviewing country conditions in this regard". In other words, it is also defined as "the adaptation of natural or human systems to the current or expected climatic warning or their effects" (AFAD, 2014).

### 3. RELATIONSHIP BETWEEN DISASTER RISK MANAGEMENT AND ADAPTATION TO CLIMATE CHANGE

Disaster risk management policies have undergone various paradigm shifts since the early 1970s. Throughout these stages, the practical and conceptual approach to disaster and humanitarian aid has brought the understanding of the management of disasters, the basic factors that turn hazards into disasters and vulnerability, to the highest level within the framework of disaster risk reduction. Application areas of risk reduction activities according to disaster risk reduction practitioners are given in chart 2. Knowledge of the links between climate variability, climate change, and extreme events has led to an increasing number of studies on the links between disaster risk reduction and climate change adaptation. These studies show that there is great potential for coordinated efforts towards adaptation. Studies on disaster risk address disaster risk reduction tools, methods and policies to reveal the risks of climate change. Climate change adaptation has a slightly shorter history than the United Nations Framework Convention on Climate Change (UNFCCC) signed in 1992. However, in the UNFCCC and Kyoto Protocol, policies and measures aimed at reducing climate change and reducing greenhouse gas emissions are mainly mentioned. Climate change adaptation has only recently come to the fore as a key issue for the UNFCCC. As stated in the UNFCCC, the development of the National Adaptation Programs (NAPA) and the 5-year Nairobi Work Program by the less developed countries has had an impact on the intelligibility of adaptation. Bali Action Plan (BAP) is adopted in the UNFCCC Conference of Parties - Bali. This plan provides a roadmap towards a new international climate change agreement by 2009 as the successor to the Kyoto Protocol. The BAP places climate change adaptation and disaster risk reduction on an equal footing. In the BAP, risk management and disaster risk reduction are defined as the most important elements of adaptation to climate change. Controlling disaster risk reduction and evaluations made in the coordination of adaptation to climate change require studies at different governance levels on how society will adapt and integrate with the changing climate (O'Brien et al., 2008).

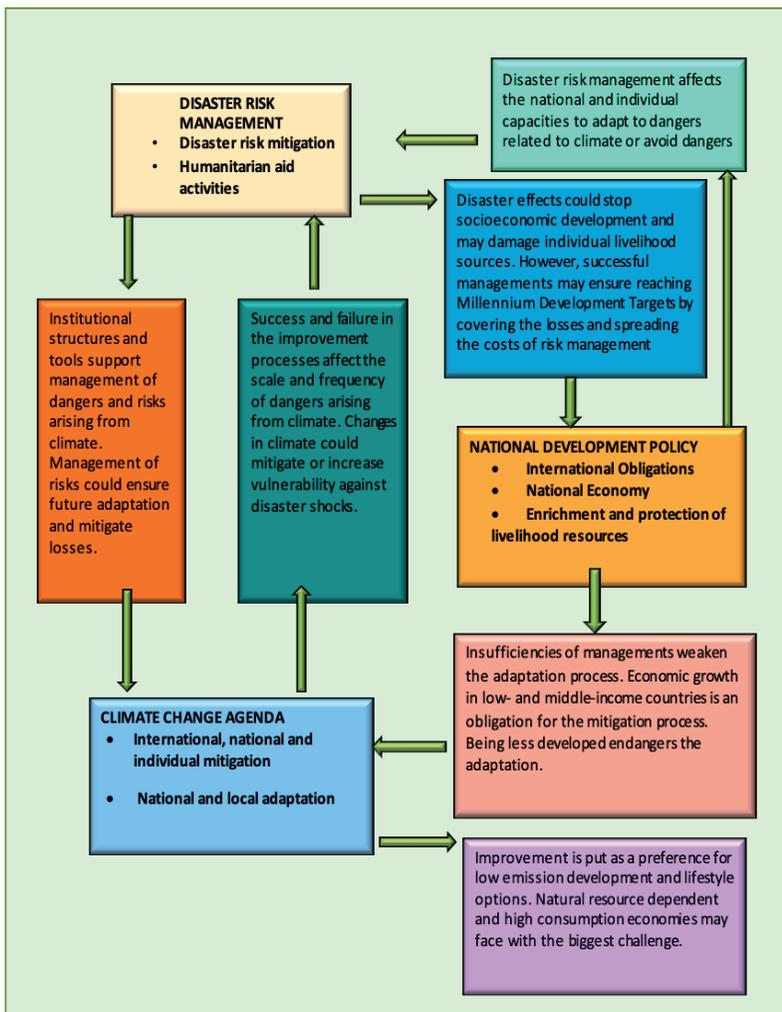
The overall management of disaster risk requires technical preventive measures to mitigate the effects of extreme weather events before, during and after meteorological disasters, and actions that include socio-economic development aspects designed to reduce vulnerability to hazards. Approaches to managing climate change impacts must also take into account reducing vulnerability below varying levels of risk. Therefore, a bridge must be established between disaster risk management efforts that aim to reduce the vulnerability caused by extreme weather events and climate change adaptation efforts. Integration between disaster risk policies and development policies has played an important role in determining vulnerability reduction strategies (O'Brien, et al. 2008).

**Chart 2:** Disaster Risk Reduction Activities And Implementation Areas



Increasing cooperation between disaster risk, climate change, and development communities can be the most effective way to promote sustainable adaptation to climate change. However, in the analysis of the links between climate change adaptation, disaster risk management, and development, Schipper and Pelling (2006) point to the difficulty of unifying the three agendas due to different actors and institutions in the process (Figure 1). Instead of consulting each other on common issues and interests, they express that these groups are almost “trying to reinvent the wheel” (Schipper and Pelling 2006).

**Figure 1:** Relationship Between Disaster Risk Management, Climate Change Adaptation, and National Development Policies. (Schipper and Pelling, 2006)

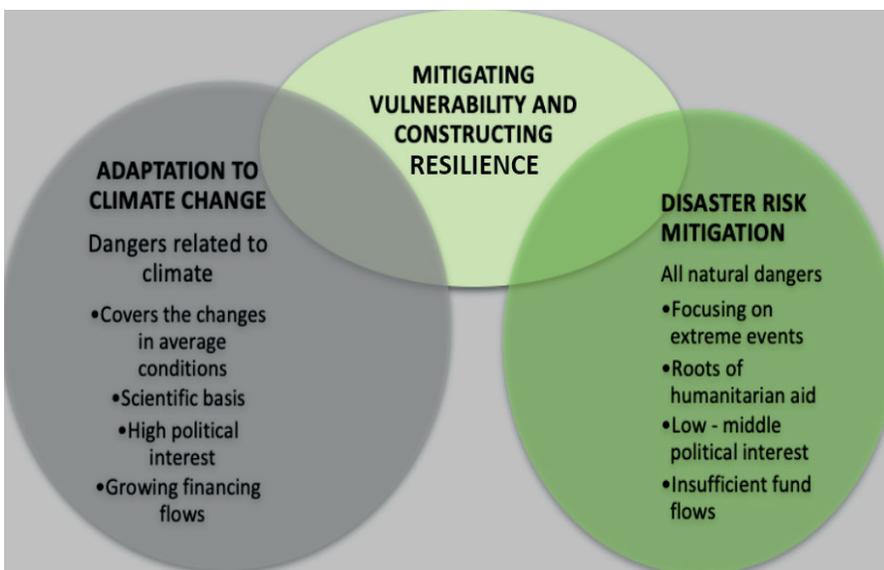


### 3.1. Similarities and Differences Between Disaster Risk Reduction and Climate Change Adaptation

Disaster experts state that the links between Disaster Risk Management, Climate Change Adaptation, and National Development Policies should be designed for the needs of all levels, from the individual to the whole society. Experience gained at the local level can be considered as the frontline of impacts from airborne hazards and extreme events. Thus, they provide important clues to the most pressing challenges related to extreme weather events in changing climatic conditions (O'Brien et al., 2008).

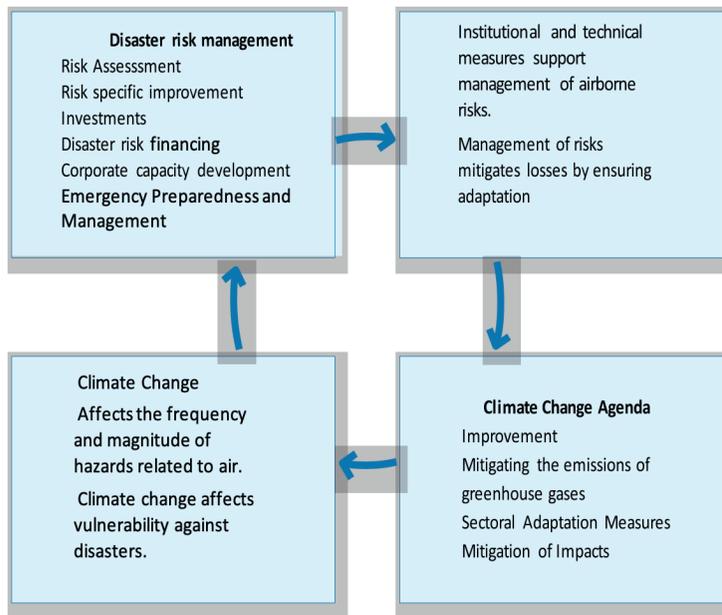
Disaster management is a qualitative or quantitative approach that determines the nature and scope of disaster risk by analyzing possible dangers, evaluating exposure and vulnerability conditions. Disaster risk management analyzes the extent of the disaster, its technical character and the location, probability, frequency, victimization and defenselessness of the disaster (Figure 2).

**Figure 2:** Similarities and Differences Between Disaster Risk Reduction and Climate Change Adaptation (UNISDR, 2012)



These include physical, social, health, environmental, and economic dimensions and the effectiveness of existing and alternative coping capacities according to potential risk scenarios. Recently, in the axis of international policies, the relationship between disaster and development has been analyzed in the context of “risk-focused sustainable development and resilience”. On the other hand, climate change adaptation deals with actions to mitigate the effects of climate change in the long term and benefit from possible beneficial results. It concerns both increases in extreme weather conditions and long-term gradual changes in weather conditions that increase vulnerability. Countries have considered disaster risk reduction and adaptation to climate change as two separate policy areas in the past. In general, the Ministries of Environment care for climate change adaptation, and the units responsible for disaster risk reduction are civil defence or disaster management offices (ADPC, 2013).

Developing and strengthening an institutional and legal disaster risk management framework by countries will help budget allocations, planning, and finally, the implementation of disaster risk management plans. Establishing legal statuses and ensuring that disaster risk management is properly financed are the first steps. A strong system should have a robust preparedness program with plans, training, and exercises for all levels of the emergency management system. Clarifying the roles and responsibilities of local and national government bodies in risk reduction, as well as emergency preparedness and response, will enhance disaster risk management capacity. Countries take "hard" and "soft" measures to reduce the risk of natural disasters and adapt to climate changes. However, it is recommended that hazard risk assessments and relevant hazard maps be completed before taking concrete steps. Risk assessment is also important for policymakers to assess the costs and benefits of risk reduction investments and prioritize these investments (Figure 3) (Pollner et al., 2010).

**Figure 3:** Disaster Risk Management and Climate Change Agenda (Pollner et al., 2010)

Global climate change resulting from growing greenhouse gas emissions is expected to lead to increased temperatures and changing precipitation patterns. Effects may vary by sub-regions and regions. However, in general, the increase in temperature and the decrease in average precipitation cause an annual increase in the frequency and intensity of drought and heatwaves. The warmer ocean surface temperature produces more and more powerful hurricanes as well as subsequent flooding. Severe droughts cause an increase in forest fires. Very strong wind and rain density cause severe floods and landslides (Pollner et al., 2010).

Combining disaster risk reduction and climate change adaptation efforts wherever and whenever possible is generally a 'win-win strategy' that will increase the reduction of climate-related losses, result in more efficient use of resources and increase the effectiveness and sustainability of both approaches. Indeed, in many areas, adaptation to climate change should be considered a component of the existing and wider disaster risk reduction agenda (ProAct, 2008).

## 3.2. Integration Areas of Climate Change Adaptation and Disaster Risk Reduction Activities

Integrating disaster risk reduction activities into climate change adaptation processes requires incorporating these risk management stages and perspectives into planning and implementing adaptation by sectors (such as water and agriculture) or specific areas in a country (exposed deltas and towns and cities in vulnerable environments). Each sector or area has its own adaptation needs and challenges. The goal of integration is part of discovering a good pathway to resilience to changing climates. It is possible to summarize the contributions of disaster risk reduction activities in integrating disaster risk reduction studies and climate change adaptation processes as follows. (Chart 3 (ADPC, 2013):

**Chart 3:** Integration of Disaster Risk Reduction Studies and Adaptation to Climate Change

<b>From the point of perspective:</b>
1. Point of view is risk-oriented.
2. Focuses on mitigating all existing and future risks related to all hazards
<b>From tools used:</b>
1. Risk evaluation methods
2. Loss and damage evaluations
3. Computer-based modelling of risk and disaster effects
4. National disaster risk reduction policies and frameworks
5. International agreements and conventions
6. Geographical Information Systems (GIS) based spatial analysis
<b>From the point of view of skills:</b>
1. Proactive
2. Awareness rising
3. Capacity Development
4. Risk communication
5. Negotiating
6. Planning and testing
7. Interpreting the technical information
8. Spatial and financial analysis

### From the point of perspective:

#### From the point of experience and knowledge:

1. Focused on mitigating disaster risk
2. Implementer
3. Natural disasters and climate change
4. Mastery in the region

#### From the point of approaches:

1. Consultation and communication
2. Demonstrating the scope
3. Risk Assessment
4. Risk reduction activities
5. Monitoring and examination

If we examine some examples of adaptation and disaster risk reduction, it will be seen that studies have been carried out for many different sectors. For example;

**Agriculture and Food Safety:** Well-known measures include changing planting times and crop patterns to increase drought and pest resistance and changing land topography to improve water intake and reduce wind erosion. For example, Burkina Faso is a country researching new drought-resistant millet and sorghum for decreasing rainfall regimes. For example, diversification in the crop, combining food crops, livestock and agroforestry, is one option. Implementing insurance programs can help people cope with crop losses.

**Water sector:** Adaptation measures include actions on water supply and water risks, such as protecting water supply infrastructure and traditional water supply resources, developing flood ponds, water harvesting, improved irrigation, desalination, non-water-based sanitation.

**Health sector:** The measures include early warning systems and air conditioning for extreme weather events and systematic actions on water and vector-borne diseases to raise public awareness of watershed protection, vector control and safe water and food regulations. Education, research and development support is required

on the implementation of relevant regulations and climate-related health risks. For example, Philadelphia (USA) developed an extreme heat event notification and response program in the summer of 2003 to reduce the number of deaths caused by future heat waves in response to deaths from heat.

**Awareness-raising and education:** The measures include curriculum development for schools, information provision to community groups and women's networks, radio and television programs, public campaigns, and leadership by national figures and celebrities. Awareness-raising for strategic intermediaries such as teachers, journalists and politicians, support to technical experts and groups are also important.

**Environmental management:** It provides risk reduction services that provide significant benefits for healthy ecosystems, resilience, livelihoods and capacity building. The measures include strengthening environmental management in areas at greatest risk due to meteorological disasters; conservation of ecosystems such as coral reefs or mangrove forests; supporting the livelihoods and the implementation of regulations related to these practices.

**Early alert systems:** Measures include improving existing systems to cover changing hazard conditions, establishing special tools to spread warnings to affected people in a timely, useful and understandable manner, and advising on actions to be taken after receiving warnings. For example, early warning systems for tropical cyclones can be easily created or developed using well-known methods.

**Development planning and applications:** It includes making adaptation and disaster risk reduction measures an official part of development processes and budgets. Efforts to ensure sustainable land management through settlement, infrastructure, coastal development, forest use, etc., avoiding hazardous areas and ensuring the security of critical infrastructures such as hospitals, schools and communication facilities could be given as examples (UNISDR, 2008).

## 4. INTERNATIONAL DISASTER POLICY AND ADAPTATION TO CLIMATE CHANGE

Within the scope of international disaster policy, disaster policies are guided by the International Strategy for Disaster Risk Reduction (UNISDR) every ten years since the United Nations started the Yokohoma Strategy in the 1990s.<sup>2</sup> Recently, the disaster management approach has evolved towards disaster risk management rather than crisis management. In its general meaning, with the Yokohoma Conference, which is adopted towards disaster management, the UN has initiated efforts to reduce natural, human and/or technological disasters in member countries. Increasing urban problems and population concentration cause the effects of disasters to be devastating. For this reason, to increase the resilience of countries against disasters, the strategy documents executed by the United Nations and the United Nations Development Program and strategy documents for disaster risks were also prepared.

### 4.1. Hyogo Disaster Risk Reduction Framework Action Plan

Disaster risk reduction is defined as the “measures taken to reduce the risks arising from disasters and the negative effects of natural disasters through systematic efforts to analyze and manage the causes of disasters; better preparedness against dangers and adverse events”. Therefore, it also includes helping to prevent additional risks from climate change. The Hyogo Framework for Action (HFA) is the basis for the implementation of disaster risk reduction. The point reached a result of the planned summit for this decade, which was accepted by 168 Governments at the World Conference on Disaster Reduction in Kobe, Japan in January 2005, is "to significantly reduce the loss of life and social, economic and environmental assets of communities and countries" It specifically identifies the need to encourage the

<sup>2</sup> UNISDR – United Office for Disaster Risk Reduction Strategy change its name in 2019 into The United Nations Office for Disaster Risk Reduction (UNDRR).

integration of current climate variability and risk reduction associated with future climate change into disaster risk reduction and climate change adaptation strategies (UNISDR, 2008).

The explanations of the priorities accepted in the document regarding adaptation to climate change are as follows: Hyogo Framework, based on a review of past successes and failures in disaster risk reduction, includes five action priorities, each dedicated to a range of special interests. These priorities provide a strong basis for developing concrete risk-mitigating adaptation measures. Ensuring that disaster risk reduction is a national and local priority with a strong institutional basis for implementation is critical for adaptation and risk reduction. Actions recommended to reach this priority are as follows: Encourage a core ministry to have a broad mandate, including finance, economics, or planning, to be responsible for promoting climate change adaptation policies and activities; organize a national high-level policy dialogue to prepare a national adaptation strategy linked to disaster risk reduction strategies. Five fundamental priorities are determined within the scope of the document. These are:

### **a. Ensure mitigation of climate change and disaster risk**

It is necessary to develop a multisectoral mechanism, such as a national platform for disaster risk reduction, and mechanisms to actively engage and empower women, communities, and local governments in the assessment of vulnerabilities and impacts, and the creation of local adaptation activities.

### **b. Identify, assess and monitor disaster risks and increase early warning**

Key steps under this priority include the development and dissemination of high-quality information on climate hazards and possible future changes; making assessments of vulnerability and particularly vulnerable groups; preparing briefings for policymakers and industry leaders; reviewing the effectiveness of early warning systems; implementation of procedures to ensure that alerts reach vulnerable

groups; public information programs necessary to help people understand the risks they face and how they can respond to alerts.

### **c. Use knowledge, innovation, and education to create a culture of safety and resilience at all levels**

This principle applies equally to adaptation and disaster risk reduction. Special steps include blending and disseminating good practice; running public information programs on local and personal actions that contribute to security and resilience; publicizing community achievements; educating the media on climate-related issues; development of training curricula on climate adaptation and risk reduction; supporting research programs on flexibility; and the development of mechanisms to transfer knowledge from science to risk management practice in climate-sensitive sectors.

### **d. Reduce underlying risk factors**

This includes many environmental and social factors that create or increase risks from natural hazards. The measures include the inclusion of climate risk-related issues in development planning processes, macro-economic projections and sector plans; making it necessary to use information about climate risk in urban planning, land use planning, water management, environmental and natural resource management; strengthening and maintaining protective work such as coastal wave barriers, flood paths and floodplains; routine assessment and reporting of climate risks in infrastructure projects, building designs and other engineering applications; development of risk transfer mechanisms and social safety nets; supporting programs for the diversification of livelihoods; these are required for launching climate change adaptation activities.

### **e. Strengthen disaster preparedness for effective response at all levels**

Actions include preparedness plans and contingency plans to take into account

anticipated changes in existing hazards and new hazards that have not been experienced before; building evacuation mechanisms and accommodation facilities; developing specific preparedness plans, and supporting the community-based preparedness initiatives for areas where settlement and livelihoods are under constant threat of change. Resilience development and early warning systems also contribute to this priority (UNISDR, 2008).

## 4.2. Sendai Framework for Disaster Risk Reduction (2015-2030)

Intergovernmental negotiations on development agenda, financing of development, climate change and disaster risk reduction were held after Hyogo. These meetings allowing the international community to increase the alignment between policies, targets, indicators and implementation measurement systems. Providing appropriate reliable links between these processes was expected to contribute to achieving the global target of disaster resilience and poverty eradication. In the final declaration of the UN Sustainable Development Conference with the theme of "The Future We Want", which was adopted in 2012, disaster risk reduction and increasing resistance to disasters were discussed in the context of sustainable development and poverty eradication. At the same time, addressing climate change as a disaster risk factor within the scope of the United Nations Framework Convention on Climate Change will benefit disaster risk reduction.

Compared to the HFA, the Sendai Framework Document focuses more on the drivers of disaster risk. Poverty, climate change, inappropriate land use, planning, environmental degradation, weak building codes affect sustainable development and undermine governance. However, the scope of the Sendai framework is also expanding with the prevention of new risk formation through information, priority development practices and investments, long-term risk reduction. It is argued that the diversity of the dangers (natural, man-made, environmental, biological and technological) and types of disasters (slow and fast onset, comprehensive and intense) covered by Sendai and the diversity of the actors it includes will facilitate the

integration of disaster risks into sectors in reducing climate change and achieving sustainable development goals (UNISDR, 2019a).

In 2015, 187 United Nations Member State representatives accepted the 2015-2030 Disaster Risk Reduction Framework - Sendai at the World Conference on Disaster Risk Reduction (Sendai, Japan), with a renewed sense of urgency in the context of sustainable development and poverty, as well as their sensitivity to disaster risk reduction. They have decided that they will give priority to creating resilience against disasters. Within the scope of the Sendai Framework Document, four action priorities have been determined:

- ▶ Understanding the disaster risk (knowledge)
- ▶ Strengthening disaster risk governance (governance)
- ▶ Investing in mitigating disaster risk for resilience (financing)
- ▶ Increasing disaster preparedness (doing better than before) for effective response and recovery, rehabilitation, and reconstruction.

Under these priorities, many actions related to risk reduction and adaptation to climate change are detailed at national, regional, and local scales. The Sendai Framework envisages the implementation of the disaster risk reduction measure, as well as the integration of activities to be carried out with adaptation to climate change (UNISDR, 2019b).

Considering that disaster risk reduction is essential for sustainable development in subparagraph (h) of the guiding principles determined in the Sendai Framework Document; the goal in the development, strengthening, and implementation of the relevant policies, plans, practices, and mechanisms was specified as ensuring harmonization between the agendas of sustainable development and growth, food safety, health and safety, climate change and variability, environmental management, and disaster risk reduction.

- ▶ Within the scope of priority "Understanding disaster risk", it is envisaged to encourage research on multi-hazard disaster risks and the development of

regional disaster risk assessments and maps, including climate change scenarios, at the global and regional levels in paragraph (b). In paragraph (c), it is aimed to maintain and strengthen earth and climate observations through on-site and remote sensing, with the support of information technologies

► It was foreseen to be in contact with the national platforms of countries on disaster risk reduction with the "Global Disaster Risk Reduction Platform" established within the United Nations to shape partnerships at global and regional levels in the context of "Strengthening disaster risk governance to manage disaster risk", assess progress in implementation, and share information on policies, programs and investments related to disaster risk, including those dealing with climate issues, and encourage the integration of disaster risk management and other sectors.

► Even if the concept of climate change is not used directly in the context of "Investment in disaster risk reduction for resilience", in paragraph (g), the target was set as encouraging the dissemination of disaster risk assessment mapping and management in determining safe settlement areas both within the scope of rural development planning, as well as in the management of mountains, rivers, coastal flood prevention areas, arid areas, wetlands and other areas prone to drought and floods, taking into account the protection of ecosystem functions.

► Within the scope of the priority of "Built Back Better" in developing and improving disaster preparedness for effective response, rehabilitation and reconstruction", it was aimed at preparing and updating, together with relevant institutions, the policies, plans, and programs related to disaster preparedness and emergencies taking into account climate change scenarios and disaster risk effects with the participation of all stakeholders.

In part (d) of the document related to application tools of the document, it was demonstrated as an important target to include disaster risk reduction measures in all sectors and inter-sectoral multi- and bilateral development assistance programs related to poverty reduction, sustainable development, natural resource management, environment, urban development and adaptation to climate change (UNISDR, 2015).<sup>3</sup>

<sup>3</sup> Sendai Disaster Risk Reduction Framework Document (2015-2030) was published on 18 March 2015. The translation of the original text made by AFAD is used within the scope of this study.

In some reports prepared by the OECD, determinations were made to include Sendai Framework Document for adaptation to climate change and reducing disaster risks. Setting out and implementing targets in both adaptation to climate change and disaster risk reduction requires both political support and strong leadership. Common solutions are produced with awareness-raising and capacity building by stakeholders. For example, with the efforts to adapt to climate change and reduce disaster risks occurring at the local or sectoral level, ministries and other public institutions and organizations ensure that joint decisions are taken to ensure consistency between the two (Chart 4), (OECD, 2019).

**Chart 5:** Relationships between Sustainable Development Goals SDG, Paris Agreement on Climate Change and Sendai Framework Document on Disaster Risk Reduction (OECD, 2019)

	Sustainable Development Goals SDG	Paris Agreement on Climate Change	Sendai Framework for Disaster Risk Reduction
Background	Global agenda for actions towards sustainable development	A global response to climate change adaptation, remediation and finance	A global framework to guide the multi-hazard management of disaster risks
Climate change adaptation and disaster risk reduction	Climate action and disaster risk reduction are intersecting issues, however, as clearly stated in Target 13, combatting climate change and its effects; Target 11, making cities resistant, safe, inclusive and sustainable Climate action also helps many other targets to reach success.	Articles 7 and 8 explicitly focus on climate change adaptation and disaster risk reduction.  Improving adaptation capacity to reduce climate change vulnerability and increase resilience in Article 7.1  Article 8.1, adverse effects of climate change associated with prevention, minimization and addressing loss and damage	Paragraph 13 defines climate change as the driver of disaster risk and points to an opportunity to reduce disaster risk in a meaningful and consistent way.

	Sustainable Development Goals SDG	Paris Agreement on Climate Change	Sendai Framework for Disaster Risk Reduction
Role in development and cooperation	In targets 17.16 and 17.17, it emphasizes the need for strengthening global solidarity with the participation of all countries, all stakeholders and the public.	Article 7.6 defines the importance of international cooperation and support in adaptation efforts. Providing financial resources aiming to achieve the balance between adaptation and risk reduction in Article 9.4	Paragraph 19 defines the capability of developing countries to manage risks, the timely provision of adequate and sustainable support, and capacity building through finance, technology transfer from developed countries and their partners"

Source: OECD, 2019.

### 4.3. New Urban Agenda Habitat III

Habitat III adopted the New Urban Agenda, namely the "Quito Declaration on Sustainable Cities and Settlements for All" at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito on 17-20 October 2016. By 2050, the urban population is expected to nearly double, making urbanization one of the most transformative trends of the 21<sup>st</sup> century. In HABITAT III, "Environmentally Sustainable and Resilient Urban Development ", it was accepted that cities and human settlements face unprecedented threats due to natural and man-made disasters, climate change, and associated risks and that the physical-demographic-economic and environmental characteristics of cities have direct effects on sustainability and resilience far beyond their urban boundaries.

In HABITAT III, targets were set as accepting and implementing disaster risk reduction and management, reducing vulnerability, developing resistance and response flexibility against natural and man-made disasters, reducing the damages of climate change and encouraging adaptation to its consequences, encouraging sustainable land use, resource use and clean energies in urban development, protecting ecosystems and biodiversity, promoting sustainable consumption and production patterns, reducing disaster risks by establishing resilient urban

structures, and ensuring environmental sustainability by taking climate change adaptation and mitigation measures. Within the scope of commitments, integrating disaster risk reduction and climate change adaptation and mitigation solutions into urban and regional development and planning processes; promoting cooperation and coordination between sectors; ensuring capacity building in local governments to reduce disaster risk, to make response-crisis management effective, to develop and implement disaster plans; developing solutions for climate and disaster risks in cities and human settlements, were emphasized (MEU, 2020).



## 5. RELATIONSHIP BETWEEN TURKEY'S DISASTER POLICY AND ADAPTATION TO CLIMATE CHANGE

Turkey's policy of disasters is shaped with important agreements, as in the case of many countries, in reduction disaster risks and adaptation to climate change executed recently by the UN. The Sendai Framework for Disaster Risk Reduction (SFDRR), with its outlines, acknowledges climate change coordinated with climate change adaptation efforts where relevant. It also addresses disaster preparedness for effective response and 'building better'. Addis Ababa Agenda for Action (AAAA) sets financial instruments to achieve UN sustainable development goals. The 2030 Agenda for Sustainable Development addresses goals and commitments related to disaster risk reduction and adaptation to climate change, poverty reduction, economic growth, social inclusion, and environmental protection. The issue of combating climate change is explicitly addressed in this Agenda (SDG13). The Paris Agreement on Climate Change limits human-induced global temperature rise to 2 °C (1.5 °C) compared to pre-industrial levels. It deals with climate change as part of its climate change policies (Item 7). It affirms the Loss and Damage initiative (item 8) as the cornerstone of global policy architecture. The World Humanitarian Summit directs the UN member states to take the basic responsibilities of humanitarian aid and disaster risk and to identify urban habitats as the most vulnerable areas in terms of vulnerability. HABITAT III creates the New Urban Agenda as a tool for better integration of various policies that contribute to sustainable development (EEA, 2017).

Turkey creates its disaster policy in a risk-oriented manner, including first the AFAD, under the light of these international conventions to which Turkey is a party upon signing.

## 5.1. National Policy Documents on Disaster Management and Climate Change Adaptation

Turkey, as a result of global climate change, has to struggle with problems of desertification, hydro-meteorological disasters, and sea-level rise. National strategy documents and action plans have been prepared and implemented within the scope of the commitments brought by international policies for disasters that fall under their job descriptions by many public institutions and organizations according to their duties and responsibilities. Among these, some important documents related to disasters and climate change are included in detail.

### 5.1.1. Climate Change Action Plan of Turkey (2011- 2023) (IDEP):

Works related to climate change are ongoing within the framework of Turkey Climate Change Action Plan (2011- 2023) prepared with the contributions of UNDP by the National Climate Change Strategy Paper (2010-2020). These studies are reported every year through the United Nations Framework Convention on Climate Change (UNFCCC) National Communications. The basic principles of the National Climate Change Strategy Document are to participate in the measures to be taken in the global fight against climate change, in cooperation with international parties, in the light of objective and scientific findings, to the goals determined with the common mind, within the scope of common but differentiated responsibilities following sustainable development policies. With climate change combatting and adaptation policies and measures, targets have been determined such as limiting the rate of increase in greenhouse gas emissions, increasing the national preparedness level and capacity to prevent adverse effects; sharing knowledge and experience with other countries, providing financing opportunities, developing research and development and innovation capacity for cleaner production (MEU, 2012a).

### 5.1.2. Turkey Climate Change Adaptation Strategy and Action Plan (2011-2023):

The National Climate Change Adaptation Strategy and Action Plan were prepared and put into effect by the Ministry of Environment and Urbanization for 2011-2023. Strategies and actions were demonstrated over five fundamental areas determined to be affected by climate change in Turkey. Although natural disaster risk management is a separate fundamental area, there are disaster risks and measures to be taken specifically to that area in other areas.

- ▶ **Water Resources: Management;** monitoring and determining hydrological, social, economic and environmental vulnerabilities (including natural disasters) in river basins and sub-basins, developing and implementing adaptation options; determining the risks of the coasts to be affected by climate change (including natural disasters) and developing adaptation capacity as solution proposals (MEU, 2012b).
- ▶ **Agriculture and Food Safety:** In addition to the new arrangements envisaged in the spatial planning in rural areas, measures regarding the development of agricultural and pasture lands and protection against natural disasters, disaster risk management measures were included in the strategy. Besides, the strategy states that in rural settlements where disasters such as earthquakes, landslides, landslides and floods pose significant threats, there is the necessity of increasing efficiency in activities aimed at reducing the risks arising from disasters and ensuring safe settlement conditions. Conducting and monitoring disaster analysis for agricultural drought, and developing disaster management policies, are foreseen (MEU, 2012b).
- ▶ **Ecosystem Services, Biodiversity and Forestry:** Determining the effects of climate change on the species in forest areas, integrating data related to natural disasters such as flood, flood, avalanche, landslide into the Forest Inventory and Monitoring System; in agricultural forestry activities, conducting R&D studies to minimize climate risks and to establish an early warning system, were targeted (MEU, 2012b).

- ▶ **Natural Disaster Risk Management:** It is envisaged to identify threats and risks for the management of natural disasters caused by climate change, and to take necessary measures by using early warning systems to minimize the effects of disasters. Activities are foreseen for making separate disaster management plans for sectors affected by natural disasters caused by climate change and reviewing the legislation on natural disasters caused by climate change and determining the implementation principles. It is aimed to conduct training activities to raise awareness about disasters and risks caused by climate change. To strengthen response mechanisms in natural disasters caused by climate change, it is aimed to establish "community-based disaster management" and to ensure capacity development in local administrations, including mukhtars (MEU, 2012b).
- ▶ **Human Health:** To reduce the effects of extreme weather events on human health, it is aimed to establish and expand early warning systems and to establish emergency warnings. Coordination and cooperation between relevant institutions and organizations on climate-sensitive disasters and the health risks they will create are envisaged (MEU, 2012b).

### 5.1.3. National Earthquake Strategy Action Plan - UDSEP 2023

The main purpose of the "National Earthquake Strategy and Action Plan", which aims to create a prepared and resilient society in reducing the risk of earthquakes and to cope with earthquakes, to establish an institutional infrastructure for this purpose and to determine the priorities of R&D activities, is to prevent or reduce physical, economic, social, environmental and political damages and losses and to create new living environments that are earthquake resistant, safe, prepared and sustainable". It is an exemplary study in our country in terms of being a document containing strategic approaches and action sequences to minimise earthquake losses. In its preparation process, in addition to benefiting from the past experiences, information and document archives, it was prepared with multi-stakeholder participation recommended by today's modern disaster management systems, and it was ensured that the public, private sector, universities, trade associations and non-governmental organizations contribute to the process. It includes many

actions aiming to raise awareness of all segments, including children, teachers, masters, journeymen, public institutions, private sector, central government, local administrations and NGOs against earthquakes (AFAD, 2013).

#### 5.1.4. National Radiation Emergency Plan (URAP)

URAP was prepared based on Paragraph 3 of Article 6 of the Regulation on Disaster and Emergency Response Services published in the Official Gazette dated 18/12/2013 and numbered 28855, Article 1.6 of the Disaster Response Plan published in the Official Gazette of Turkey Dated 01.03.2014 and numbered 28871 and Article 5, paragraph 5 of the Decree-Law No. 702 on the Organization and Duties of the Nuclear Regulatory Authority and Making Amendments to Some Laws, published in the Official Gazette dated 9/7/2018 and numbered 30473.

The purpose of the plan is to determine the principles of planning to be made at the national and provincial level for a radiation emergency that may occur in the country or abroad, the intervention to be carried out and the conduct of international relations. Its scope is to provide the necessary national support to governorships by ensuring coordination between relevant ministries, institutions and organizations in radiation emergencies that occur / possibly occur in the country, in the territorial waters and the economic region, as well as in the territory of neighboring countries and that may require contributions from different organizations (afad.gov.tr, 2020).

#### 5.1.5. Action Plan to Combat Desertification

In the National Strategy Document for Combating Desertification and in the United Nations Convention to Combat Desertification (UNCCD), to which 195 countries are parties, desertification is defined as "land degradation" that occurs as a result of various factors, including climate change and human activities in arid, semi-arid and semi-humid areas. The General Directorate of Combating Desertification, which prepared the Action Program for Combating Desertification in 2005, works with relevant institutions, organizations, universities and non-governmental organizations at the level of various programs. Besides, the National Strategy

Document for Combating Desertification (2013-2023) and the "National Action Plan for Combating Desertification" were prepared with a participatory approach, and the road map to be followed in combating desertification was determined. Also, Guidelines for Creating Landscapes Resilient to Global Changes in Arid Areas and Afforestation and Erosion in Arid and Semi-Arid Areas were prepared and presented to the relevant stakeholders (ÇEM, 2012).

### 5.1.6. Integrated Urban Development Strategy and Action Plan (2010-2023) (KENTGES)

"Urban Development Strategy (KENTGES) Integrated Urban Development Strategy and Action Plan" prepared and adopted by the Ministry of Environment and Urbanization in 2010, associates the policies regarding settlement and urbanization with an integrated approach within the framework of the principle of sustainability. The document is a national document that determines the principles, strategies and actions to ensure healthy, balanced and livable urban development for the structural problems of urbanization and determines their implementation principles. Within the ten commission groups formed within the scope of the document, "Disaster Preparedness and Urban Risk Management" and "Climate Change, Natural Resources, Ecological Balance, Energy Efficiency and Urbanization" working groups carry out actions related to these areas. The fact that cities are not sufficiently prepared against disasters and in particular earthquakes, and the need for a holistic approach to disaster and/or risk management, including pre-disaster "protection" and post-disaster "response and recovery" processes, has been the main objective in the preparation of this document. One of the most important determinations made in the document is that risks such as natural, technological and climate change should be made manageable at national/regional and local levels (MEU, 2010).

### 5.1.7. Eleventh Five Year Development Plan

The 11<sup>th</sup> Development Plan was published in July 2019 and entered into force for the 2019-2023 Period. In the "Protection of the Environment" section of the Plan, it is envisaged that the international climate change negotiations will be conducted in

the context of "principles of common but differentiated responsibilities and relative capabilities" and "Intended National Contribution"; that measures will be taken for the sectors that increase greenhouse gas emissions; capacity will be developed concerning adaptation to climate change and vulnerability will be decreased, and resilience against climate risks will be developed. It has been stated that efforts will be made to reduce emissions, especially in buildings, energy use, industry, transportation, waste, agriculture and forestry sectors. As well as conducting national-regional planning, implementation and capacity building activities in the context of adaptation to climate change and determining necessary elements for adaptation studies at regional and city scale, Climate Change Action Plans will be prepared for 7 Regions, especially the Black Sea Region. Regarding disaster management, it is planned to prepare disaster hazard and risk maps by developing country-wide scenarios regarding the effects of climate change (CSB, 2019).

## 5.2. Institutions and Organizations Responsible for Disaster Management

With the disasters experienced in the historical past of Turkey, its approach focused on earthquake and crisis management has undergone a big transformation following the 1999 Kocaeli and Düzce earthquakes, which is termed as the period of awakening. In the process of disaster management wherein many different public institutions and organizations work, the Civil Defense General Directorate under the Ministry of Interior, Disaster Affairs General Directorate under the Ministry of Public Works and Settlement and Turkey Emergency Management General Directorate (TAY) under the Prime Ministry were closed, and AFAD was established with the Law on Organization and Tasks of Disaster and Emergency Management Presidency No. 5902 in 2009. With the establishment of the AFAD in 2009 and is influenced by changes in disaster policy in the international arena, a proactive, risk-oriented, participatory, strategic approach has been started to be implemented in Turkey based on the lessons learned from disasters (Akay and Ozmen, 2017).

## 5.2.1. Central Administration

Institutions and organizations that have task-authorities and responsibilities within the scope of central administration in Turkey have been examined in this section within the scope of disaster management and adaptation to climate change. AFAD is handled separately in this process, while the Ministry of Environment and Urbanization and other institutions were examined under a separate title.

### 4.2.1.1. AFAD

With the understanding of “Turkey’s Joint Power in Disasters”, AFAD plans, realizes, directs, and coordinates disaster management plans affiliated under the Ministry of Interior at the central level in Turkey, carries out research and rescue, humanitarian aid, evacuation and transfer work in disaster conditions at national and international areas, and establishes humanistic infrastructures (afad.gov.tr, 2020). AFAD created the “Road Map on Climate Change” document in 2014 to support climate change adaptation efforts. In the 2019-2023 Strategic Plan, AFAD has set its mission as “to carry out the necessary studies for the effective management of disaster and emergency processes, to ensure coordination between relevant institutions and organizations and to produce policies in this field”. With the vision of “creating a disaster-resilient society”, 6 Objectives, 30 Goals, and 117 Indicators were determined and included in the Strategic Plan. These objectives are:

- ▶ “Objective 1: To increase the effectiveness of coordination in disaster and emergency management.
- ▶ Objective 2: To ensure the adoption of a risk-focused integrated disaster management approach and its establishment in all sectors.
- ▶ Objective 3: To manage the processes during and after disasters in the most effective way.
- ▶ Objective 4: To be constantly prepared for disasters and emergencies by increasing social awareness.

- ▶ Objective 5: To become one of the leading organizations in the international arena.
- ▶ Objective 6: To be a continuously learning and developing institution (afad.gov.tr, 2020).

AFAD, which was established in 2009 under the "Law on the Organization and Duties of the Disaster and Emergency Management Presidency" numbered 5902, affiliated to the Prime Ministry, was connected to the Ministry of Interior with the Presidential Decree No. 4 published on 15 July 2018, within the scope of the regulations made on the Presidential Government System, is continuing its activities for preventing disasters and mitigating damages, intervening in the disasters and post-disaster improvement works. In terms of its field of work, it provides effective coordination and cooperation between universities, public institutions, the private sector and non-governmental organizations.

Based on the fact that disaster management is an issue that concerns all segments of society, the "Disaster and Emergency Advisory Board" was established with Law No. 5902 to create macro-level policies. The Board, under the chairmanship of AFAD President or Deputy President to be determined by him, comprises one representative at the level of Head of Department from Ministry of Foreign Affairs, Ministry of Interior, Bogazici University Kandilli Observatory and Earthquake Research Institute, General Directorate of Mineral Research and Exploration, Turkey Scientific and Technological Research Council of Turkey, five members to be determined by the President from among at least ten university lecturers who work on emergencies and will be nominated by the Higher Education Council, and three members to be determined by the President from relevant non-governmental organizations accredited. As stated in Law No. 5902, AFAD consists of central and provincial organizations. The central organization of the Presidency consists of the following service units structured to manage disasters and emergencies. Whereas the disaster cycle is kept at the forefront in the constitution of these service units, earthquake disaster risk is kept separate from other types of disasters for Turkey and is handled within a separate department organization.

The duties of each department are separately specified in the Presidential Decree on the Constitution of Affiliated and Subsidiary Organizations and Institution of Ministries and Other Institutions No. 4. The central organization of the Presidency comprises the following service units:

- ▶ Planning and Risk Reduction Department
- ▶ Intervention Department
- ▶ Improvement Department
- ▶ Civil Defense Department
- ▶ Earthquake Department
- ▶ Staff and Support Services Department
- ▶ Training Department
- ▶ Foreign Relations and International Humanitarian Aid Department
- ▶ Volunteer and Donor Relations Department
- ▶ Inspection Services Departments
- ▶ Strategy Development Department
- ▶ Information Systems and Communication Department, and
- ▶ Legal Department.

Only the duties of the Planning and Risk Reduction Department, directly related to the scope of disaster risk reduction and climate change adaptation activities, are included in this study in detail. According to this, the tasks of the Department were set out as follows: “To make or have done disaster and emergency response, risk management, and reduction plans at the country level; to identify possible disaster and emergency areas and to take preventive measures; to determine the plan, project and zoning principles of the places that are likely to be damaged; to determine in-kind, cash and humanitarian aid principles; to collect and evaluate information about disasters and emergencies occurring at home and abroad; to determine management strategies for disasters and emergencies; to make suggestions to relevant institutions regarding public investments and personnel needs; to ensure the development and expansion of insurance services; to determine and inspect service standards and accreditation principles”.

There are 81 provincial disaster and emergency directorates in the provincial organization of the Presidency. They are responsible for identifying disaster and emergency hazards and risks at a provincial level, making disaster and emergency preparations; making disaster and emergency risk reduction, response and recovery provincial plans jointly with local governments and relevant public institutions. Provincial Directorates of Disaster and Emergency have been held responsible for planning processes regarding disasters and emergencies to be carried out at the local level. The Directorates have duties and responsibilities within the scope of disaster risk reduction and climate change adaptation studies to be prepared in this context. To reduce hydro-meteorological disaster risks, “Road Map Document for Climate Change and Related Disasters (2014-2023)” was accepted by AFAD. There is a need for re-handling the existing incentives because combatting climate change is relatively a new policy area in Turkey (AFAD, 2015).

There are “Provincial Disaster Risk Reduction Plans” that AFAD started to prepare in 2019. Besides, Turkey Disaster Response Plan (TAMPA) was prepared and entered into force in 2014. TAMPA covers public institutions, the private sector, civil society organizations and real persons assigned for effective intervention in disaster and emergencies at any type or scale experienced in Turkey. Within the scope of TAMP, which aims to reduce operational risks during disasters with its integrated planning approach and modular structure, 28 different service groups have been created according to the nature of the services carried out in the response. TAMP defines the roles, duties and responsibilities of service groups and coordination units that will take part in response to disasters and emergencies such as earthquakes, floods, landslides, avalanches, fires, industrial accidents and mass population movements following their areas of expertise. Disaster Management and Decision Support System, AYDES, developed based on geographic information systems, is used as a base for TAMP. AYDES is a web-based information system where institutions and organizations in charge of disaster response can manage demand and resources and allow coordination with common decision-support mechanisms. Besides, 22 logistics centres were established overall Turkey, and the logistics of the provisional sheltering materials after disasters are provided rapidly (AFAD, 2020). Actions are ongoing

for developing Turkey's Disaster Management Strategy Document and Action Plan (TAYSB) and the framework document of a disaster management system which will ensure carrying out risk mitigation, disaster preparation, intervention, and post-disaster rehabilitation works in an integrated manner (AFAD, 2020).

### 5.1.1.2. Ministry of Environment and Urbanization and Other Institutions and Organizations

The General Directorate of Infrastructure and Urban Transformation Services, which is among the service units specified in the 6th article of the amended Decree No.644 amended with the Decree No. 648 on the organization and duties of the Ministry of Environment and Urbanization, has duties regarding the transformation of risky areas determined by the Law on Transformation of Areas Under Disaster Risk No. 6306. It is also responsible for determining general planning, programming, feasibility, project design, operation, financing needs and investment priorities related to the infrastructure systems of local governments and integrating them into the planning process.

The duties of the Spatial Planning General Directorate, which has been operating within the body of the Ministry, have been rearranged under Article 102 of Presidential Decree No. 1 on the Presidential Organization that was published in the Official Gazette dated 10.07.2018, and it carries out the services of directing the upper- scale spatial planning system, determining and following the rules for making and approving urban transformation applications, risk management and contingency plans, conducting geological and geotechnical surveys based on the plan, getting done and approving the same, creating disaster sensitive settlements, producing projects related to rural settlements, ensuring the planned development of coastal areas and providing technical support to local governments.

It was emphasized that with the "Spatial Plans Construction Regulation", which was prepared by the General Directorate and entered into force in 2014, that research,

studies and studies should be carried out, especially on disasters and other urban risks, and the necessary risk mitigation measures should be taken according to the researches in the plans, and the balance of protection and utilization should be considered. In the Plan Research Report, which constitutes the synthesis phase of the landscaping plans in the planning hierarchy, meteorological elements such as temperature, precipitation, relative humidity, evaporation, canopy and insolation, wind, pressure specific to the planning area are evaluated. It is also involved in environmental pollution such as air, water and soil pollution in the area. Ecologically sensitive and risky areas and non-risky areas are determined in the planning area by analysing natural structure in line with the data regarding the entire ecological structure. In the habitability synthesis done at the end, the areas of the planning area that are suitable, risky and not suitable for settlement are determined. In this context, the areas that are likely to be affected by both disasters and climate change are determined and plan decisions are taken by considering the balance of protection and use (MEU, 2018).

According to the Decree-Law No. 644 on the Organization and Duties of the Ministry of Environment and Urbanization, the duties of the General Directorate of Environmental Management regarding disaster and climate change are as follows: taking necessary measures to prevent environmental pollution; cooperating with Turkey Atomic Energy Agency to cooperate on nuclear security with; coordinating with other institutions and organizations to determine plans, policies and strategies for taking measures regarding global climate change and ozone depletion; ensuring the management of wastes in cooperation with relevant institutions and organizations; determining the current pollution status of contaminated areas; conducting and making studies on risks to the environment and human health and improvement of contaminated areas (cygm.csb.gov.tr, 2020).

Climate Change and Adaptation Department were established within the body of the General Directorate, and four branches were established under it. These are:

- ▶ Climate Change Policies and International Negotiations Branch

- ▶ Local Climate Change Policies Branch Directorate;
- ▶ Greenhouse Gas Emissions Monitoring Branch
- ▶ Ozone Layer Protection and Florine Gases Management Branch

Tasks of the Climate Change and Adaptation Department are detailed as follows within the context of disaster risk and climate change adaptation:

- ▶ To monitor and coordinate local, national and international studies for combating climate change and protecting the ozone layer
- ▶ To provide national coordination within the scope of international organizations and conventions for combating climate change and protecting the ozone layer and to fulfilling the duties of a national focal point,
- ▶ To carry out legislative studies and other studies for the harmonization of the European Union acquis in the fields that fall within its field of duty,
- ▶ To prepare or have prepared national reports that our country is obliged to submit within the scope of international organizations and conventions,
- ▶ To ensure coordination of Climate Change and Air Management Coordination Board,
- ▶ To ensure the national coordination of combating climate change activities at the local (at the scale of cities and geographical regions), to organize/have organized capacity building activities for the preparation and implementation of climate change action plans at the local scale and to develop legislation,
- ▶ To monitor and evaluate national and international developments regarding the control, recovery and disposal of the substances that cause ozone depletion and the greenhouse gases that are the alternatives of these substances, to carry out and have carried out studies to determine and implement policies and strategies,
- ▶ To monitor, control and report greenhouse gas emissions that cause climate change on a national scale,
- ▶ To work on market-based mechanisms and economic instruments, especially the emission trading system, within the framework of climate change policies,
- ▶ To coordinate the studies for the monitoring and evaluation of climate

change adaptation policies,

- ▶ To carry out actions towards information and awareness-raising among the public;
- ▶ To prepare and implement national and international projects in the fields that fall within its field of duty(cygm.csb.gov.tr, 2020).

Many general directorates of the Ministry of Environment and Urbanization, and some units of the Ministry of Agriculture and Forestry, the Ministry of Transport and Infrastructure, the Ministry of Energy and Natural Resources and the Ministry of Health have duties, powers and responsibilities regarding adaptation to climate change and disaster management. Their details are given in Chart 5.

**Chart 5:** Other Public Institutions and Organizations with Duties in the Context of Disaster Risk Reduction and Climate Change Adaptation

MINISTRY OF AGRICULTURE AND FORESTRY	General Directorate for Combatting Desertification and Erosion  Department for Combatting Desertification	<ul style="list-style-type: none"> <li>• Preparing policies and strategies, developing legislation in cooperation with relevant institutions and organizations on combating desertification and adaptation to climate change,</li> <li>• Conducting national and international projects and studies in cooperation with all stakeholders regarding desertification, land-soil degradation and drought,</li> <li>• Monitoring, evaluating and reporting the effects of desertification and climate change, land use status, change in vegetation cover and carbon accumulation,</li> </ul>
	General Directorate for Combatting Desertification and Erosion  Erosion Control Department	<ul style="list-style-type: none"> <li>• Working with relevant institutions and organizations on sustainable management of arid and semi-arid areas, prevention of land degradation, adaptation to climate change,</li> </ul>
	General Directorate for Combatting Desertification and Erosion  Survey and Project Department	<ul style="list-style-type: none"> <li>• Carrying out studies, plans and implementation projects on combating desertification and erosion, afforestation, rehabilitation, drought, flood, avalanche, landslide, and providing project support.</li> <li>• Conducting economic, social and technical researches, producing projects with stakeholders (tarimorman.gov.tr/CEM, 2020),</li> </ul>
	Water Management General Directorate  Flood and Drought Management Department	<ul style="list-style-type: none"> <li>• Working and monitoring the effects of climate change on water resources and adaptation measures,</li> <li>• Conducting studies to determine the effects of climate change and changes in the rainfall basin on floods and drought,</li> <li>• Monitoring and reporting floods and drought in coordination with relevant institutions and preparing flood yearbooks,</li> <li>• Conducting studies to identify historical floods and droughts and to learn lessons</li> </ul>

	<p>Water Management General Directorate</p> <p>Climate Change Adaptation Working Group</p>	<ul style="list-style-type: none"> <li>• Developing principles and targets, strategy and policy regarding adaptation to climate change in water resources management,</li> <li>• Assessing the impact of internationally valid climate change scenarios on water resources,</li> <li>• Conducting basin and country-scale researches on the effects of climate change on water resources, floods, drought and precautions, and following up the precautions</li> <li>• Cooperating with national and international institutions and organizations regarding the impact of climate change on water resources and adaptation, monitoring and reporting the processes</li> <li>• Coordination, monitoring and reporting of climate change adaptation activities carried out by the Ministry units and affiliated organizations (tarimorman.gov.tr/SYGM, 2020),</li> </ul>
	<p>Nature Protection and National Parks General Directorate</p> <p>Nature Protection Department</p>	<ul style="list-style-type: none"> <li>• With a precautionary measure approach, to create an emergency action plan for ecological damages that occur suddenly due to various reasons such as accidents and natural disasters, and to conduct and have conducted rapid ecosystem assessment studies (tarimorman.gov.tr/DKMP, 2020),</li> </ul>
	<p>Agricultural Reform General Directorate</p> <p>Integrated Administration and Control System Department</p>	<ul style="list-style-type: none"> <li>• Providing integration for use within the scope of climate change and Integrated Administration and Control System by carrying out studies on land use classes within the scope of GIS studies (tarimorman.gov.tr/TRGM, 2020)</li> </ul>
	<p>Agricultural Reform General Directorate</p> <p>Agricultural, Environmental and Natural Resources Protection Department</p>	<ul style="list-style-type: none"> <li>• Preparing plans, programs, national and international projects for biodiversity, climate change, sustainable use of natural resources, environment and climate-friendly agricultural practices in agricultural ecosystems,</li> <li>• Carrying out works on agricultural drought and desertification caused by global climate change,</li> <li>• Performing agricultural-sourced greenhouse gas emission and sink calculations, preparing the National Greenhouse Gas Inventory,</li> <li>• Determining the greenhouse gas emission reduction potential by making future projections and modelling of the activities that cause agricultural greenhouse gas emissions (tarimorman.gov.tr/TRGM, 2020).</li> </ul>

	<p>Agricultural Reform General Directorate</p> <p>Agricultural Insurances and Natural Disasters Department</p>	<ul style="list-style-type: none"> <li>• Making plans for premium support for agricultural products, risk regions and enterprise scales, ensuring that the proposals are submitted for the President's approval,</li> <li>• Ensuring the control and regular payment of damage compensation payments,</li> <li>• Providing the allocation of the allowance in disaster schemes to the farmers who were harmed within the scope of Law No. 2090 on Aid to Farmers Suffered by Natural Disasters,</li> <li>• Tracking the loan returns of the farmers who suffered from disasters and whose conditions will be evaluated within the framework of Law No. 2090,</li> <li>• Ensuring that the loan debts of the farmers who use loans and suffer from disasters again within the framework of the Law No. 2090 are postponed for a year (<a href="http://tarimorman.gov.tr/TRGM">tarimorman.gov.tr/TRGM</a>, 2020),</li> </ul>
	<p>State Hydraulic Affairs General Directorate (DSI)</p> <p>Survey Planning and Allocations Department</p>	<ul style="list-style-type: none"> <li>• To collect data to benefit from water and related soil resources, to evaluate them and to determine whether the project is technically, economically and environmentally feasible by conducting exploration, master plan and feasibility studies,</li> <li>• Preparing exploration and planning reports by conducting studies for flood and sediment control (,2020)</li> </ul>
	<p>State Hydraulic Affairs General Directorate (DSI)</p> <p>Specialty Group on Effect of Climate Change on Water Resources</p>	<ul style="list-style-type: none"> <li>• In 2012, the "Climate Change Adaptation Unit" was established under the Department of Surveying, Planning and Allocations to carry out and coordinate climate change and adaptation studies. Later, it was restructured under the name of "Specialty Group on the Effect of Climate Change on Water Resources" with Circular No. 2012/8 dated 18.12.2012 prepared by the Ministry. It participates in the activities under the DSI Climate Change and Air Management Coordination Board (İDHYKK) (<a href="http://dsi.gov.tr/faaliyetler/iklim-degisikligi">dsi.gov.tr/faaliyetler/iklim-degisikligi</a>, 2020).</li> </ul>
	<p>Meteorology General Directorate</p> <p>Research Department</p> <p>Meteorological Disasters Branch</p>	<ul style="list-style-type: none"> <li>• Conducting research and development studies on meteorological disasters, hydrometeorology, marine and agricultural meteorology, climate, climate change and other subjects related to meteorology,</li> <li>• Conducting meteorological studies for environmental activities and cooperating with stakeholders (<a href="http://mgm.gov.tr/kurumsal/birimler.aspx">mgm.gov.tr/kurumsal/birimler.aspx</a>, 2020),</li> </ul>

	<p>Research Department Climate and Climate Change Branch</p>	<ul style="list-style-type: none"> <li>• Perform monitoring, research and model works on the issues of climate and climate change;</li> <li>• Perform analysis of climate parameters and Turkey climate classification;</li> <li>• Create climate projections using models, support adaptation and damage reduction works against negative impacts of climate change;</li> <li>• Perform analysis and research on the issues of ozone and ultraviolet radiation (<a href="http://mgm.gov.tr/kurumsal/birimler.aspx">mgm.gov.tr/kurumsal/birimler.aspx</a>, 2020)</li> </ul>
	<p>Research Department Hydro-Meteorology Branch</p>	<ul style="list-style-type: none"> <li>• Conducting research and development works on hydrometeorological issues;</li> <li>• Carrying out research and development studies on sudden flood and early warning issues;</li> <li>• Conducting hydrometeorological survey, analysis and precipitation assessment works (<a href="http://mgm.gov.tr/kurumsal/birimler.aspx">mgm.gov.tr/kurumsal/birimler.aspx</a>, 2020),</li> </ul>
	<p>Research Department Agricultural Meteorology Branch</p>	<ul style="list-style-type: none"> <li>• Conducting drought analysis</li> <li>• Carrying out research and analysis on plant climate demands, product monitoring and efficiency estimation</li> <li>• Operating plant climate models (<a href="http://mgm.gov.tr/kurumsal/birimler.aspx">mgm.gov.tr/kurumsal/birimler.aspx</a>, 2020),</li> </ul>
	<p>General Directorate of Forestry</p>	<ul style="list-style-type: none"> <li>• Preventing erosion, controlling floods, avalanches and overflows;</li> <li>• Implementing the integrated basin improvement master plan prepared in cooperation with the relevant units to protect the soil, water and plant balance,</li> <li>• Carrying out works for struggling against desertification</li> <li>• Erosion control studies in forest areas or areas subject to erosion to be taken into forest regime, mountainous areas (<a href="http://ogm.gov.tr/Baskanliklar/ToprakMuhafazaveHavzaIslahi/Sayfalar/Toprak-Muhafaza-ve-Havza-Islahi.aspx">ogm.gov.tr/Baskanliklar/ToprakMuhafazaveHavzaIslahi/Sayfalar/Toprak-Muhafaza-ve-Havza-Islahi.aspx</a>, 2020).</li> </ul>

MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE	European Union and External Relations General Directorate	<ul style="list-style-type: none"> <li>• Participating in the works of national and international organizations, platforms, formations and similar structures on the environment, energy, greenhouse gases and climate change (abdi.uab.gov.tr/, 2020),</li> </ul>
	Communication General Directorate	<ul style="list-style-type: none"> <li>• Determining the policies, strategies and targets for communication and postal services and related universal services and emergency communication</li> <li>• Determining service policies and principles of execution related to them and following their implementation, planning and implementing infrastructure and services (hgm.uab.gov.tr/, 2020),</li> </ul>
MINISTRY OF ENERGY AND NATURAL RESOURCES <sup>4</sup>	Energy Efficiency and Environment Department General Director of Management Services	<ul style="list-style-type: none"> <li>• Following national and international developments within the scope of sustainability, environment and climate management, researching their effect on energy policies,</li> <li>• Taking part in working groups of the Climate Change and Air Management Coordination Board in the electricity and heat generation sector,</li> <li>• Contributing to the preparation of national climate-related notifications and reports, preparing the sector-related section of the national greenhouse gas inventory report,</li> <li>• Participating in the review meetings of the United Nations Framework Convention on Climate Change secretariat (yegm.gov.tr/iklim_degisikligi.aspx, 2020)</li> <li>• Carry out processes and transactions with disasters and emergencies</li> </ul>
MINISTRY OF HEALTH	Turkey Public Health Institution  Environmental Health Department	<ul style="list-style-type: none"> <li>• Taking necessary measures for air pollution and climate change</li> <li>• Ensuring that in natural disasters environmental health services are provided in place, on time and effectively\),</li> <li>• Identifying, monitoring and auditing the elements that threaten environmental health, participating in environmental health impact assessment studies,</li> <li>• To improve and develop environmental health services; conducting studies at the national or international level, developing programs, plans and projects and implementing them in cooperation with other institutions and organizations, (hsgm.saglik.gov.tr/tr, 2020)</li> </ul>

<sup>4</sup> Presidential Decree on the Presidential Organization No.1, Published in the Official Gazette dated - No: 10/7/2018 - 30474

MINISTRY OF HEALTH	Turkey Public Health Institution Environmental Health Department	<ul style="list-style-type: none"> <li>• Taking necessary measures for air pollution and climate change</li> <li>• Ensuring that in natural disasters environmental health services are provided in place, on time and effectively,</li> <li>• Identifying, monitoring and auditing the elements that threaten environmental health, participating in environmental health impact assessment studies,</li> <li>• To improve and develop environmental health services; conducting studies at the national or international level, developing programs, plans and projects and implementing them in cooperation with other institutions and organizations (hsgm.saglik.gov.tr/tr, 2020)</li> </ul>
	Health Threats Early Warning and Response Department	<ul style="list-style-type: none"> <li>• In events that have the potential to threaten public health; collecting and analyzing data and information about biological, environmental, chemical, radiological and nuclear events and events that have an unknown origin and have the potential to threaten public health,</li> <li>• Preventing spread at local, regional, national and international level with risk management and monitoring activities</li> <li>• Communicating early warning information to relevant stakeholders and evaluation (hsgm.saglik.gov.tr/tr/, 2020)</li> </ul>



## 5.2.2. Local Governments

The General Directorate of Local Governments was established within the Ministry of Environment and Urbanization with the Presidential Decree No. 1 on the Presidential Organization, published in the Official Gazette No. 30474 dated 0.07.2018, with the mission of regulating local governments and their relations and relations with the central administration. The 100th article of Presidential Decree no.1 specifies the duties and powers of the General Directorate of Local Governments. Accordingly, these were defined as following-up the duties and services given by the legislation regarding the work and operations of the local administrations, ensuring that investments and services are carried out by the development plans and annual programs, conducting research, collecting, evaluating and publishing statistical information, in-service training and determining the standards for organization, vehicle and staff. In this context, the General Directorate provides the control and monitoring of the services performed by local governments in the context of disaster management and adaptation to climate change. In Turkey, the strategic plan is prepared every five years by the public institutions under the scope of central administration and municipalities with a population of over 50,000 municipalities under Law No. 5018 on Public Financial Management and Control Law. Within the scope of their job descriptions, local governments include their strategic goals and action priorities regarding disaster risk reduction according to the type of disaster they encounter in their strategic plans.

Definitions of duties, powers and responsibilities for disaster management have been made in the legislation on local governments. According to this; Article 53 of the Municipality Law No. 5393 related to emergency planning states: “The municipality makes the necessary disaster and emergency plans, prepares the team and equipment, taking into account the characteristics of the town to protect against fire, industrial accidents, earthquakes and other natural disasters or to reduce their damages.” In the process of preparing these plans by local governments, it is important to integrate with other emergency plans at the provincial level and to take the opinions of all

stakeholders (relevant ministries, public institutions, professional organizations, universities and other local administrations). It is possible to make joint programs with stakeholders by taking measures to increase the public's awareness in line with these Plans in the Law. It is also regulated under the same article that, about the places of occurrence of disasters, even if these take place outside the municipality's borders, if any fire and natural disaster takes place, required aid and support is provided to such regions.

Article 69, which regulates the production of lands and houses, includes the process of producing land from the soil by the Municipality. "It has the authority to produce zoned and infrastructure lands within the boundaries of the municipality and adjacent areas, excluding the areas that need to be protected according to special laws and agricultural lands to ensure regular urbanization, to meet the needs of the city's housing, industrial and commercial areas, to build, sell, rent housing, collective housing and to purchase land for these purposes, to make expropriation, to barter these lands, to cooperate with other relevant public institutions and organizations and banks and to realize joint projects with them when necessary".

Concerning land allocation for those who suffered disasters, it is stipulated that: "The sale of houses and workplaces, except lands, is not subject to the provisions of the State Tender Law No. 2886 Land could be allocated within the borders of that municipality and adjacent areas, to people with low income who do not have housing belonging to themselves, their spouses or their children under the age of eighteen, those who are exposed to disasters, those who will be transferred from the industrial zones and cooperatives whose members are all in this situation, from the amount which shall not be less than the amount to be determined by the discretionary commission established under the provisions of the Expropriation Law No. 2942."

The additional paragraph for the continuity of municipality services in settlement areas that are subject to disasters (31/10/2016-KHK-678/11 Art.; Adopted 1/2/2018-7071/11 Art.): "The governor or mayor of the municipalities of the settlements exposed to the disaster, mass migration and terror may request that the disrupted

municipal service be performed by another municipality. The municipality from which assistance is sought may fulfil this request with the permission of the Minister of Interior, without the need for a council decision” ensures that service support from another municipality could be provided with Ministerial permit without any decision by the council.

The Third Section of the Metropolitan Municipality Law No. 5216 includes the Duties, Authorities and Responsibilities of the Metropolitan Municipality. In Article 7-subparagraph u, the duties, powers and responsibilities of the metropolitan municipality in the context of disaster management are stated as follows,

- ▶ Following the plans made at the provincial level, to make planning and other preparations for natural disasters at the metropolitan scale; to provide tools, equipment and material support to other disaster areas when necessary; to conduct fire brigade and emergency services; to determine explosive and flammable substance production and storage places, to inspect residences, workplaces, entertainment places, factories and industrial establishments and public institutions in terms of measures to be taken against fire and other disasters, to give permits and licenses required by the legislation in this regard”.
- ▶ (Amended 12/11/2012-6360/7 Art.): Providing all kinds of support upon request of district municipalities for evacuation and demolition of buildings that pose a disaster risk or pose a danger to life and property safety.

Concerning disaster management under paragraph f related to the tasks and duties of district municipalities (Annex 12/11/2012-6360 / 7 art.), the evacuation and demolition of buildings that pose a disaster risk or a danger to life and property safety are under the responsibility of the district municipalities.

In the Special Provincial Administration Law No. 5302, which is the organization law of provincial private administrations, another local governance unit, the local administrations are granted the task of preparing disaster emergency plans, and new measures have been foreseen with disasters. The Revenues and Expenses

of the Special Provincial Administration are stated in the First Part of the Fifth Chapter of the Law, Financial Provisions and Penalties. Natural disaster expenses were specified under paragraph “o” of expenses. Provisions related to Emergency Planning are given in Article 69. “The special provincial administration makes the necessary disaster and emergency plans, prepares the team and equipment, taking into account the characteristics of the province to protect against fires, industrial accidents, earthquakes and other natural disasters or to reduce their damages. In the preparation of emergency plans, coordination with other provincial emergency plans, if any, is ensured and the opinions of the relevant ministries, public institutions, professional organizations, universities and other local administrations are taken. In line with the plans, necessary measures can be taken for the education of the public and joint programs can be made with the administrations, institutions and organizations listed in the second paragraph. Special provincial administration can provide necessary assistance and support to these regions in case of fire and natural disasters outside the province”, which provision sets out the responsibility for emergency planning outside the borders of adjacent areas. It was stated that these plans should be prepared in cooperation with the stakeholders, and they should be integrated with the plans prepared by other institutions. It is also allowed to provide support in any disaster outside the province, as in the case of municipalities.

With authority given to them by the relevant law, 30 metropolitan municipalities emphasize the environmental planning and development planning processes, and the other 51 provincial municipalities emphasize their measures to mitigate risks in their development planning processes. Efforts to combat poverty, adaptation to climate change, and reduce natural and human-induced disaster risks are intensively carried out by local governments. However, since disaster risk reduction is not made under a different economic code in the budgeting system, the data on how much allowance has been allocated and spent cannot be seen as a whole. In recent years, studies have been carried out to determine the allocations made for activities in disaster management and each phase of disaster management (AFAD, 2015). Also, there are some uncertainties about the work and procedures to be done by local governments in terms of risk reduction. Existing mechanisms for disaster risk

analysis, assessment and transfer of these findings to the development planning process, coordination with other institutions, NGOs and citizen participation are insufficient. Through the city councils established within the municipalities, participation mechanisms are tried to be operated, even if limited.

The Provincial Disaster Risk Reduction Plans prepared by AFAD at the provincial level were first prepared and implemented in the pilot province of Maraş. It is planned to complete the risk reduction processes by determining the provincial disaster risks with these plans to be prepared in the context of other provinces. Provincial Disaster Risk Reduction Plan (IRAP) is a sustainable plan that reveals the disaster nature of the province and the possible effects of disasters and defines the responsibilities, defining the works to be carried out without disasters to minimize these effects. It is aimed by AFAD to prepare a Provincial Disaster Risk Reduction Plan specifically for Maraş and to create a guide to be used in other provinces (kahramanmaras.afad.gov.tr, 2020). These plans to be prepared are expected to constitute an important basis in the provinces, especially for municipalities, in the context of disaster management, especially in development planning processes.

Within the scope of the measures to be taken by local governments against climate change and disaster risks, a circular was sent to 81 provincial governorships and all municipalities by the Ministry of Environment and Urbanization in January 2019 regarding the urgent measures to be taken against disasters caused by climate change. With the circular on “Climate Change and Disaster Measures” signed by the Minister of Environment and Urbanization, Murat Kurum, it was stated by local governments that the number and severity of disasters, especially floods and floods experienced due to global climate change, increased and caused the loss of life and property. Under the scope of risk mitigation measures to be taken;

- ▶ “Cleaning of rubble and soils in the stream beds, improvement of streams and canals, ensuring the flow of water at low altitudes of the land, performing bridge and culvert work in a way that does not narrow the water flow section;
- ▶ Terracing works on slopes with flood risk, determination and transformation

of structures under risk;

- ▶ Improvement of insufficient structures in floods and rainwater discharge, taking necessary measures in landslide sensitive areas;
- ▶ Determining disaster risks in the selection of new residential areas, preparing sensitivity maps and taking into account maps in development plans;
- ▶ Providing data flow to engineers and urban planners on high-risk areas in the selection of new residential areas;
- ▶ Removal of factors that will force the flow of floodwaters towards the sea in settlements on the seaside;
- ▶ Basins will be established in city centres for the disposal of floodwaters, and necessary information should be given to the people in the areas exposed to disasters about what to do after the disaster;
- ▶ Increasing the awareness of the public against disaster risks and creating early warning mechanisms against disasters”, which have been specified in the Circular.

Also, it was stated that when necessary, technical, training, personnel and coordination support should be requested from other assigned public institutions and organizations, and local administrations should work in coordination.

Besides, with the "Regulation on Amendments to the Regulation on Norm Staff Principles and Standards of Municipalities and Affiliated Organizations and Local Administration Unions" published in the Official Gazette dated 8 April 2020, updates were made for the departments and branch directorates in Metropolitan Municipalities. In this context, within the Public Officer Staff Ledger of Local Administrative Unions and Ledger No I for Municipalities and Affiliated Institutions under the scope of Annex 4- Staff Ledgers of Municipalities and Affiliated Organizations and Local Administration Unions (Amended OG 8/4/2020-31093), the definitions for the positions of Climate Change Department Head, Climate Change Director and Earthquake Risk Management and Urban Improvement Department Head, were assigned under General Administrative services (GIH) class. Necessary conditions have been provided for making arrangements in the

organizational charts of metropolitan, provincial and district municipalities within the body of municipalities. The management of the “local climate action plans”, which should be prepared by the climate departments and directorates and local governments, will be carried out effectively. Local climate action plans will start to be prepared by the municipalities in the coming days following the enactment of the Regulation, which is being prepared by the Ministry.

As indicated in Turkey's Seventh National Communication; within the scope of the "Increasing Institutional and Technical Capacity for the Development of Climate Adaptation Strategies Project" supported by the Ministry of Environment and Urbanization, a "Climate Change Adaptation Support Package for Cities" was created for Bursa Metropolitan Municipality. This practice constitutes a guideline for the process of preparing the municipal climate change adaptation plans in Turkey. Also, local governments have various duty-authority responsibilities in making legal regulations and creating implementation tools in climate-related sectors (waste, building, energy, etc.). There are also applications in the measures required to reduce greenhouse gases and in the urban planning process related to adaptation activities (MEU, 2018).

In 2017, the "Development of Planning Principles and Criteria in Urban Transformation Applications" was initiated by the Ministry of Environment and Urbanization towards Law No. 6306 on Transformation of Areas Under Disaster Risk. Within the scope of the project, under the Spatial Plan Preparation Regulation and the "Law No. 6306", it is aimed at re-determining the habitability standards of the urban space in the zoning plans for the renewal of unqualified building stocks for the reduction of disaster risks and creating planning principles and criteria that handle together with the urban green areas, social and cultural facilities, technical infrastructure and transportation systems. Protection of interior architecture and reintegration of the neighbourhood scale is also among the primary objectives of the project (MEU, 2018).

United Nations, UNISDR (United Nations Office for Disaster Risk Reduction) launched a campaign for local governments under “Making Cities Resilient” in

2012. This campaign is promoted at international meetings held on the disaster, risk, earthquake, climate change and other related issues, and efforts are made to reach all under-risk cities, especially local administrators, through the materials developed. Ten main articles have been determined to make cities more resilient within the scope of the campaign. Within the scope of Article 1, it is stipulated to organize events and cooperate to understand and reduce disaster risks based on the participation of groups formed from citizens and non-governmental organizations. In Article 2, allocating a budget for disaster risk reduction and granting incentives to homeowners, low-income families, communities, workplaces and public institutions to reduce the risks faced have been brought to the agenda. In Article 3, collecting up-to-date data on sensitive points against hazards and disasters, making risk assessment as a basis for city development plans and decisions, information and plans for the city's resilience being available to the public and public opinion, were emphasized. In Article 4, it is specified to invest in critical infrastructure that reduces risks such as flood drainage and, if necessary, to change such infrastructures to deal with the climate change problem. In Article 5, it is mentioned to evaluate the security of all schools and health facilities and to increase their security if necessary. It is stated in Article 6 that realistic and risk-compliant construction regulations and land use principles should be applied. It is envisaged to identify safe lands, especially for low-income citizens and to improve illegal buildings where appropriate. In Article 7, it is stated that the ecosystems and natural buffers should be protected to provide education and training services to students and local people for the reduction of disaster risks, and in Article 8 to alleviate the flood, storm wave and other dangers that the city may be sensitive to. It is envisaged to ensure adaptation to climate change by developing risk reduction practices. In Article 9, it is stated that early warning systems should be established in the city and the emergency management capacity should be improved, and public preparation exercises should be carried out regularly. In Article 10, it was stated that, after any disaster, the needs of the surviving citizens should be placed at the centre of restructuring activities, and individuals and social organizations should be assisted in determining and responding to problems, including the rebuilding of homes and livelihoods (UNISDR, 2018). From Turkey, four metropolitan cities, including Istanbul, Bursa, Antalya and Gaziantep Metropolitan have been carrying out their activities under

this scope (AFAD, 2014).

As specified under the 7<sup>th</sup> Climate Change Communication of Turkey, since the introduction of the 6th National Communication on Climate Change, progress has been made in local government and different sectors in adaptation to climate change in their work at the national level. The Ministry of Environment and Urbanization provides activity support for capacity building compliance with municipalities and district administrations. Organizations in the private and voluntary sectors contribute to studies on adaptation to climate change. However, there are gaps in local strategy and action plans for climate change actions at the local level, especially in metropolitan cities. Although local climate plans and strategies have been developed in some cities, local studies on climate change adaptation and mitigation are limited (MEU, 2018).

## 6. CONCLUSION

In conclusion, there is now an increasing demand for a common framework for climate change adaptation and long-term climate change in reducing vulnerability to disasters. Turkey is also required to engage in a total risk reduction mobilization by stakeholders compared to the previous period to do the better within the context of information, governance, financing relates to disaster risks in the Sendai process.

The world is exposed to different disasters every day, and governments constantly test their management skills. As in the Covid19-Pandemic process, which our country, unlike many other developed countries, has been conducting with great self-sacrifice and success under the leadership of scientific foundations since March 2020, it is necessary to combat disasters by ensuring the participation of public-private sector-citizens in harmony as a single voice. Our sense of belonging as a society and our ability to engage have enabled a rapid recovery process by the central government and local governments after many disasters. In this context, achieving the same success in climate change adaptation studies and doing what is necessary to reduce existing disaster risks depends on the systematic implementation of commitments, programs and targets determined in the context of both international and national policies.

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# AGRICULTURAL POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

*Prof. Dr. Zeynep Zaimođlu*



# 1. INTRODUCTION

The agriculture sector is a sector directly linked to natural resources and climatic conditions. For this reason, agricultural product prices vary every year. Countries should be able to support both production and producers simultaneously with the agricultural policies they will form according to changing economic and natural conditions.

Today, it is one of the biggest difficulties of policy makers to develop policies that are compatible with climate changes and the decrease of natural resources day by day, in addition to many constraints in general.

Our country's agricultural policies have become more fragile with the limitation of climate and natural resources. The high risk perception of the agricultural sector and the uncertainties in its nature, as well as climate change and its effects cause the income of the producers and employees in the sector to be under significant risks. It is an important requirement to protect all components in the sector from these risks. Both the risks undertaken by those in the sector and the costs to consumers of the fluctuations in agricultural output prices cause the state to intervene in the agricultural sector and to protect the sector with various support policies.

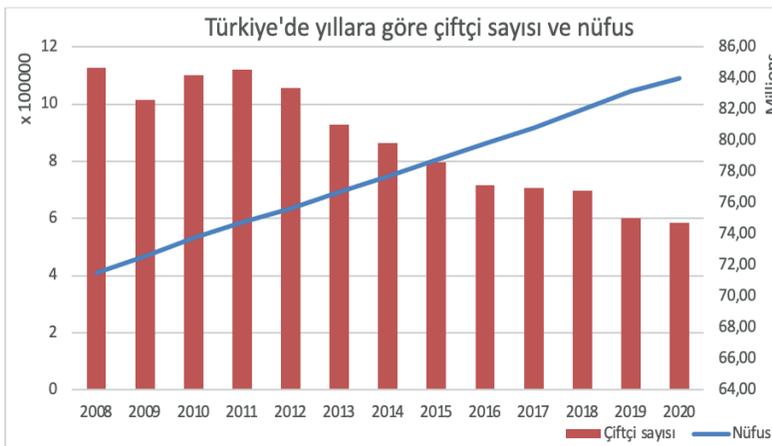


## 2. TURKEY AGRICULTURAL POLICIES

### 2.1. Main Indicators Related to the Agricultural Sector

The agriculture sector in Turkey corresponds to some 7% of GDP, as opposed to constituting livelihood for one almost one third of population. The changes in agricultural policies in recent years have negatively affected the share of the sector in the GDP and the sector, which received more than 30% of the GDP in the 1970s, has regressed to a position that can produce only 6-7% of the GDP today. On the other hand, it is seen that the employment in the sector also declined over time, but there was no sharp decline similar to the sector's share of GDP. While the share of the sector in total employment was around 34% in the 1970s, it is observed that this ratio has decreased to 23% since the 2010s, as a result of the declining years. It is seen that with the added value created by the sector, it has decreased to its total employment share levels. Considering the added value created by the sector together with the total employment share data, it is possible to say that the level of income in the sector is quite low, and even this level has declined further in recent years (Turan et al. 2017, Ataseven, et al. 2020).

**Table 1:** Change of Employment in Population and Agriculture Over the Years (SGK, TÜİK, 2020)



Turkey is among the top 20 countries in agricultural production in the world though this changes over years and according to the product. Although it is a fact that the climatic and geographical conditions of our country are suitable for agriculture, agriculture can only be done by forcing the conditions on approximately 30 million hectares of the total area of 77.8 million hectares. Although the unit area productivity in agriculture is increasing in the world, the increase in the population and consumer demands necessitates the protection of limited agricultural areas. As can be seen in Table 1, the loss of agricultural area overall Turkey is approximately 4.2 million hectares between 1990 and 2018.

**Table 2:** Changes in Cultivated Areas by Years

Years	Total Agricultural Area	Total Cultivated Area and Long Life Plant Area	Cultivated Agricultural Area			Field of Long Life Plants	Meadow And Pasture Land
			Planted Area	Fallow	Total		
1990	42,0	27,9	18,9	5,3	24,2	3,0	14,2
2000	38,8	26,4	18,0	4,8	22,8	2,6	12,4
2010	39,0	24,4	16,3	4,2	20,5	3,0	14,6
2018	37,8	23,2	15,4	3,5	18,9	3,5	14,6

Resource: TUIK, 2019; Ataseven, et al., 2020

While the total agricultural areas in the world were 4,92 billion hectares in 2000, it decreased to 4,83 billion hectares in 2017 (FAOSTAT, 2018). Agricultural areas in Turkey are decreasing. According to the 2018 data of TURKSTAT, the total agricultural area decreased to 37,8 million hectares and the cultivated agricultural areas decreased to 23,2 million hectares. The decrease in agricultural areas is due to reasons such as allocation of agricultural lands for misuse, the fact that some small-scale business lands that cannot generate sufficient income are out of agriculture and land degradation caused by wrong agricultural activities and incorrect land use (TZOB, 2019; Ataseven et al., 2020).

One of the major problems that could be prevented in our country, managerially and legally, was that the enterprises were small and fragmented and these lands became smaller over the years, but in recent years, legal regulations regarding inheritance law have been rearranged in order to prevent this fragmentation and land shrinkage. Apart from the fact that this inheritance law regulation prevents the fragmentation of the lands, the land consolidation works created for fragmented lands have been started especially on 1st class agricultural lands with high productivity. In Turkey, according to Soil Conservation and Land Use Law No. 6537, the minimum size of agricultural land that will apply from 2014 has been determined by the Law. In the Law, it is stated that agricultural lands cannot be smaller than 20 decares, planted agricultural lands 5 decares and greenhouse agricultural lands 3 decares (RG, 2014). In recent years, especially since 2017, the consolidated area has reached 6.1 million hectares. The area that needs consolidation in Turkey is 14,3 million hectares in total. As can be seen from Table 1, Turkey faces with decrease in the planted agricultural areas due to fragmentation, use for non-intended purpose, agricultural supports and costs.

**Table 3:** Change in Agricultural Lands by Years, TUIK, 2020



As can be seen from Table 3, agricultural land, which was 26 million 579 thousand hectares in 2002, decreased to 23 million 94 thousand hectares in 2019. Accordingly, agricultural areas decreased by 12,3 percent in 18 years.

However, in recent years, consumers of agricultural products have become more sensitive to organic products produced cleanly with ancestral seeds, especially those living in metropolises with a higher income and education level socio-economically. For this reason, another hope arises for women farmers in cooperatives and agriculture as a result of the rural women reaching the final consumer with the help of women's production cooperatives by making production on their own small lands.

Land consolidation efforts can be defined as one of the most important political measures in terms of adaptation and mitigation with climate change, especially in terms of efficiency of irrigation water and emission reduction due to agricultural mechanization and savings in the use of fossil fuels used in agricultural machinery. Irrigation rate exceeds 90% in areas where land consolidation is carried out (TZOB, 2019).

**Table 4:** Proportional Evaluation of Agriculture Turkey

	2001	2006	2016
Average business width (decares)	61	-	76
The number of parcels per business (units)	4,1	-	5,9
Average parcel size (decares)	15,0	-	12,9
Irrigated land rate in total land (%)	23,9	24,1	31,4
Irrigated land rate in total planted land (%)	23,7	27,8	34,7
The proportion of enterprises that can only cultivate their own land (%)	81,3	85,1	79,5
The share of those who cultivate their own land in the cultivated agricultural areas (%)	74,0	71,4	59,9
The proportion of enterprises with only crop production (%)	30,2	37,2	-

Resource: TUIK, 2019; Ataseven, et al., 2020

On the other hand, it is possible to say that we are faced with important productivity problems, and we need to take into account climate changes and their effects.

If we take a look at the yield losses as a result of extreme meteorological events that occurred only in the first 6 months of 2020, according to the May "Phenological Evaluation Report" of the Agriculture Soil Products Office, between 16-21 May, there was a 20-30% loss in yield in wheat cultivated areas İmamoğlu, Kozan and Sağkaya regions of Adana depending on extreme heat.

In Şanlıurfa, a local increase was observed in the ratio of scrawny grain as the wheat in the milk ripening period entered the full maturation period before it fully filled. Barley in arid / sandy areas in the high parts of Ankara caused early rising due to water stress, burning in the spike in barley cultivated areas in Kırıkkale, weak grain and low level of hectoliters.

In the same week, empty spike formation due to frost damage in cereal cultivated local areas in Konya province Yunak-Paddy-Tuzlukçu-Akşehir line, empty spike formation in barley cultivated local areas in Eskişehir, local damage to wheat, have occurred. Local damage occurred in beans and some fruit trees in 4 villages in Niğde, and local damage occurred in beans in Afyonkarahisar (Yıldırım, 2020).

As it could be seen from the foregoing examples, climate change is at sectoral level that directly affect the agricultural world and Turkey and is becoming a growing source of risk and vulnerability (Salalı, et al. 2019). In this framework, medium and long-term (2030 and 2050) agricultural policies should be determined for the observed and predicted effects of climate change in order to make the agricultural product supply sustainable (Tüsiad 2019).

According to comparative data for major agricultural countries, Turkey falls back many developed countries in the field of many sub-production areas in vegetative production in unit area, mainly lead by the production of animal products. It is also seen that the numbers have changed over the years according to the agricultural GDP figures (Durmaz, 2019). Growth in the agricultural sector is below the general

growth figures of our country. In agriculture, while the GDP, reached from 70.5 billion TL to 107.7 billion TL in the 10-year period from 1998 to 2018, Turkey's economy has grown by around 2.5 folds in the same period, reaching to 1.737,1 billion TL from 710 billion TL. Despite the increasing amount of support provided recently, it is clearly seen from the TUIK figures that the sector's share of GDP has decreased.

## 2.2. Key Policy Changes

In 2018, the Ministry of Agriculture and Forestry was established by merging the Ministry of Food, Agriculture and Livestock and the Ministry of Forestry and Water Affairs. The preparation works for the 2019-2023 strategic plan are carried out by the Ministry of Agriculture and Forestry.

The scope of agricultural insurance support has been expanded by adding more varieties and risk factors. In 2018, barley, rye, oat and triticale production losses and risk factors for drought, frost, hot winds, heat waves, excessive humidity and excessive precipitation were added to the scope of the program. In 2019, the expansion continued with the addition of chickpeas, red lentils and green lentils. In 2018, 2.05 million TL (424 million \$) of insurance premium payments were made to 1.76 million agricultural insurance policies (TPIDR, 2019).

The climate change special expertise report prepared under the body of 8th 5-year development plan showed a roadmap in agricultural sector on sectoral basis in struggling against climate change in Turkey. According to this report:

Indirect measures that can be taken in agriculture and animal husbandry are listed as follows:

- ▶ Contributing to production by increasing irrigable areas, controlling fallow areas.
- ▶ Disseminating organic agriculture, developing policies related to support.
- ▶ Reducing methane emissions from paddy agriculture, improving irrigation technologies, reducing groundwater depth by improving drainage systems;

- ▶ Making regular soil analyzes in paddy fields and reducing fertilizer use based on Preventing the burning of herbal wastes remaining on the soil after grain production, especially stubble, which is prohibited by the Ministry of Agriculture.

#### Political measures to be taken related to livestock

- ▶ Extending the use of easily digestible grain feeds and supporting education and training programs
- ▶ Increasing the use of silage feeds instead of dried, difficult to digest feeds and expanding the production of silage;
- ▶ Development of intensive livestock farming instead of widespread animal husbandry; supporting animal breeding with high meat and milk yield.
- ▶ Research and determination of application areas of biogas energy-production systems based on fertilizer
- ▶ Solid storage systems of animal fertilizers, drying systems (dry storage), mixing (mixing with other plant wastes) and disseminating over large areas such as pasture (DPT, 8<sup>th</sup> Development Plan)

In addition to the road map suggested by the development plan, the policy recommendations that are requested to be implemented in an up-to-date and urgent manner are summarized below.

- ▶ Mobilization for Adaptation to Climate Change
- ▶ Urgent Formation of the "Adaptation Fund" for Climate Change
- ▶ Establishment of Climate Change Research and Application Institute in Agriculture
- ▶ Low-Income Farmers and Export-Oriented Climate Change Adaptation Supports
- ▶ Target in Organic Agriculture: 10% and Above Market Share
- ▶ Transition to 100% Pressure Irrigation in Agriculture
- ▶ Climate Based Dynamic Agricultural Insurance
- ▶ Risk-Management Centered International Trade Policies
- ▶ Farmer, Child and Youth Education and Dynamic Information (Tüsiad, 2019)



## 3. CONCLUSION

If it could use the agricultural potential which it has with policies focused on production, Turkey will become one of the countries that have advantage in the new agriculture order. Having a great richness with its climate, biodiversity, agricultural areas, Turkey can both produce its own needs and feed other countries. For this, it is necessary to implement policies that support production and farmers in the supply of agricultural inputs, agricultural supports, research, development and technology use.

Whereas Turkey has a high potential in agricultural production, it is weak in bringing concrete solutions to its structural problems. Especially the fragilities experienced throughout the economy are strongly reflected in the agricultural sector and it becomes even more important to implement permanent solutions that will have long-term effects.

For Turkey's agriculture and food sectors, in both the production side and in global terms, there is a significant potential for the formation of a competitive industry, but that potential cannot be assessed adequately. The basic target for Turkey in the way of reaching the target put by the Ministry of Agriculture and Forestry for the year 2023, which is 150 billion dollars of production and 40 billion dollars of export, should be an agricultural and food sector that is strategically positioned and prioritized in country policies (Yıldırım2, 2020).

As a result of the economic, institutional, social, legal, environmental and cultural problems experienced, there is a need for integrated and holistic, inclusive and permanent solutions to improve the status of stakeholders from producers to consumers throughout the value chain. In order to realize these, it is necessary to create micro-meso-macro scale and short-medium-long term road maps; benefit from Turkey's geographical and climatic advantages; use high technology; be a leader in selected products and create the added value within the country.

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# WATER MANAGEMENT POLICY IN TURKEY AND CLIMATE CHANGE ADAPTATION

*Prof. Dr. Erdem Görgün*



# 1. WATER RESOURCES MANAGEMENT IN TURKEY

Turkey's water policy is directly linked to the existing water potential and precipitation. Turkey has different climate types and precipitation regimes due to the geographical diversity it has. While higher precipitation is observed in the Black Sea and Mediterranean regions, lower precipitation values are observed in Eastern Anatolia and Central Anatolia regions.

This is one of the main components that shape Turkey's water policies.

Therefore; it is expected that approaches such as water-based watershed management, water allocation and management of inter-basin water transfer according to the purposes of use will be at the forefront in the management of water resources of Turkey.

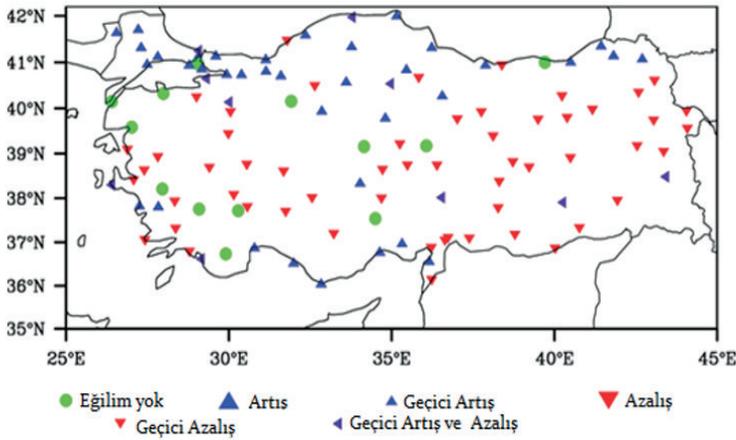
As Turkey takes place in the semi-arid region, improvement of water quality, ensuring the sustainability of conservation and use balances by increasing the amount of water used, are of great importance.

According to preliminary projections made with global climate models, a large part of Turkey will become under the effect of quite dry and hot weather. Rainfall shows a slight increase in winter, with 5-15% in summer and it is estimated that soil moisture will decrease by 15-25% during the summer months (SYGM, 2020).

In our country, which shows the spatial character of continental climate, the average annual rainfall between the years 1981-2017 has been recorded as 574 mm, which corresponds to an average annual rainfall volume of 450 billion m<sup>3</sup>.

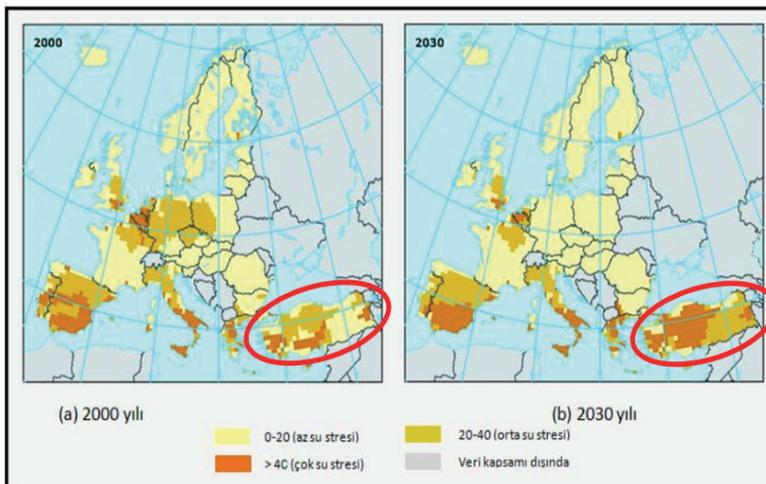
As described in Figure 1, precipitation varies between regions in terms of amount throughout the year in our country. While the annual precipitation amount is measured as 2,500 mm in the Eastern Black Sea Region, this value can be as low as 230 mm in Central Anatolia. Part of this precipitation that flows amounted to 172 billion m<sup>3</sup> overall the country (the National Water Plan, 2019).

**Figure 1:** Total Annual Precipitation Trend Analysis for Turkey, SYGM, 2020



As can be seen in Figure 2, whereas the situation improved in the Central Europe by the year 2030, it is foreseen that almost half of Turkey will encounter a "multiple water stress". In a study carried out by European Environment Agency (EEA), water stress levels were determined in Turkey and the EU for the years 2000 and 2030. Accordingly, by 2030 in Turkey, Central and Western regions will experience water stress at a rate exceeding 40%, while in the Southeast and East that rate is expected to be between 20-40% (SYGM, 2020).

**Figure 2:** Water Stress Levels in Different Years



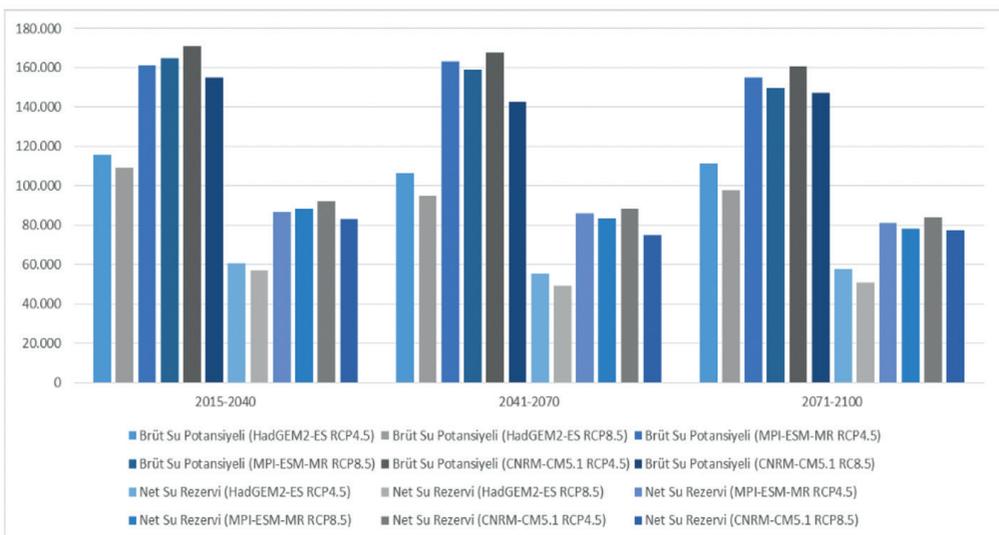
In a study conducted by the Repealed Ministry of Forestry and Water Affairs in order to determine how climate change will affect the water potential in the basins and the basins and periods that are likely to cause budget deficits, climate projections and hydrological models in the basins were created.

Possible changes in the water potential in the basins in the future period were determined using HadGEM2-ES, MPI-ESM-MR and CNRM-CM5.1 climate models and using temperature and precipitation projections for the 2015-2100 period based on RCP4.5 and RCP8.5 scenarios. The hydrological variables in the scale of the drainage areas identified in the basin were predicted until 2100, and the gross and net water potential variation in each basin were calculated.

2015-2100 period, gross and net change in total water potential in Turkey can be seen in Figure 3 based on all scenarios of models.

According to the results of each of the three climate models and two scenarios based on the reference period it is expected that total flow will decrease in Turkey.

**Figure 3:** Gross and Net Comparison of Water Potentials for Turkey by Climate Projection Scenarios



Development policies in Turkey show progress towards sustainable development. While the needs and diversifying preferences of the increasing population affect the development process, it becomes important to cope with the pressure created on the environment.

In the Tenth Development Plan, it is emphasized that the increasing demand in Turkey for the amount of usable water became increasingly unable to meet the needs as a result of drought and pollution in water collection basins. In the plan; issues such as lack of monitoring, evaluation and inspection, lack of a common database and information flow, weakness of coordination between institutions / organizations have been identified as the main problems encountered in water resources management, and policies have been determined in the field of water management.

Actions regarding the development of water resources were also included in the 65th Government Action Plan, which is another basic policy document and was put into effect in 2016.

In addition to national-scale strategy and development plans, there are various action plans directly or indirectly related to water management in institutions and organizations that have authority and responsibilities in water management.

**Figure 4:** Başlıca Ulusal Eylem Planları, Ulusal Su Planı, 2019

PLAN ADI	KURUM/ KURULUŞ
Nehir Havza Yönetim Planları (NHYP)	TOB
Havza Koruma Eylem Planları	TOB
Havza Master Planları	TOB
Su Kalitesi Eylem Planları	TOB
İçme-kullanma Suyu Havza Koruma Planları	TOB
Taşkın Yönetim Planları	TOB
Kuraklık Yönetimi Eylem Planı	TOB
Havza Su Tahsis Eylem Planları	TOB
Çölleşme ile Mücadele Ulusal Stratejisi Eylem Planı (2015-2023)	TOB
Erozyonla Mücadele Eylem Planı-	TOB
Maden Sahalarının Rehabilitasyonu Eylem Planı	TOB
Baraj Havzaları Yeşil Kuşak Eylem Planı (2013-2017)	TOB
Yukarı Havza Sel Kontrolü Eylem Planı (2013-2017)	TOB
Kırsal Kalkınma Eylem Planı (2015-2018)	TOB
Sulak Alan Yönetim Planları	TOB
Göller ve Sulak Alanlar Eylem Planı	TOB
Avrupa Birliği Entegre Çevre Uyum Stratejisi	ÇŞB
İklim Değişikliği Eylem Planı (2011-2023)	ÇŞB
Atık su Eylem Planı (2017-2023)	ÇŞB
Türkiye'nin İklim Değişikliği Uyum Stratejisi ve Eylem Planı	ÇŞB
Özel Çevre Koruma Bölgelerinde Su Kaynakları Yönetim Planı	ÇŞB
Avrupa Birliği'ne Katılım İçin Ulusal Eylem Planı (2016 – 2019)	DB

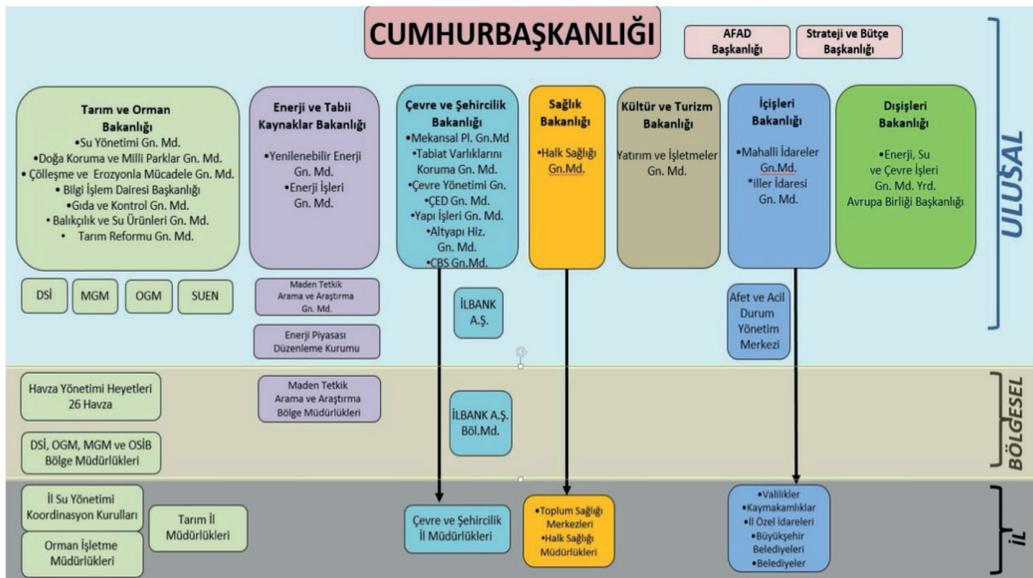
Although the main national plans, strategies and action plans given in Figure 4 have been prepared by different institutions, they concern many common areas and institutions/organizations in terms of content.

The most important of these common areas is "water". The fact that a large number of institutions are responsible in the field of water brings along various problems in applications in this regard.

Currently, institutions and organizations that have duties and authorities related to water are:

- ▶ Ministry of Interior,
- ▶ Ministry of Agriculture and Forestry
- ▶ Ministry of Environment and Urbanization
- ▶ Ministry of Industry and Technology
- ▶ Ministry of Foreign Affairs
- ▶ Ministry of Treasury and Finance
- ▶ Ministry of Energy and Natural Resources
- ▶ Ministry of Culture and Tourism.
- ▶ Ministry of Health
- ▶ Other Institutions

**Figure 5:** Institutions and organizations in Turkey Related To water, the National Water Plan, 2019



The general approach towards water management with DSI that is established in the 1950s has been towards the development of water resources in Turkey as in the case of the whole world.

DSI has carried out many projects to develop water resources in 25 basins.

The Environmental Law was enacted in 1983 to prevent environmental and water pollution, which increased in parallel with population growth and increasing urbanization and industrialization since the 1980s.

In 1988, Water Pollution Control Regulation was adopted.

The Ministry of Environment was established in 1991.

The General Directorate of ToprakSu, which is affiliated with the Ministry of Agriculture, dealing with vital issues such as farm drainage in irrigation areas developed by DSI, land consolidation studies and farmer training, was closed in 1984 and its activities were carried out by the General Directorate of Rural Services, which was responsible for providing drinking water and road services to rural areas. However, this General Directorate was also closed in 2005 and its services were transferred to Special Provincial Administrations (Water Policies Association, 2019).

In 2011, the General Directorate of Water Management affiliated to the abolished Ministry of Forestry and Water Affairs was established in order to ensure coordination in water management and to become the competent authority on water-related issues in the European Union. Basin-based management has been taken as a basis by the General Directorate of Water Management in order to ensure the protection and sustainable use of our country's water resources.



## 2. INSTITUTIONS PLAYING A ROLE IN WATER MANAGEMENT

Management of water resources in Turkey is undertaken by various public and private sector institutions that are directly and indirectly responsible from their management, development and protection. In the institutional framework, this structure consists of three stages: decision making, management and users.

In this process, in the decision mechanisms of the Prime Ministry, Ministry of Development (former State Planning Organization) and Ministries; DSI, General Directorate of Water Management, General Directorate of Environmental Management, Iller Bank, Special Provincial Administrations, Municipalities and similar organizations are at the management and development level, and farmers, Water User Associations and other water consumers are also at the usage phase.

### **Ministry of Environment and Urbanization**

To prepare and implement environmental legislation; to evaluate the environmental impact of facilities and activities; to watch, to allow, to control; to carry out measurement and monitoring studies related to receiving environments; treatment plant project approval, wastewater treatment plant project, tender and construction work, financing.

### **General Directorate of Environmental Management (CYGM)**

Preparing legislation on the control and prevention of environmental pollution, determining measurement, detection and quality criteria; to give an opinion in terms of environmental pollution according to the characteristics of the receiving environment; to carry out studies for the protection of ground and surface waters, seas and soil, and to prevent or eliminate pollution; to take part in determining

the design principles and criteria of wastewater treatment facilities, to carry out approval procedures; to work on minimizing waste.

### **General Directorate of Environmental Impact Assessment, Permit and Inspection**

To monitor all kinds of activities and facilities aimed at preventing environmental pollution and improving environmental quality, to take and take the necessary measures, to inspect, to issue environmental permits and licenses; to monitor and control the emission, discharge and wastes and treatment and disposal systems of activities and facilities that cause environmental pollution.

### **General Directorate of Protection of Natural Assets**

To manage national parks, natural parks, natural monuments, nature protection areas, wetlands, natural assets and natural protected areas and special environmental protection zones

### **Iller Bank:**

To develop drinking water supply, storage, network and treatment, stormwater network projects, to provide consultancy services to these administrations and to provide credit and technical support to municipalities for the construction of water, sewerage and wastewater treatment facilities

### **Ministry of Agriculture and Forestry**

Determination of agricultural policies, irrigation efficiency, fisheries and aquaculture legislation, assessment of the quality of all fisheries including coastal waters, pesticide control and monitoring.

Two government agencies have the biggest role to play in water management in Turkey are State Hydraulic Works (DSI) and the General Directorate of Water

Management (SYGM), respectively. Both institutions are under the Ministry of Agriculture and Forestry.

### **State Hydraulic Works (DSI):**

Since its establishment, DS has been the biggest institution in Turkey in water management.

While mentioning the main duties of DSI, providing drinking, irrigation and utility water and wastewater treatment services, flood protection, dissemination of irrigated agriculture, hydroelectric power generation, drilling or opening wells for groundwater studies and researches, allocating groundwater, underground water protection and registration , dam and transmission line, water purification facility constructions, water tanks construction, could be counted (Karabay, 2015).

### **General Directorate of Water Management (SYGM)**

SYGM was established in 2011 with the aim to ensure coordination among all institutions in Turkey on water management. While mentioning the duties of the SYGM, subjects such as water resources management, policy determination, coordination of water management at national and international level, preparation of river basin management plans, monitoring the quality of ground and surface waters, sectoral water allocation, establishment of the National Water Information System can be counted (Karabay, 2015).

### **General Directorate of Nature Conservation and National Parks:**

Protection of wetlands and biological diversity; management of protected wetlands.

### **Ministry of Energy and Natural Resources**

- ▶ General Directorate of Renewable Energy (abolished Electrical Works Study

Administration-EİE): Investigation of water resources for electricity generation.

- ▶ Energy Market Regulatory Authority (EPDK): Licensing for hydroelectric generation.

## **Ministry of Health**

Drinking water and bathing water quality monitoring, taking and taking measures related to environment and public health, making and inspecting health regulations related to water supply, sewage and conduit installations.

## **Ministry of Culture and Tourism**

Construction of wastewater treatment infrastructures in touristic areas

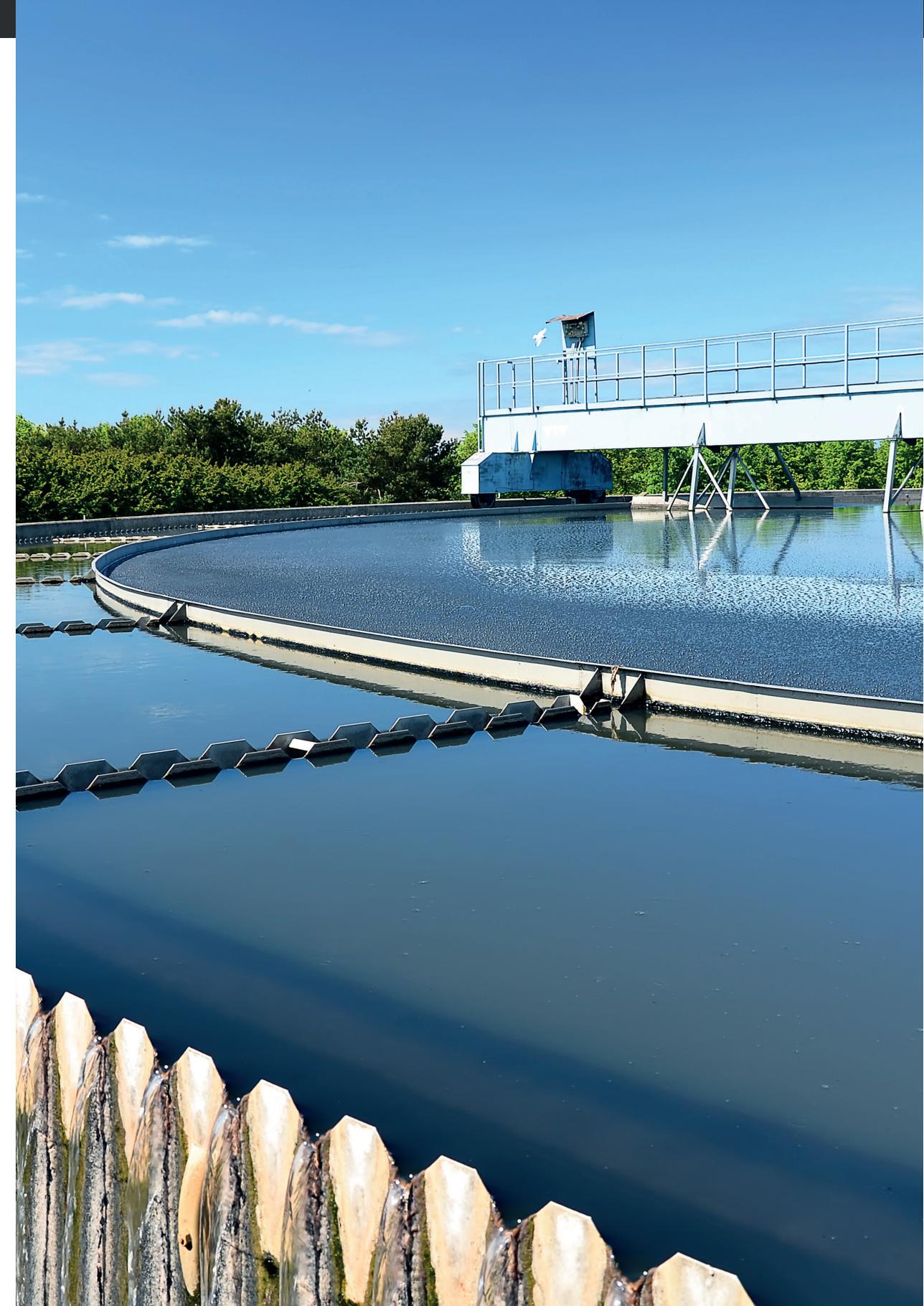
## **Ministry of Development**

General planning of water resources investments (e.g. dams, reservoirs and water supply, sewerage and treatment)

(Karabay, 2015).

## **Other Institutions**

- ▶ Special Provincial Administrations: Providing water, sewage and wastewater treatment services to settlements outside of municipal areas.
- ▶ Irrigation Unions: Irrigation water distribution at the local level.
- ▶ Municipalities: Water distribution, sewerage and wastewater treatment services, an inspection of industrial wastewater discharges, construction, operation and maintenance of wastewater treatment facilities.



## 3. WATER MANAGEMENT POLICIES

- 1.** Local governments should be empowered under the supervision of a strengthened central administration in water management. An administrative structure that will ensure the holistic management, planning and coordination of implementations of water and coincide with natural basin boundaries should be established.
- 2.** A strong administrative structure should be established in order to eliminate the confusion of duties, authorities and responsibilities in water, to prevent duplicate monitoring activities and waste of resources, and to ensure uniformity in permit, inspection and sanction processes, and a framework legal arrangement should be made to support this structure.
- 3.** Based on the agreement between the Ministry of Agriculture and Forestry and the Ministry of Environment and Urbanization on the Water Law Draft, the draft law should be put into effect and authorization conflicts should be ended.
- 4.** The relevant laws (Flood Law, Groundwater Law) should be revised accordingly.
- 5.** The effectiveness of water management should be increased by including structures such as agencies, institutes, watershed coordinators, foundations and NGOs.
- 6.** Social awareness on water management issues should be increased by assigning duty and responsibility to the representatives of non-governmental organizations invited and participating in activities carried out on water management issues (such as stakeholder / public participation).
- 7.** Topics/courses regarding the protection of water resources and floods should be added to the education curriculum by the Ministry of National Education.
- 8.** Coordination and harmony should be ensured between the plans made for water resources by other institutions and organizations, with Basin Management Plans at the top of the planning hierarchy regarding water.
- 9.** Basin Management Committees should be turned into the only authorized structure at basin scale in all planning and applications related to water resources and should have legal personality.
- 10.** A cumulative and strategic EIA application that takes into account basin-based water management plans should be adopted instead of investment-based EIA.

**11.** For the revision of the national water legislation, the infrastructure (personnel, equipment, organization, system, etc.), financing, administrative capacity needs should be determined and the necessary arrangements should be made immediately by setting the requirements of the EU environmental sector acquis.

**12.** NHYPs and Drought Management Plans in 25 basins should be completed until 2023; Flood Management Plans should be completed by 2021 and necessary updates should be made every 6 years.

**13.** For surface water resources, drinking-utility water basin protection plans should be prepared.

**14.** In relation to the Basin Management Plans, specific environmental standards should be set in Special Environmental Protection Zones, taking into account the flora, fauna and ecosystem integrity of the area.

**Figure 6:** Measures that can help water management, TEMA



## 4. ADAPTATION TO CLIMATE CHANGE

Turkey's current sustainable usable water potential is 112 billion m<sup>3</sup>, of which 94 billion m<sup>3</sup> is surface and 18 billion m<sup>3</sup> is ground water. Approximately 50% of this potential is currently being used in Turkey.

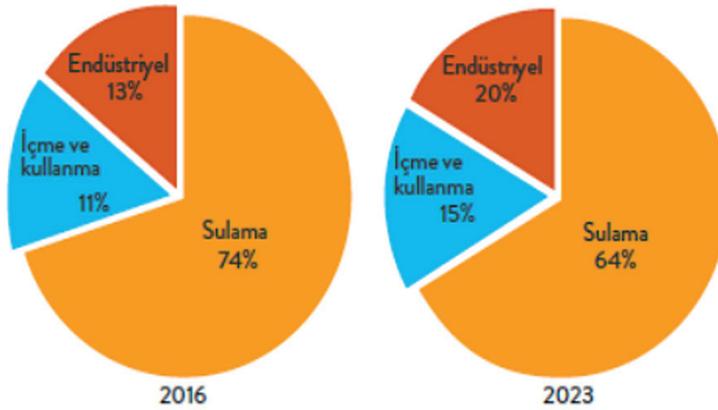
Total water consumption which was 54 billion m<sup>3</sup> in 2016 corresponds to 48% of the total water potential of Turkey. Total usage is covered by 39 billion m<sup>3</sup> surface and 15 billion m<sup>3</sup> groundwater.

Water used in agricultural irrigation has the highest share with 74%, where 13% is used in domestic and 13% in industry.

40 billion m<sup>3</sup> water was used for irrigation in 2016, 7 billion m<sup>3</sup> for domestic and 7 billion m<sup>3</sup> for industrial use (Turkey Water Institute, 2017).

Of the total water consumption in Turkey, the year 2004 is projected to increase nearly three times up to 2030 (Silkin, 2014).

In Turkey, it is estimated that all of 112 billion m<sup>3</sup> water will be totally used in 2023. It is expected that the water consumption amounts for 2023 will be a total of 112 billion m<sup>3</sup>, of which 72 billion m<sup>3</sup> for irrigation, 18 billion m<sup>3</sup> for utilization and 22 billion m<sup>3</sup> for the industry.

**Figure 7:** Sectoral water consumption in Turkey, Turkey Water Institute, 2017

Since the publication of the Sixth National Communication in 2016, progress has been accomplished in Turkey in the work on climate change adaptation.

This progress has been made at national level, in local governments and in different sectors.

The Strategic Environmental Assessment (SEA) Regulation entered into force after being published in the Official Gazette dated 8 April 2017 and numbered 30032.

While the environmental impact of certain minor projects were evaluated with the EIA Regulation that existed before the publishing of this Regulation, environmental, economic and social impacts of plans and programs prepared in the field of agriculture, forestry, fisheries, energy, industry, transportation, waste management, water management, telecommunications, tourism, spatial planning and the framework for projects and activities defined in Annex I and II of the EIA Regulation will be evaluated by the SEA Regulation.

IDEP (Climate Change Action Plan) has been reflected in corporate documents, and this gives information about approach of Turkey to the process.

In the 2013-2017 and 2018-2020 Strategic Plans of the Ministry of Environment and Urbanization, climate change mitigation and adaptation activities are among the main strategic objectives (Ministry of Environment and Urbanization, 2017).

Ministry of Environment and Urbanization, local governments, non-governmental organizations, universities, relevant public institutions and provincial organizations, etc. support stakeholders in their work and carry out various capacity building and supporting activities on adaptation to climate change.

In addition to public institutions, organizations in both private and voluntary sectors make significant contributions to climate change adaptation efforts.

Provinces and regions have recognized the need for adaptation through independent plans or strategies, or as part of larger climate change plans or strategies, and invested to support adaptation initiatives.



## 5. ADAPTATION MEASURES

It is a known fact that water resources will be exposed to the negative effects of climate change on a serious scale. As a result of this situation, many water-dependent sectors that use water will also be indirectly affected by climate change. For this reason, climate change adaptation planning and applications are of great importance and priority in water management.

Water is mostly used in agriculture, industry and energy production. Increasing demand for water due to temperature and population increase necessitates effective water management policies (SYGM, 2020).

Studies on water conservation and reuse of used water within the framework of sustainable development principle in industrial investments to reduce water stress (cleaner production practices in industry), practices regarding losses and leakages in city networks (measures to reduce water leakage in the network, studies on irrigation water saving) are carried out.

- ▶ Reducing Loss / Leakage Rates If turkey water loss/leakage rate of 36% is considered appropriate infrastructure, pressure control and active leakage control with the ratio of reduction is possible.
- ▶ Rainwater Harvest: Areas of use for harvested rainwater include irrigation of green areas, use of water in the toilet, and laundry.
- ▶ Recycling of Domestic Wastewater: Greenfield irrigation and other urban uses, agricultural use of treated wastewater
- ▶ Reuse of Gray Water: Examples of recycled gray water uses include toilet reservoirs, garden irrigation, car washing, fire installation, laundry, ornamental pools, general cleaning and cooling tower feeding.
- ▶ Efficient Irrigation Techniques: Drip irrigation method, Sprinkler irrigation method

Basin-based approaches are developed to ensure efficiency in water management, making sure that basin protection action plans are prepared in which integrated protection and controlled use principles are determined, and practices are monitored. River basin conservation action plans across 25 basins in Turkey are completed.

In addition, in order to ensure sustainable agricultural production and increase productivity, taking into account the climatic conditions, soil structure and topographic characteristics of the regions, and the dimensions of being manageable, 30 agricultural basins were determined with the decision of the Council of Ministers dated 29/06/2009 and numbered 2009/15173.

Issues considered as important from the studies conducted in terms of water resources management, climate change, impacts, vulnerability, sustainable rational use of resources:

▶ THE EFFECT OF CLIMATE CHANGE ON WATER RESOURCES PROJECT

- ▶ Increasing the Storage Capacity,
- ▶ Lake Water Project,
- ▶ Basin Protection Action Plans,
- ▶ Conversion of Basin Protection Action Plans into River Basin Management Plans,
- ▶ Protection Studies for Drinking Water Basins,
- ▶ Ensuring Water Saving in Irrigation,
- ▶ Drought Management Studies,
- ▶ Supply of Drinking, Utilization and Industrial Water,
- ▶ Flood Protection Activities,
- ▶ Distribution of Water Between Sectors,
- ▶ Studies on the Control of Nitrate Pollution Caused by Agriculture,
- ▶ Determination of Sensitive Areas and Quality Targets in Turkey based on Basins
- ▶ Erosion and Sediment Control Studies,

- ▶ Rehabilitation Project for Control and Reuse of Irrigation Water in the GAP Region,
- ▶ Assessment of Reuse Alternatives of Used Water Project,
- ▶ Evaluation of Hydro-meteorological Measurement and Monitoring,
- ▶ Special Decision Making Studies,
- ▶ Projects Realized in Turkey Related to the Implementation of the Nitrates Directive and Regulation
- ▶ Implementation of the Nitrates Directive in Turkey Project (IPA Project)
- ▶ Water Quality Monitoring EU Twinning Project,
- ▶ Investigation of the Applicability of Using Treated Wastewater in Irrigation in Ergene Basin,
- ▶ Climate Change Originated Risk Assessment with Integrated Monitoring and Modeling Systems,
- ▶ Preparation Project Ensuring Change (Sixth and Seventh National Communication).

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